CLOUSTON associates

Wildlife Lake Landscape Concept

Penrith Lakes Development Corporation

October 2010

WILDLIFE LAKE LANDSCAPE CONCEPT REPORT

Client
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Revision	*Date*	*Description*	*Checked*
A	*14.05.09*	*Interim issue to client for review*	*CD*
B	*18.05.09*	*Draft issue for client review*	*CD*
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D	*29.06.09*	*Document revised and finalised for meeting with the Minister for Planning (prior to Two Year Plan submission)*	*CD*
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F	*11.12.09*	*Further client revisions prior to Two Year Plan Submission*	*CD*
G	*29.10.10*	*Further client revisions prior to Two Year Plan Submission*	

COMMENTS

Revision A	Interim issue of (document not complete)
Revision B	Base line and Opportunities plans completed
Revision C	Client comments incorporated throughout document.
Revision D	Client comments incorporated throughout document.
Revision E	Client comments incorporated throughout document.
Revision F	Client comments incorporated throughout document.
Revision G	Client revisions incorporated throughout document.

TABLE OF CONTENTS

1.0 INTRODUCTION

The Wildlife Lake Landscape Concept document has been prepared by CLOUSTON Associates for Penrith Lakes Development Corporation Limited (PLDC) in collaboration with TCM Services and Godden Mackay Logan.

This document brings together concepts and principles which relate to the Wildlife Lake which are contained in other documents:

- Landscape Masterplan Report (2009).
- Visual Management Strategy (2009).
- Landscape Heritage Strategy (2009).
- Draft Natural Heritage and Biodiversity Master Plan (TCM Services 2009).

The purpose of this document is to illustrate the Wildlife Lake concept and guide the detailed design of landform and landscape for the Wildlife Lake area, in the north of the Penrith Lakes site. This document provides:

- Project Background
- Landscape Design Principles
- Description of proposed landscape character
- Description of the landscape concept, expressed in two stages:
  - *Base Line Landscape Concept*: which refers to the first stage of construction where the basic components of the lake and its surrounding landscape would be provided by PLDC.
  - *Opportunities Landscape Concept:* which illustrates opportunities that could be explored and developed, but not provided by PLDC, within the Wildlife Lake area.

The purpose of the two Landscape Concepts is to demonstrate the short and long term delivery of the Wildlife Lake and its surrounding landscape.

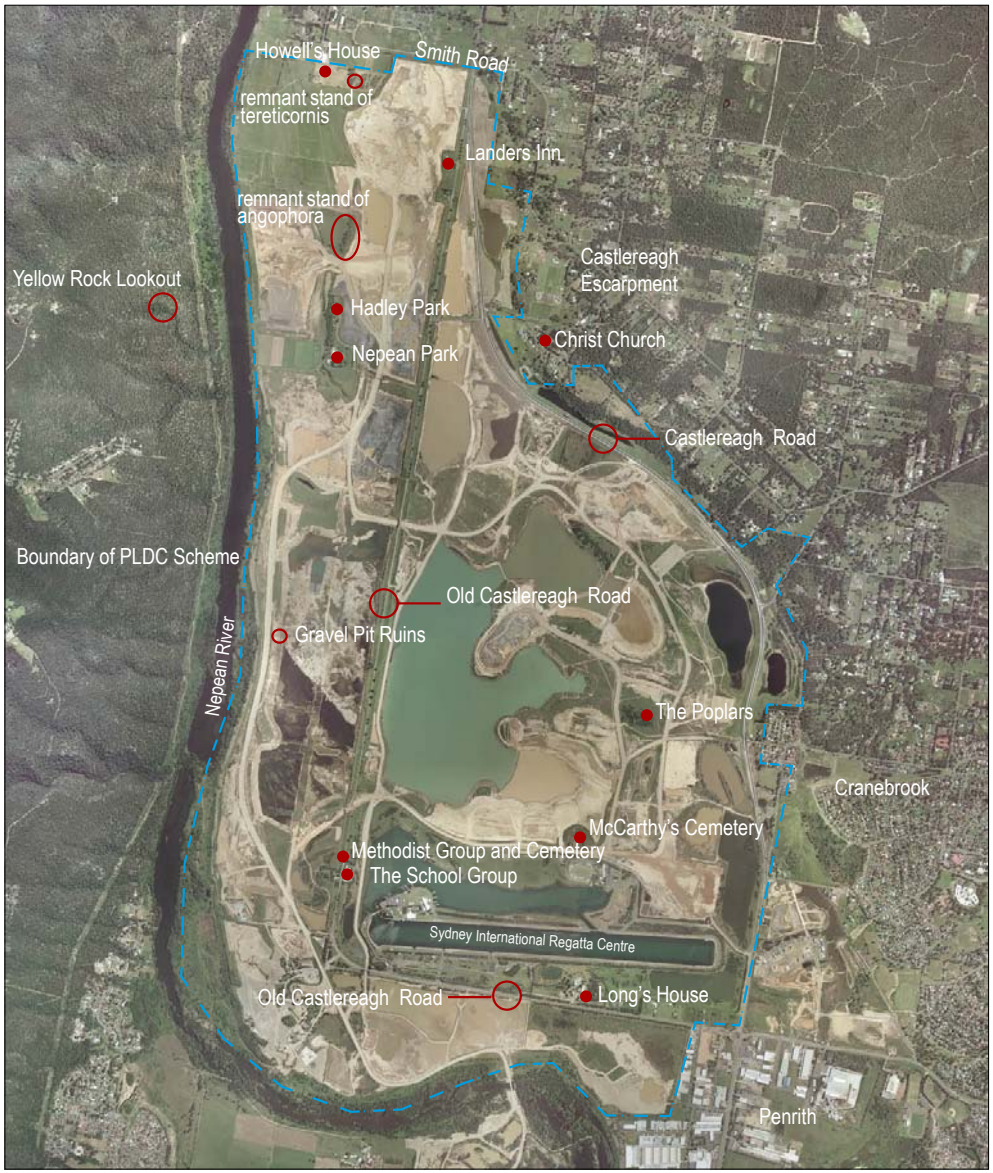


Figure 1 Penrith Lakes Scheme context plan

2.0 PROJECT BACKGROUND

Overall Penrith Lakes site

The Penrith Lakes Scheme is located in Castlereagh, approximately 54 km west of Sydney in New South Wales. The site, which comprises 1935 hectares is bounded by the Nepean River to the west and south, Smith Road to the north and Castlereagh Escarpment to the east.

The surrounding landscape is characterised by the Blue Mountains Escarpment with its deep gorges such as Nepean Gorge to the south west of the site, the Castlereagh Escarpment and the Nepean River. The river bank and foothills are heavily vegetated with remnant pockets of indigenous Cumberland Plain Foothills sandstone communities. The Penrith Lakes Scheme lies on the north-western edge of the Cumberland Plain on the flat river floodplains and alluvial terraces of Cranebrook.

The local landscape is characterised by alluvial floodplains and terraces with their pre-contact and historic agricultural land use.

Traditional ownership of the Cumberland Plain land covered by this report lies with the Mulgoa clan of the Darug who occupied the land for up to 14,000 years before white settlement. The area was regarded as a significant meeting place for the local tribes and the Mulgoa clan possibly traded the hand tools which they fashioned from the locally found chert and silcret stone.

Early European settlers initially farmed the fertile floodplains but moved to quarrying on the discovery of the rivers resource of sand and gravel in great demand for the building of the new Sydney town.

Sand and gravel quarrying first began in the Nepean River bed during the 1880s and when the rivers resources were exhausted moved to the adjacent river flood plain in the 1970s to continue quarrying. The sites mining history which has continued to the present day has dramatically changed the topography, in places altering the natural drainage patterns, of the sites landscape character.

Figure 2: View to Howell's House from within the proposed Wildlife Lake

2.0 PROJECT BACKGROUND

Wildlife Lake site

The Wildlife Lake site is located in the northern part of the overall Penrith Lakes site. It is bounded by Smith Road to the north, the Nepean River to the west and Castlereagh Escarpment to the east.

The Wildlife Lake site is approximately 270 hectares (Ha), excluding the riverbank and the Smith Road outcrop. The lake is 112 Ha excluding the islands and the land surrounding the lake is 158 Ha including the roads that pass through the site.

The Wildlife Lake and its immediate surrounds contain a variety of important landscape features:

- ***Wildlife corridors*** – the Wildlife Lake is situated between two important wildlife corridors. The Blue Mountains National Park lies on the western side of the Nepean River and to the east is the Castlereagh Escarpment. The Wildlife Lake project provides an opportunity to enhance wildlife links between these two habitats.
- ***Natural Heritage*** – the site contains some areas of remnant vegetation including a stand of Broad-leaved Apple (*Angophora subvelutina*) trees to the north of Hadley Park and a collection of Forest Red Gum (*Eucalyptus tereticornis*) trees to the east of Howell's House. Old creek lines exist on the site in the form of a tributary of Cranebrook Creek, near Hadley Park and the Creek near Howell's House.
- ***Aboriginal Heritage*** – a significant number of archaeological relics have been discovered on the sandstone outcrop near Howell's House. In general the Penrith Lakes area was thought to be an important meeting place and feeding ground for Aboriginal people, due to the proximity to the river and the network of creeks that once existed on the site.
- ***Early European Heritage*** – the land grants of the early 1800s are still visible in the Penrith Lakes landscape today. The settlement patterns are most evident near Landers Inn where houses, wind breaks and old fence lines still exist. Old Castlereagh Road is also intact and abuts the historic properties Landers Inn. The telegraph poles and cultural street tree plantings along this road emphasize this important axis and view corridor.
- ***Historic Properties*** – two historic properties are located within the Wildlife Lake area:
  - ***Landers Inn*** is a locally rare 19th century inn with remains of sandstone stables that lie adjacent to the northern end remnants of the Old Castlereagh Road. The building remains as a visible local landmark.
  - ***Howell's House*** is a mass concrete structure (completed in 1902) and is in reasonable condition. It is situated on an elevated part of the site allowing for sweeping views of the proposed wildlife lake and beyond.
- ***Great River Walk Opportunity*** – The Great River Walk is a whole of Hawkesbury-Nepean River initiative to create a continuous walk from the River's source near Goulburn to its mouth at Broken Bay. Penrith City Council have delivered a significant length of the Great River Walk in their region and the opportunity exists to continue the walk through the Penrith Lakes site, providing a variety of river and lake side walking environments.
- ***The Visual Connections*** within the Wildlife Lake area are important for the interpretation of the cultural heritage within the site:
  - Views within the site between heritage properties and remnant vegetation.
  - Views into the site from Castlereagh Road.
  - Views of water, in particular from the northern, elevated section of Castlereagh Road.

2.0 PROJECT BACKGROUND

LEGEND

- Proposed Wildlife Lake and islands
- Proposed Main Lake
- Penrith Lakes Scheme boundary
- Southern extent of Wildlife Lake concept

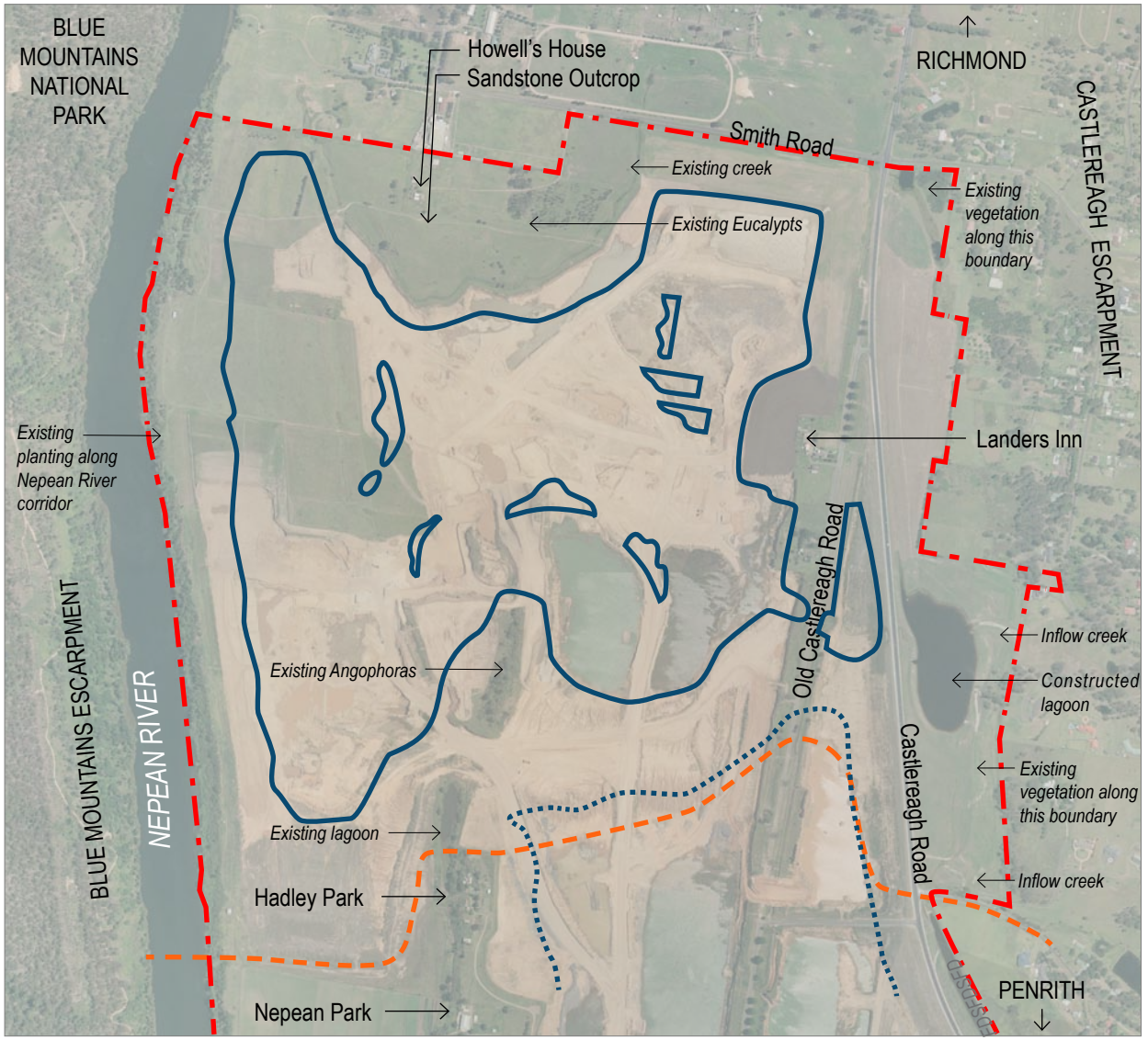


Figure 3: Wildlife Lake context plan

2.0 PROJECT BACKGROUND

Figure 5: View from the Cranebrook Escarpment looking south towards Lander's Inn

Figure 5: View from Howell's House looking south to the existing Angophoras and Hadley Park in the background

Figure 6: View from within the mining area, south of Howell's' House looking north to Howell's House and existing sandstone outcrop and creek

2.0 PROJECT BACKGROUND

LEGEND

- Key Views within the Wildlife Lake area
- Key Views into the Wildlife Lake area
- Proposed Wildlife Lake and islands
- Proposed Main Lake
- Penrith Lakes Scheme boundary
- Southern extent of Wildlife Lake concept

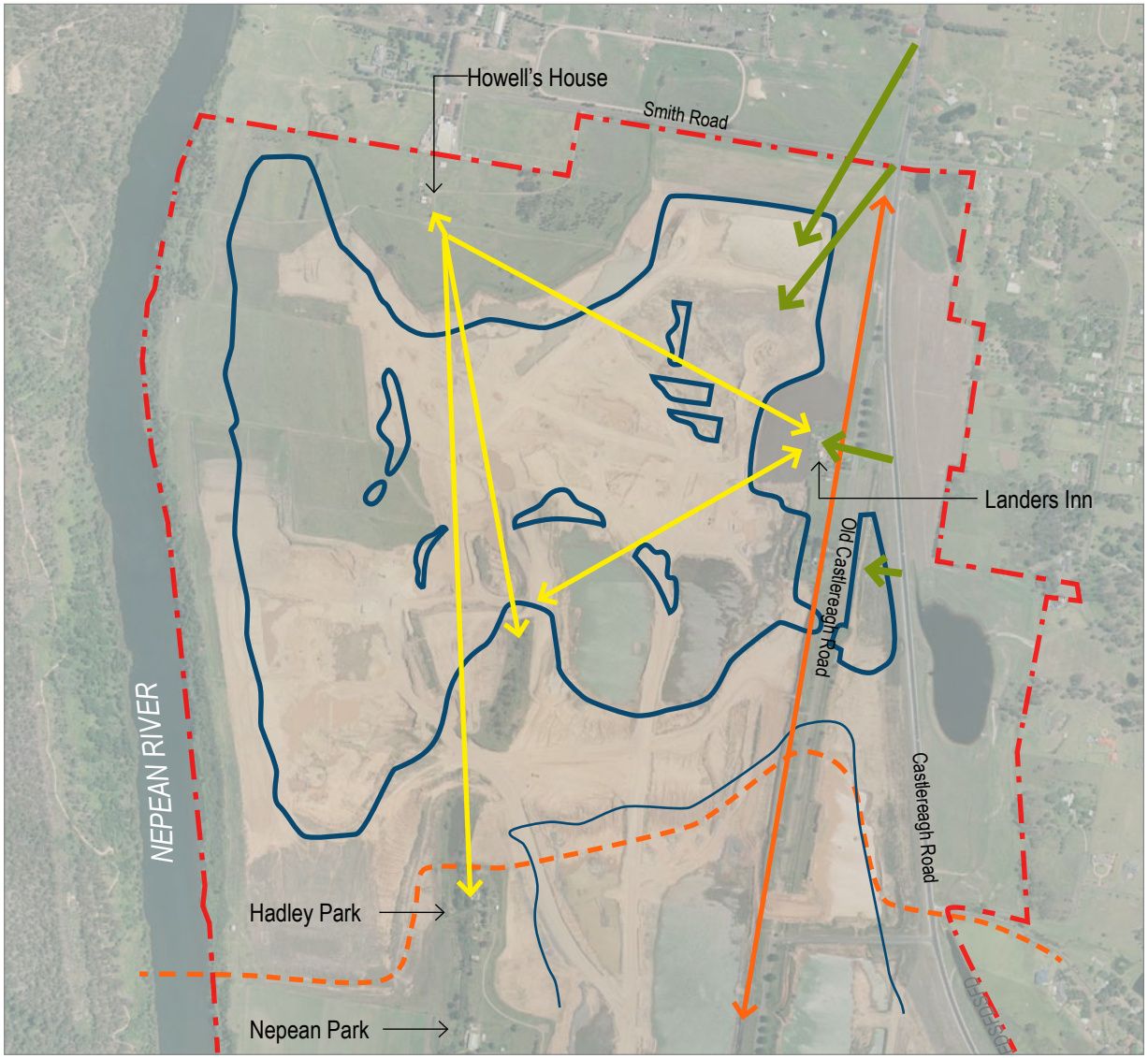


Figure 7: Wildlife Lake context plan

3.0 PROPOSED LANDSCAPE DESIGN PRINCIPLES

The Wildlife Lake and its immediate surrounds is expected to be constructed over an extended period and in separate stages. Therefore it is important to establish a set of Landscape Design Principles for the ongoing establishment of the Lake and its foreshore.

The following Proposed Landscape Design Principles focus on the landscape design of the lake edge and its immediate surrounds. These principles should be read in conjunction with the principles for design presented in:

- Ecological considerations for development of the Wildlife Lake (TCM Services 2009)
- Landscape Heritage Strategy (Clouston 2009) with regard to specific heritage sites.
- Visual Management Strategy (Clouston 2009)
- Draft Natural Heritage and Biodiversity Master Plan (TCM Services 2009).

To provide a complete set of principles for the Wildlife Lake design, many of the following principles are provided for long term guidance to the development of the site (denoted by an *), not to be delivered by PLDC.

3.1 Wildlife Lake Proposed Purpose

a. The Wildlife Lake and its immediate surrounds should be primarily designed to optimise attractiveness to wildlife whilst also supporting flood management, ecological water quality improvement and maintenance, providing suitable habitat and enabling research.

b. The design of the Wildlife Lake and its immediate surrounds should communicate different layers of history associated with the site through landscape features and interpretation.

c. Design and development of the Wildlife Lake should embrace the concepts of integrated catchment management and sustainable water cycle management.

3.2 Character

a. Design and layout of the Wildlife Lake should reflect the character of a natural open water form with refuge islands, wetlands and a focus on wildlife habitat.

b. The lake foreshore profiles should generally appear natural in gradient and planting types/ communities.

c. The design of some lake foreshore profiles should be influenced by the geometric nature of the former land grant boundaries and would be appropriate near Landers Inn. This would still promote natural ecological processes while integrating cultural heritage.

d. The Wildlife Lake precinct topography should be constructed with natural resources from within the Penrith Lakes Scheme.

e. The Wildlife Lake should be designed to be visually integrated within the context of the floodplain and river, including the use of trees of local provenance, shrubs and grasses of the original floodplain.




Indicative Images

3.0 PROPOSED LANDSCAPE DESIGN PRINCIPLES

3.3 Aquatic and Terrestrial Flora and Fauna

a. Core conservation areas should be identified, compatible with wider Penrith Lakes scheme biodiversity objectives.

b. The Lake system should be designed to achieve a high ecological value, maintain balanced fish community and be a macrophyte (rather than algal) dominated system.

c. Complex and varied topography bordering the lake should be incorporated to provide for a wide range of dryland habitats with a variety of ground cover, shrub, and tree species to establish in the long term.

d. The lake foreshore profiles/gradients should allow for plant diversity (representative of Cumberland Plain landscape) to be established.

e. The transition from aquatic to terrestrial communities around the lake should optimise the extent and diversity of habitat and plant communities.

f. All planting adjoining and within the lake should be native species and primarily of locally endemic provenance.

g. Proposed planting should optimise opportunities for appropriate wildlife linkages, while minimising the negative effects of edge conditions such as predation.

h. Reed beds should be unevenly scattered around the lake margins relating to different water depths and different substrates and interspersed with open water areas to provide a variety of micro-habitats.

i. Dense patches of emergent vegetation should be incorporated on lake and island edges for bird, roosting, feeding and breeding.

j. Screens of appropriately treed areas could be incorporated as shelter from prevailing winds and/or to minimise disturbance.

k. Islands should be specifically shaped, sized and planted to provide refuges and breeding sites for birds and other fauna.

l. Broad shallow lake edges and dense perimeter vegetation around the foreshore are essential to minimise access and disturbance within the Wildlife Lake core conservation areas.

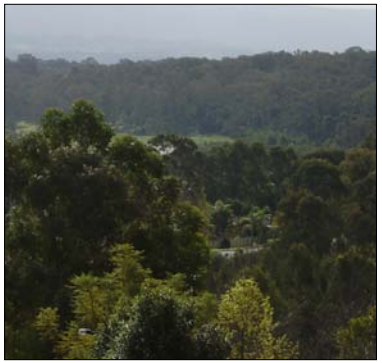
3.4 Cultural Heritage

a. The design and planting of the foreshores should conserve, interpret and respect cultural heritage.

b. Original creek alignments adjoining the lake should be integrated into the lake and foreshore design, retaining or restoring their hydraulic function wherever viable.

c. The Old Castlereagh Road alignment should be integrated into the design of the lake foreshore and water bodies.

d. Landscape features such as native hedgerows, wind breaks, fences etc. should be used along selected original land grant boundaries to interpret the early European settlement landscape while providing linked wildlife corridors.

Indicative Images

3.0 PROPOSED LANDSCAPE DESIGN PRINCIPLES

e. Cultural plantings in heritage precincts should use native species with similar form as introduced species where possible. Use of exotic species should be limited to non-invasive species and only where a native replacement is not adequate for the cultural interpretation.

3.5 Water Levels

a. Water levels should be naturally varying with infrastructure to enable controlled changes to assist management of aquatic flora and weeds if required.

b. Planting and materials used in foreshore edges should accommodate the fluctuating/varying water levels.

c. Islands within the lake should be carefully located to minimise wind driven wave climate and thus the extent of foreshore wave protection/shoreline armouring necessary.

3.6 Foreshore Access

a. Maintenance and public access tracks should be limited to meet management, maintenance and other identified needs and be designed and managed to minimise impacts on core native flora and fauna habitats.

b. Foreshore access should be focused in limited and appropriate non–core conservation areas.

c. Consider the opportunity to continue the Great River Walk through the Wildlife Lake area, providing a variety of walking environments that do not impact negatively on core conservation areas and heritage sites.

3.7 Recreation

a. The lake foreshore should generally be focused on passive, non noise-generating activities (walking, guided tours* etc).

b. Strategically placed, easily accessed passive recreation areas should be located outside of the core conservation areas.

c. Recreational use of the water should be limited to aesthetic/educational enjoyment* without adversely impacting on the wildlife sanctuary intentions of the site.

3.8 Views

a. Views to open water should be possible when seen from Castlereagh Road north of Landers Inn.

b. Positioning of structures and planting associated with the lake should not significantly obstruct the key views.




Indicative Images

3.0 PROPOSED LANDSCAPE DESIGN PRINCIPLES

3.9 Built Form, Structures and Infrastructure

a. Water Management Infrastructure should be discreet and integrated into landform wherever possible.

b. Flood weir structures should be integrated into the overall landscape character where possible.

3.10 Safety

a. Design of foreshores should consider suitable exit routes from the water to address accidental falls.

b. Safety precautions should be considered and sensitively integrated into the design of foreshores where adjoining water is deep or where easy exit is not available.

3.11 Interpretation, Education and Public Art*

a. Interpretation at the Wildlife Lake should primarily focus on natural environment values and should integrate cultural heritage narratives.

b. The lake's relationship to the Nepean River should be interpreted particularly where the visual relationship is not evident.

c. Directional, safety and interpretive signage should be low key, sensitive to and integrated into its immediate surroundings, whilst also taking into account and protecting wildlife and heritage areas.

3.12 Maintenance

a. The design and layout of the lake and foreshores should minimise long term maintenance and optimise ease of maintenance access both on land and by water.

b. Equipment and plant required for maintenance (sheds, boat ramps, vehicles etc) should be discreetly located and designed to integrate with the landform.*

c. The re-use of appropriate historic sheds and/or locating new sheds on historic building footprints should be considered.*

d. Natural energies such as those within drainage lines, creeks and the river should be considered as a means of naturally subsidising the health of the ecosystems (and therefore act to minimise maintenance).

3.13 Cost and Investment

a. Design of the system should be largely self-sustaining requiring minimal capital and operating/maintenance costs in the long and short term.

b. The design should allow for future interventions such as boardwalks, bird hides etc. to be constructed outside the core conservation areas.*

c. The design of the lake and its surrounds should allow for future revenue raising opportunities consistent with the design principles.*




Indicative Images

4.0 PROPOSED LANDSCAPE CHARACTER CONCEPT

The Wildlife Lake and its surrounding landscape provide an exciting opportunity to create a rich and diverse habitat for a variety of land and water based species. The diagram opposite illustrates:

- How existing habitat areas on the east and west of the site could be linked with the creation of a new wildlife corridor on the northern boundary of the site.
- Areas of core conservation where wildlife values are promoted and are deemed more important than the opportunity for human interaction within them.
- Where wildlife values are strongest and how the landscape transitions from areas of high human interaction to areas of very little or no human interaction.

Alongside the core conservation and wildlife values within the Wildlife Lake site, there are also other significant values and histories that need to be preserved, enhanced and interpreted. Opportunity exists for continuing the past farming history with possible ongoing use of the land for agricultural purposes. The Landscape Design Character Concept illustrates how these layers overlap.

The over arching Landscape Design concept for the Wildlife Lake involves the expression of human intervention in the landscape and across the lake, and the transition of landscape types and degree of human activity within the site.

In general terms the primary function of the western side of the Wildlife Lake is to provide a terrestrial and ephemeral core conservation environment for the establishment of wildlife habitat with minimal human interaction. The primary function of the eastern side of the Wildlife Lake is to provide wetlands and wildlife habitat on the lake edge and create an opportunity for education and research and to allow controlled human interaction with the lake.

The diagram opposite describes the conceptual landscape forms and functions of the proposed Wildlife Lake and its surrounds. Some of the features are already present in the landscape and should be retained and enhanced as part of the Two Year Plan and long term design of the lake. Other features, such as the lake and the islands are new human made interventions on the landscape which derive from the mining uses of the site.

Proposed Character Concept Features

Aboriginal and/or Natural Heritage Landscapes are a combination of existing Aboriginal significant sites and future areas earmarked for core conservation and Wildlife corridors. Existing stands of remnant vegetation and the naturally occurring sandstone outcrop near Howell's House are more organic in shape.

Early European Landscapes are the three distinct heritage properties that surround the Wildlife Lake. They have a strong historic and visual relationship to one another. These landmarks are more geometric in form due to their agricultural production.

Both types of landmark, European and Aboriginal, provide interesting visual markers across the site and an opportunity to interpret the history of the landscape.

Heritage Buildings are the primary buildings within the Agriculture/Farmland character curtilages. Research and education may operate alongside ongoing agricultural uses on the Landers Inn site due to its proximity to the Wildlife Lake and Old Castlereagh Road. Here research and education could centre around all these areas and also be a link along the GRW.

Land grant interpretation refers to the overlay of the original land grants onto the Wildlife Lake landscape. These lines are an opportunity to interpret the early European landscape, even in an water based landscape.

Old Castlereagh Road is a strong visual axis and acts like an anchor for the layout of spaces on the eastern side of the lake.

4.0 PROPOSED LANDSCAPE CHARACTER CONCEPT

LEGEND

Heritage Interpretation

- Aboriginal and natural heritage landscapes
- Early European landscapes
- Existing heritage buildings
- Land grant interpretation
- Old Castlereagh Road

Landscape Character

- Transition landscape
- Ecological/research values dominant
- Education/research values dominant
- Lake foreshore
- Ecological/research values dominant
- Education/recreation values dominant
- Agricultural land use

Circulation

- Castlereagh Road
- Great River Walk
- Ephemeral water flows

Figure 8: Proposed Landscape Character Concept sketch

4.0 PROPOSED LANDSCAPE CHARACTER CONCEPT

Transition Landscapes are spaces that link the eastern and western sides of the lake. The nature of theses spaces relates to three main values:

- Ecological
- Educational
- Recreational

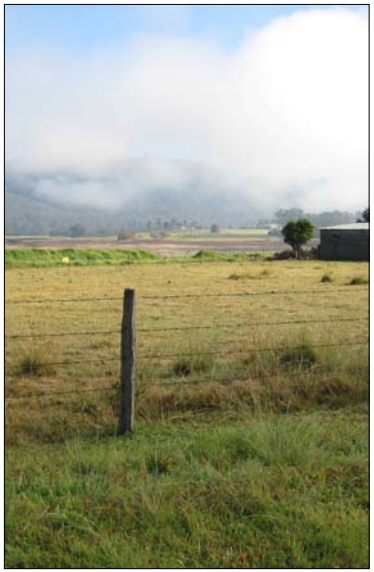
Transition landscapes on the eastern side of the lake may have an agricultural, recreational and educational focus and these values may be dominant drivers for the future opportunities within those spaces. Transition landscapes on the western side of the Wildlife Lake are proposed to have an ecological and research focus, with the exception of the heritage site of Hadley Park and its immediate agricultural lands. These values would limit the future opportunities on this side of the lake. Human activity and interaction would be limited and controlled.

The Lake foreshore concept is similar to the Transition Landscapes. The ecological and educational values of the Wildlife Lake edge determine the human interaction with the lake, the geometry and landscape type. The ecological values are highest on the western side of the lake where core conservation areas are proposed to be established, with the exception of the heritage site of Hadley Park and its immediate agricultural lands. Human activity may be limited in core conservation areas whereas on the eastern side of the lake the educational values are high enabling people to interact with the lake. The form of the Wildlife Lake edge will also be influenced by these values.

Agricultural/Farmland character refers to the heritage properties which have a history of farming. The diagram explores how this character can be retained or re-introduced within the curtilages of the property and also extend into other parcels of land that reflect the original land grants.

Great River Walk could take a detour from the river corridor in order to establish a core conservation zone along the river and avoid private property.

Ephemeral water flow refers to the overland flow of flood waters over weirs between the main lake and the Wildlife Lake and in the north west corner. It also refers to existing creek lines that will be integrated into the Wildlife Lake as part of the construction.

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5.0 PROPOSED LAKE EDGE LANDSCAPE ZONE OPTIONS

The interface between the terrestrial and aquatic environments at the Wildlife Lake's waters edge is an important consideration for:

- Creation of a ***variety of habitats*** to attract a diverse selection of both terrestrial and aquatic species.
- ***Diversity of plant communities*** that can be accommodated along the waters edge, including lake foreshore, islands and the deeper parts of the lake edge.
- ***Visual quality*** of the overall lake environment and the opportunity to create interest and diversity at key locations.
- ***Education and research*** opportunities where access to the waters edge is suitable.

The proposed Wildlife Lake edge can be divided into four main habitat and landscape zones (refer to TCM Services Ecological Considerations for development of the Wildlife Lake 2009 report for more detailed descriptions of the plant communities and the fauna they can support).

Terrestrial zone

- This zone is a dry environment with the exception of a major flood event.
- Suitable gradients within this zone should be between 1:3 and 1:80.
- The plant communities that could establish in this zone include Riparian Forest, Alluvial woodland, Shale Gravel Transition Forest, Casuarina stands, Melaleuca swampland, Castlereagh Swamp Woodland and Grasslands.

Ephemeral Wetlands

- This zone should experience wet and dry sequences depending on flood and drought events and the level of controlled water in the lake. The water level should be between 0 and 500mm deep.
- Suitable gradients within this zone should be between 1:6 and 1:40.
- The plant communities that could establish in these conditions include Shale Gravel Transition Forest, Casuarina stands, Melaleuca swampland, Castlereagh Swamp Woodland, Grasslands and Herblands.

Permanent Wetlands

- This zone should experience a permanent water depth of between 0.5m to 1m.
- Suitable gradients within this zone should be between 1:6 and 1:20.
- The plant community that could establish in these conditions includes Sedgelands and Rushlands (aquatic emergents).

Deep water

- This zone should experience a permanent water depth of up to 6 metres.
- Suitable gradients within this zone should be zero to 1:6 or 1:10.
- The plant community that could establish in these conditions is aquatic submergents (*Vallesneria* dominant with *Potamogeton* sp and *Hydrilla* sp common).

5.0 PROPOSED LAKE EDGE LANDSCAPE ZONE OPTIONS

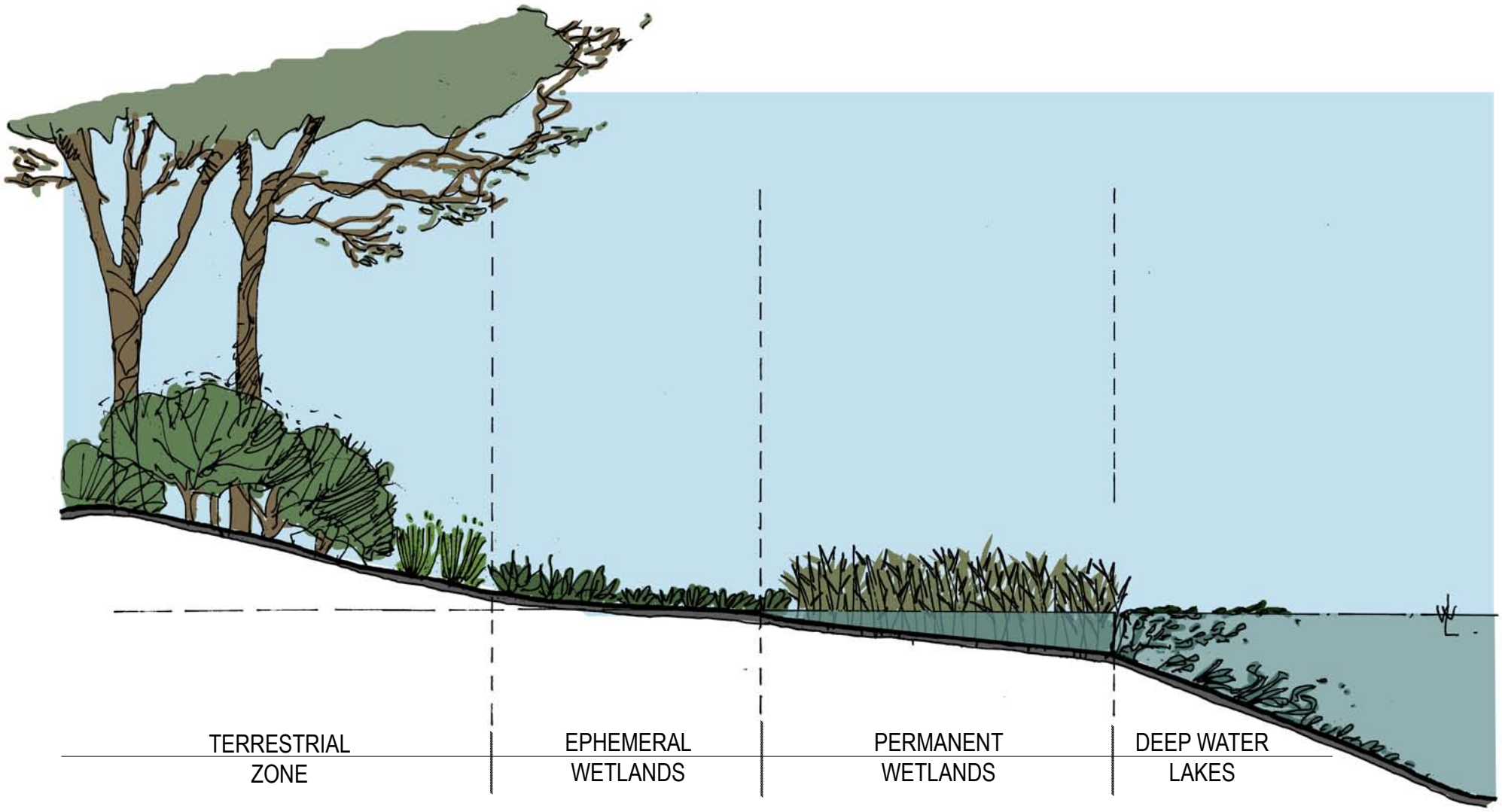


Figure 9: Landscape Zones (not to scale)

5.0 PROPOSED LAKE EDGE LANDSCAPE ZONE OPTIONS

Landscape zone application

The application of the proposed landscape zones along the lake edge, in sequence from the higher ground to the waters edge creates a variety of lake profiles as can be seen in the sketches opposite.

Variety above the waters edge has important outcomes for:

- Connections with existing habitat and plant communities such as the riparian community adjacent to the Nepean River, on the western side of the Wildlife Lake.
- Overall size and shape of the different plant communities and habitat in order to create species refuges and allow for movement.
- Quantum of particular habitats proposed across the Wildlife Lake site.
- Location of different research, education and recreational opportunities.
- Visual quality of the Wildlife Lake area when:
  - Viewed from a distance, such as from Castlereagh Road, Landers Inn, Howell's House etc.
  - Whilst within the Wildlife Lake such as walking along the Great River Walk.

Determining the most appropriate location for certain landscape features and types is also informed by the Proposed Landscape Character Concept and the testing of profile scenarios against existing and proposed landform, features such as remnant trees, structures and heritage issues.

The process of identifying different landscape zones on the waters edge and the lake profile has:

- Been successful in guiding the detailed engineering design process
- Provided an iterative design process between a variety of disciplines including wildlife and habitat values, heritage interpretation, landscape design, bulk earthworks, drainage design and detailed engineering.
- Set lake edge and profile gradients in place for opportunities to be created in the longer term.

5.0 PROPOSED LAKE EDGE LANDSCAPE ZONE OPTIONS

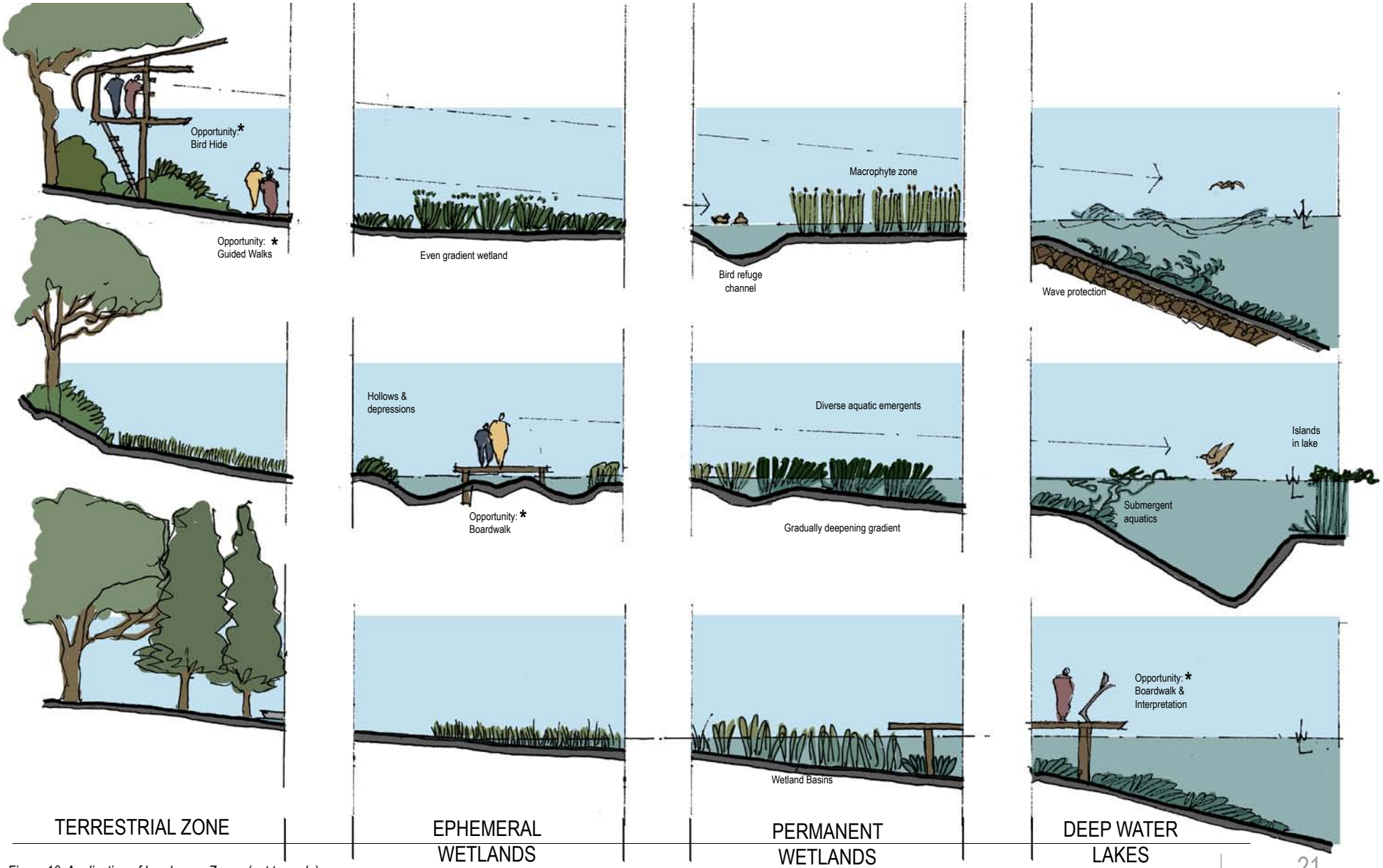


Figure 10: Application of Landscape Zones (not to scale)

***** *Opportunities not to be delivered by PLDC*

6.0 PROPOSED BASE LINE LANDSCAPE CONCEPT

The Proposed Base Line Landscape Concept refers to a landscape concept that guides the delivery of the Wildlife Lake within the scope of PLDC's obligations (allowing of the establishment of vegetation over time to create functional vegetative communities) . It is designed to allow for future opportunities in the form of landscape features and programs, such as the Great River Walk and education programs, to be introduced to the site over a period of time (as illustrated in the opportunities concept plan).

The Proposed Base Line Concept Plan provides a landscape structure, comprising a variety of landscape types and construction requirements that suit both the conservation values and heritage interpretation of the site.

Landscape Structure

The planting structure provided at the base line concept stage includes:

- ***Permanent wetland benches*** which refer to shallow areas where Sedgelands and Rushlands would be able to establish. They are positioned in a range of locations on the lake water line to create variety and interest along the lake edge. Some wetland benches would be suitable as bird refuges (See section AA page 30).

- ***Emergent vegetation*** refers to localised areas where shallow benches are not required for emergent vegetation to establish.

- ***Native grassland*** is proposed for all new landforms. The native grasslands are essential foundations for the Cumberland Plain Open Woodland plantings.

- ***Cumberland Plain Open Woodland*** features heavily along the western side of the lake, linking with the existing riparian vegetation to create a substantial core conservation corridor.

- ***Riparian Creekline*** planting that is consistent with Cumberland Plain species is proposed for the existing creeklines on the eastern side of Castlereagh Road and near Howell's House. This type of planting would also be appropriate for use adjacent to reinstated creek lines.

- ***Native Hedgerow*** trees are to be expected to be planted along the lines of the old land grants. These plantings would be substantial in width to act as wildlife corridors from Castlereagh Escarpment to the west.

- ***Old Castlereagh Road street trees*** are expected to be retained and reinstated where necessary along the Old Castlereagh Road alignment. These trees are expected to add to the cultural heritage interpretation of the old road and its strong orthogonal alignment.

- ***Heritage gardens*** are limited to Landers Inn, Howell's House and Hadley Park.

- ***Agricultural and Horticultural uses*** – provision of paddocks and plots of land suitable for growing crops and/or livestock grazing. These types of landscape/ uses could be suitable on the eastern side of Castlereagh Road or in the immediate surrounds of Landers Inn and Howells House.

- ***The Native Parkland trees*** are proposed within a passive recreation space. This is one of the Transition spaces where there is a convergence of several different overlays within the landscape: the old land grant patterns, old Castlereagh Road and the new weir. The planting structure should focus on the new inlet/swale and extend to the area in front of the weir. The fingers of vegetation are mirrored in the new planted area near the existing Angophoras.

- ***Grass terraces*** near the southern weir are proposed in order to create areas for passive recreation, such as picnics.

- ***Major stands of existing vegetation*** are expected to be retained. They include:
  - Remnant *Angophora subvelutina* located to the north of Hadley Park
  - Groups of trees on the eastern boundary of the Penrith Lakes scheme.
  - River Corridor planting adjacent to Nepean River.
  - Remnant stand of *Eucalyptus tereticornius*.

- ***Islands*** serve several purposes:
  - Habitat and wildlife refuge for birds, fish and other aquatic animals. The islands are positioned away from the lake edge creating a barrier to terrestrial predators.
  - Bird watching and other wildlife observations, especially the circular shape of islands near the existing Angophoras.
  - Interpretation of land grants where tree plantings would reflect the old land grants. This is expressed in the north west islands which are more geometric in shape.

6.0 PROPOSED BASE LINE LANDSCAPE CONCEPT

LEGEND

- Native Grassland/agricultural land
- Potential agricultural uses
- Existing Forest/Bushland
- Cumberland Plain Open Woodland
- Native Hedgerow Trees (marking former land grants)
- Parkland Trees
- Existing Old Castlereagh Road Street Trees
- Heritage gardens including cultural tree plantings and agricultural uses
- Riparian planting
- Weir structure and landscape terraces
- Permanent Wetland benches
- Emergent vegetation
- Penrith Lakes Scheme boundary
- Southern extent of Wildlife Lake concept
- Great River Walk (route only)
- Great River Walk flood route alternative
- Maintenance Track
- Key Views

Figure 11: Base Line concept plan

6.0 PROPOSED BASE LINE LANDSCAPE CONCEPT

- ***Existing creeks*** are retained and enhanced and reinstated where appropriate with Riparian planting.

Heritage Interpretation

Old Castlereagh Road is retained in the north from Smith Road to the southern extent of Landers Inn. Opportunity exists to interpret sections of Old Castlereagh Road. In keeping the alignment of the road as a major pedestrian route there is opportunity to further interpret the old country road in the future.

As described above the landscape structure is also used to interpret the natural heritage values of the site in the form of reinstating Cumberland Plain Open Woodland plant communities along the western boundary of the lake. Original land grants could be expressed as native hedgerows.

Views between key natural and historic heritage assets are maintained across the site. Planting could be positioned to create a variety of framed and open views, creating an interesting visual experience across the site:

- Views from Landers Inn to Howell's House maintain the connection between the agricultural properties.
- The view between Howell's House and Hadley Park allows the cultural and family history connection between these two properties to be maintained (See Interpretation Strategy).
- By maintaining views between the sandstone outcrop and the existing stand of Angophoras a significant visual connection is created between two natural heritage sites.
- Views from Landers Inn to the existing Angophoras are also important as they provide a visual link between the natural and agricultural heritage of the site.

Access and Circulation

In order to protect areas of core conservation and optimum wildlife habitats access to the lake is limited. As part of the Base Line Concept general visitor access would be directed through the use of landscape features such as dense planting.

The main circulation routes that would be provided at the Base Line stage are:

- ***The Great River Walk*** refers to a route only. Paths and other associated infrastructure would not be provided as part of the Base Line concept. The walk could follow the line of the proposed weir road and the Old Castlereagh Road alignment. This route would provide a variety of walking experiences along the lake edge and through the Landers Inn heritage precinct. The route could connect to river to the south as part of the Penrith Lakes Scheme.
- An ***alternative Great River Walk route*** is required in the event of a flood near Old Castlereagh Road. This route could follow the weir road to the east and connect with Castlereagh Road. An additional path could be required adjacent to the proposed native hedgerow to connect up with Old Castlereagh Road.
- ***Existing Maintenance tracks*** could be retained and used for maintenance of the lake, the lake foreshore and the surrounding landscape.




Indicative images: Wildlife Lake example images showing provision of base line infrastructure and long term outcomes

7.0 OPPORTUNITIES LANDSCAPE CONCEPT

The Opportunities Landscape Concept plan is not something PLDC is obliged or intends to deliver. The Opportunities Landscape Concept is presented to illustrate opportunities which the government, as long term owners may like to consider. These opportunities demonstrate the flexibility of the 'foundation' provided in the Base Line Concept. The opportunities could be delivered through:

- Introducing new landscape types within the landscape structure that would already be provided at the base line stage.
- Further investment in interpretation across the site.
- Provision of facilities that could enhance recreation, ecological and education purposes.
- Provision of land that could facilitate revenue raising initiatives.

Landscape Structure

The plant communities that would be planted as part of the Base Line Concept remain the same for the Opportunities Landscape Concept. However the Opportunities Landscape Concept identifies other landscape types that could be introduced to the surrounds of the Wildlife Lake to reinforce the conservation values and heritage interpretation of the site and also provide revenue-raising opportunities for the long term managers of the site.

The Opportunities Landscape Concept introduces the following landscape types that would express the early European uses of the landscape and could also facilitate revenue-raising initiatives:

- ***Agricultural and Horticultural uses*** – provision of paddocks and plots of land suitable for growing crops and/or livestock grazing. These types of landscape/ uses could be suitable on the eastern side of Castlereagh Road or in the immediate surrounds of Landers Inn and Howell's House.

- ***Orchards and Market gardens*** – this type of landscape could be suitable in close proximity to Landers Inn where fruit trees would complement the cultural plantings associated with the heritage gardens and re-use of the heritage properties. Here produce could be sold as part of a 'farm gate' initiative.

- ***Conservation values*** could be enhanced with the opportunity to increase the density and/or diversity of plantings within the core conservation and northern areas surrounding the lake. The purpose of the increase would be to enhance the Cumberland Plain identity of the Wildlife Lake area and optimise terrestrial habitat.

- ***Grass terraces*** - as part of the Proposed Opportunities Landscape Concept there are several opportunities that could be delivered in the passive recreation area near the southern weir. The Proposed Base Line plan would provide a series of grass terraces that could be made more formal as low concrete or stone walls, used for sitting and dividing the space into distinct areas. On the lake and inlet/swale edge the land form is proposed in such a way to accommodate boardwalks and low walls to allow more visitor interaction with the lake. Low walls would allow control of water coming into the lake and could control the types of species that could grow. The low walls would compliment the pattern of structured planting and the idea of a transforming geometry from Landers Inn to the southern weir.

Heritage Interpretation and Structures

The curtilage area associated with Landers Inn and to the east of Castlereagh Road and to the west of Hadley Park are ideal locations for interpreting and reinstating the agricultural uses of the past as described above. The gardens could also be enhanced to reflect country gardens of their era including the use of native and exotic species where appropriate. Structured native plantings could be provided in some areas as part of the Base Line Concept to create a framework for paddocks and fence lines that would relate to the original land grants.

A pedestrian bridge could be an opportunity for interpreting the Old Castlereagh Road and would enable a more direct route for the Great River Walk. Such a bridge could extend along the Old Castlereagh Road alignment, and over the boundary weir between the Wildlife Lake and Wildlife Lake East.

7.0 OPPORTUNITIES LANDSCAPE CONCEPT

LEGEND

- Agricultural/Horticulture uses
- Public parkland
- Orchards/market gardens
- Public Boardwalks
- Old Castlereagh Road bridge
- Jetty
- Old Castlereagh Road Interpretation (e.g. boat management buoys)
- Bird Hides
- Ongoing agricultural/horticultural uses and Maintenance hut (re-use old building/footprint)
- Permanent Wetland benches
- Emergent vegetation
- Penrith Lakes Scheme boundary
- Great River Walk
- Guided walks
- Maintenance Track
- Service Road
- Public Foreshore path
- Key Views
- Southern extent of Wildlife Lake concept
- Terrace walls

Figure 12: Base Line concept plan

7.0 OPPORTUNITIES LANDSCAPE CONCEPT

The opportunity for a bridge could be to extend at the existing level of the road alignment until it meets with the topography of the proposed weir structure between the Main Lake and Wildlife Lake. A path or ramp would be required to get over the weir where on the other side an interesting interpretation opportunity exists along the trajectory of the old road using a jetty to project into the Main Lake. Extending the interpretation of the road further into the Main Lake could be in the form of recreational boating management buoys.

The re-use of heritage buildings as Wildlife Lake maintenance huts could be suitable within the Landers Inn curtilage, if not retained as a working farm. In keeping with the Wildlife Lake Design Principles, any proposed hut or shed should be located and designed in such a way as to be visually unobtrusive and sensitively designed, with regard to size, form, and materials in order to complement its surroundings. Appropriate uses of other existing buildings could consider an education and research focus.

The major opportunity for visitors to interact with the Wildlife Lake edge and experience the wildlife attracted to the lake could be controlled in the form of particular structures:

- Boardwalks should be strategically placed away from major wildlife habitat so as not to disrupt breeding, nesting etc. The boardwalks would allow visitors to walk along the lake edge and experience the permanent and ephemeral wetlands. The geometry of the boardwalks would respond to their surroundings, for instance the boardwalks near Landers Inn could reflect the rigidity of the land grant patterns, where as near the existing Angophora stand the boardwalk would have a more organic nature.

- Bird hides could be located on the northern side of the lake, within the restricted core conservation area and within the new Cumberland Plain vegetation near the existing stand of Angophoras. The placement of the structures should relate to the old grant lines, potentially already set up as native hedgerows on the eastern side of the site.

Access and Circulation

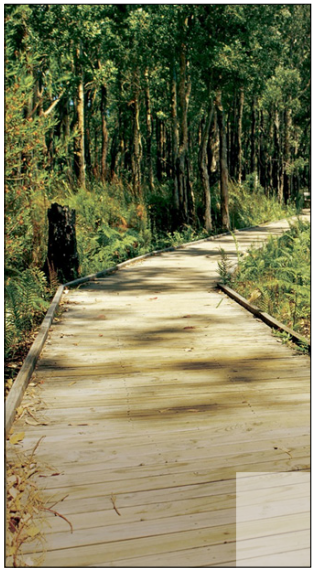
The Proposed Opportunities Landscape Concept would limit general visitor access to the eastern side of the lake along Castlereagh Road and the passive recreation area on the south eastern corner of the lake. However, by introducing an element of controlled or guided access, visitors could be offered the opportunity to experience the Wildlife Lake at closer proximity.

Guided walks refer to a small number of people being guided on specified tracks by a qualified guide. They could be introduced along the proposed maintenance tracks with the addition of small scale tracks to allow access to the boardwalks and bird hides on the northern side of the lake and also to the cultural and heritage sites within the Wildlife Lake area. These tracks may not be open to the general public. Operating guided walks may be another revenue raising opportunity for the site.

The Great River Walk would follow the same proposed route as indicated in the Base Line Concept. However the opportunity to create a bridge link between Landers Inn and the southern weir would negate the need for an alternative route in the event of flood.

Lake Foreshore paths on the eastern side of the lake.

A ***Service road*** linking the proposed maintenance hut near Landers Inn and Old Castlereagh Road.

Indicative images: Provision of jetties, boardwalks, stepped edges, bird hides etc. creates opportunities for visitors to interact with the lake.

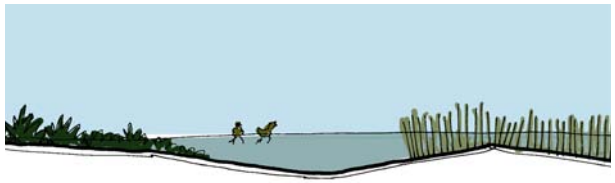
8.0 PROPOSED LANDSCAPE CONCEPT SECTIONS

The following indicative sections are based on the Opportunities Landscape Concept. They illustrate the variety in landscape types and lake profiles and some of the opportunities described in the previous section.

Section AA

This section is taken from the existing Angophoras through to the proposed islands:

- Existing gradients surrounding the Angophoras.
- The retention of existing Angophora trees.
- New Cumberland Plain planting to compliment the existing vegetation.
- Bird refuge opportunity near the lake edge. The detailed sketch shows how a refuge can incorporated into the design of the lake edge whilst still fulfilling the overall bulk earth works requirements.



Bird refuge detail

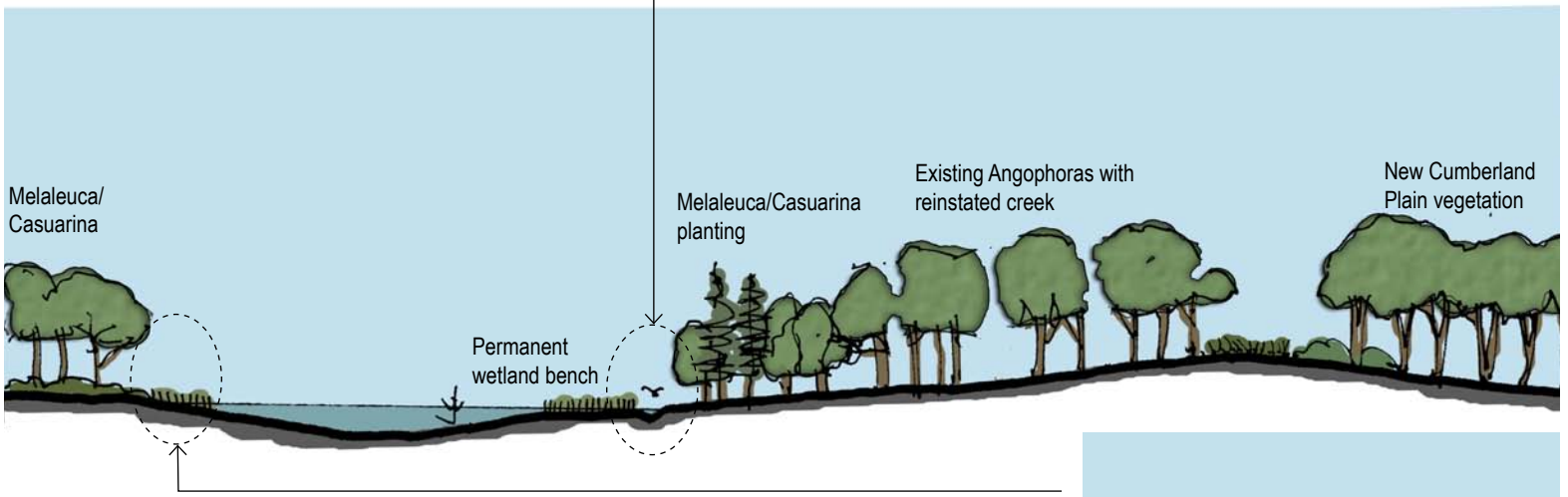


Figure 13: Section AA (not to scale)

Boardwalk opportunity detail

8.0 PROPOSED LANDSCAPE CONCEPT SECTIONS

Section BB

This section provides an indicative profile of the lake edge near Howell's House:

- A standard 1:6 gradient down to the lake edge.
- Open woodlands.
- Opportunity for lake side interaction.
- Vegetation at the water's edge where wetland benches are not required.

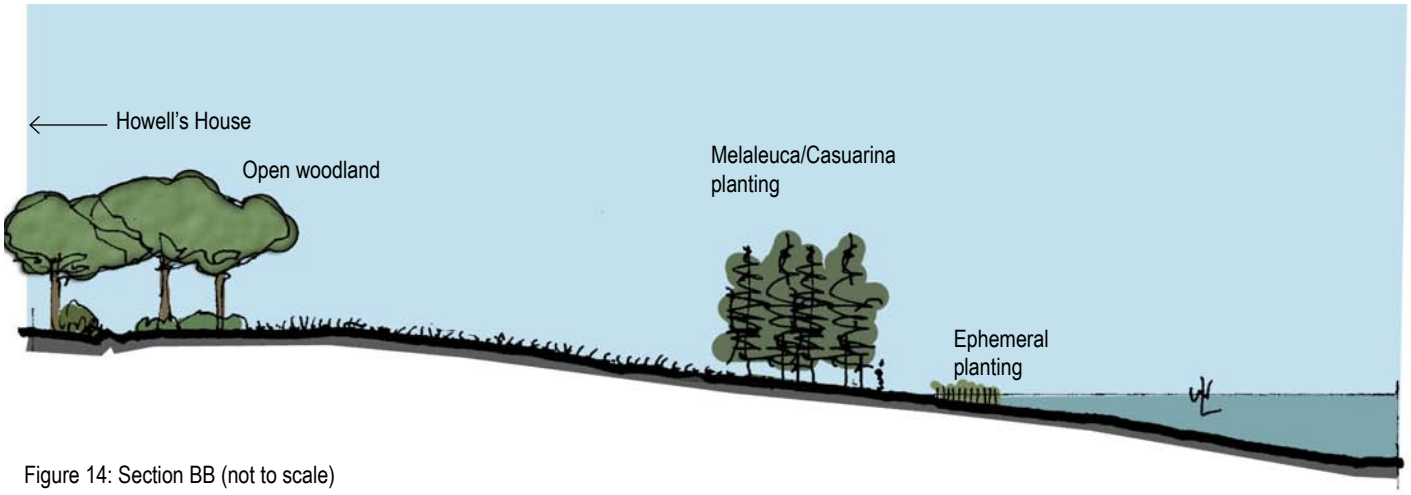


Figure 14: Section BB (not to scale)

8.0 PROPOSED LANDSCAPE CONCEPT SECTIONS

Section CC

This section is taken from the River Corridor through to the western side of the Wildlife Lake:

- Heavily vegetated core conservation corridor.
- Maintenance track on top of the Riparian corridor bank.
- Potential to use the maintenance track as a guided walk track.
- Opportunities for bird hides and interpretation.

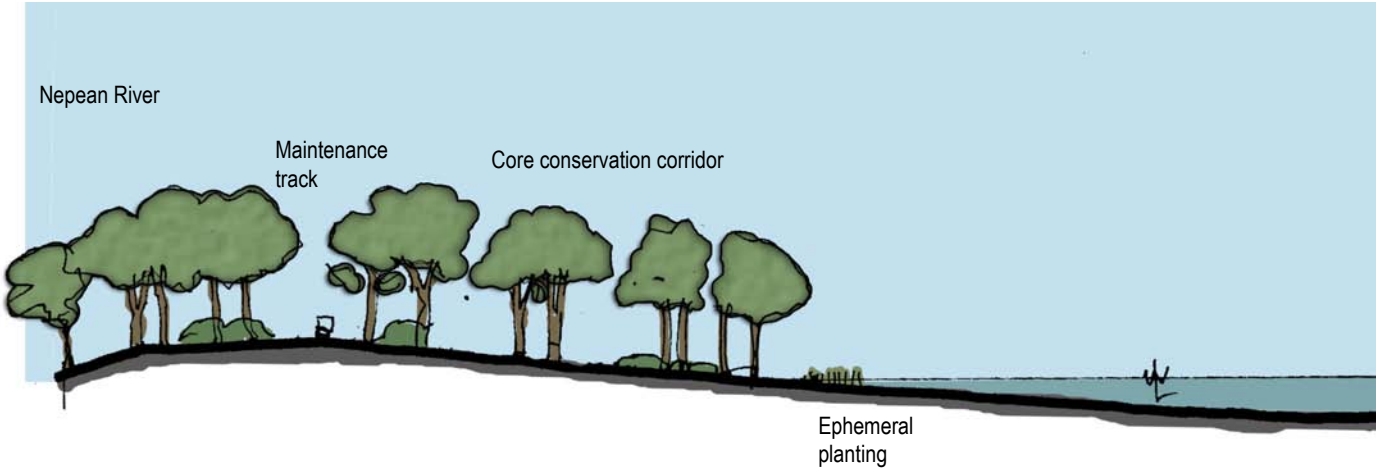


Figure 15: Section CC (not to scale)