

7.6 Biodiversity

A technical working paper: biodiversity (**Appendix J**) has been prepared in order to assess the potential biodiversity impacts of the project. This section provides a summary of the technical working paper.

Table 7-147 sets out the Director-General's Requirements as they relate to biodiversity and where in the environmental impact statement these have been addressed.

Table 7-147 Director-General's Requirements - biodiversity

Director-General's Requirement	Where addressed
An assessment of the potential ecological impacts of the project, with specific reference to vegetation and habitat clearing, connectivity, edge effects, weed dispersal, bushfire risk, riparian and aquatic habitat impacts and soil and water quality impacts. The assessment must: <ul style="list-style-type: none">• make specific reference to impacts on threatened species and endangered ecological communities.• have reference to the Draft Guidelines for Threatened Species Assessment (DEC/DPI, 2005), Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (DEC), the Guidelines for Aquatic Habitat Management and Fish Conservation (DPI, 1999) and any relevant draft or final recovery plans.• include details of any offset measures that may be required, including demonstration that the measures are consistent with the NSW offset principles for major projects (state significant development and state significant infrastructure) (OEH, 2013c).	Identification and assessment of potential ecological impacts including impacts on threatened species and endangered ecological communities is provided in Section 7.6.3 . Offset measures are provided in Section 7.6.4 . Additional detail regarding ecological impacts is provided in Appendix J – Technical working paper: biodiversity.

7.6.1 Assessment methodology

The biodiversity study area includes existing motorways, residential areas and landscaped areas as well as patches of remnant native vegetation in varying conditions and connectivity.

The study area includes the construction and operational footprints (outlined in **Chapter 5**) and has been divided into the following areas as shown in **Figure 7-63**:

- Windsor Road compound (C1).
- The Hills M2 Motorway integration works.
- Southern interchange.
- Wilson Road compound (C6).
- Trelawney Street compound (C7).
- Pioneer Avenue compound (C8)
- Northern interchange.

The biodiversity assessment has conservatively assumed complete vegetation clearance within the construction footprint and impacts have been assessed accordingly. While total vegetation clearance is unlikely to occur, vegetation clearance may potentially change within the footprint during detailed design. As such, total clearance has been assumed to ensure the 'worst case scenario' has been assessed.

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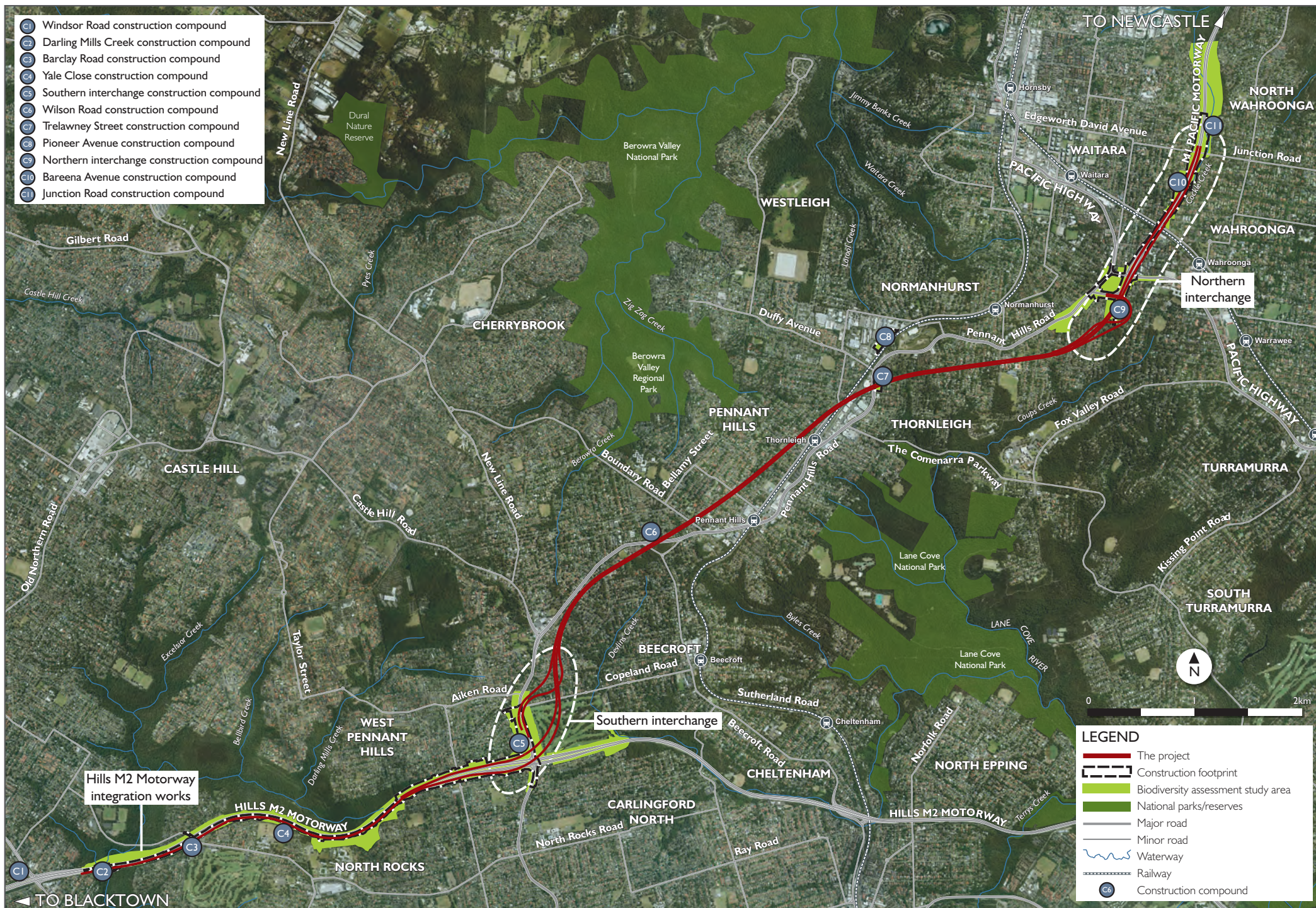


Figure 7-63 Biodiversity assessment study area

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This biodiversity assessment was undertaken in accordance with the guidelines specified in the Director-General's Requirements in **Table 7-147**, including:

- Draft Guidelines for Threatened Species Assessment (DEC & DPI, 2005).
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (DEC).
- Policy and Guidelines for Fish Habitat Conservation and Management Update (Fairfull, 2013).
- Principles for the use of Biodiversity Offsets in NSW (DECCW, 2008).
- Environment Protection and Biodiversity Conservation (EPBC) Act Environmental Offsets Policy – Consultation Draft (DSEWPaC, 2011).
- NSW Offset Principles for Major Projects (state significant development and state significant infrastructure) (OEH, 2013c).

The biodiversity assessment includes:

- Searches of relevant databases and literature review of previous reports.
- Field surveys to determine the presence or likelihood of threatened species, populations, habitats and endangered ecological communities (EECs).
- Significance assessments to evaluate potential impacts on threatened species, populations, habitats and EECs that may be affected by the project during construction and operation.
- Identification of measures to avoid, minimise and mitigate potential impacts to biodiversity, including the provision of an offset strategy where impacts could not be avoided.

Database searches and literature review

Existing information about the biodiversity study area has been obtained from a range of sources including threatened species databases, aerial photographs and previous studies relevant to the project. A review of various vegetation and soil datasets relevant to the biodiversity study area has also been conducted.

Database searches carried out as part of the biodiversity assessment included:

- Office of Environment and Heritage (OEH) Atlas of NSW Wildlife.
- EPBC Act Protected Matters Search Tool.
- National Atlas of Groundwater Dependent Ecosystems.

Previous mapping applicable to the biodiversity study area has also been reviewed including Sydney Metropolitan Catchment Management Authority vegetation mapping (DECCW, 2009d), Hornsby Local Government Area vegetation mapping (Smith & Smith, 2012) and Western Sydney vegetation mapping (NPWS, 2002). Regional-scale mapping covering an area roughly from Sydney to Batemans Bay by Tozer et al. (2006) has been used to inform the targeted field surveys.

The likelihood of occurrence for each relevant threatened species, population, habitat and endangered ecological community has been assessed based on information obtained from database searches and literature reviews. The likelihood of occurrence analysis has been used to guide and inform field survey work.

Field surveys

A field survey program has been developed and implemented based on the outcomes of database searches and literature reviews, and the likelihood of occurrence analysis carried out for relevant threatened species, populations, habitats and endangered ecological communities. The field survey methodology was also based on the existing nature of the study area, eg areas located adjacent to busy road and motorway corridors are not conducive to methods such as call –playback surveys. Details of field surveys, survey effort, survey extent and timing of field work is provided in **Appendix J**, and in summary included:

- Surveys of vegetation communities within the biodiversity study area to verify existing mapping of vegetation and to confirm the presence, composition and quality of natural vegetation including the threatened ecological communities.
- Targeted floristic surveys (20 metre by 20 metre quadrats), conducted in conjunction with BioBanking plots to identify flora species within vegetation communities, and to assist in the identification of those vegetation communities by comparing characteristic species.
- Random meander surveys for threatened flora species, with particular attention paid to *Epacris purpurascens* var. *purpurascens* based on a high probability of occurrence of this species in parts of the biodiversity study area.
- BioBanking plots and vegetation mapping to assess the extent and condition of vegetation within the biodiversity study area.
- Opportunistic sightings of fauna species during vegetation surveys.
- Fauna habitat assessments to identify potential habitat for threatened fauna species, including culverts, rock habitats and foraging substrates, termite mounds and the presence of hollow bearing trees and coarse woody debris.
- Hollow bearing tree surveys.
- Aquatic surveys within and downstream of the project footprint, with a particular focus on areas potentially receiving water discharged from the project during construction and operation.

In some cases, the survey periods for this assessment did not align with the seasonality requirements for certain threatened species. In these circumstances, the presence of threatened species has been conservatively assumed based on identified habitat values.

7.6.2 Existing environment

The biodiversity study area is located within the Sydney Basin Bioregion which extends as far north as the Hunter Valley, west to Mudgee and south to Batemans Bay. The majority of the project would be located within the Cumberland sub-region of the Sydney Basin Bioregion, with part of the northern interchange situated across the boundary with the Pittwater sub-region. A description of the geology and soils within the biodiversity study area is provided in **Section 7.8** (Hydrogeology and soils).

Existing vegetation across the biodiversity study area varies in terms of extent, connectivity and quality. Most of the biodiversity study area is characterised by established suburban development, with remnant patches of vegetation associated with suburban residential properties, infrastructure corridors and riparian areas. The most significant areas of contiguous vegetation are located in the north of the biodiversity study area. These areas are generally heavily vegetated and mark the start of vegetation in proximity to and connecting with the Ku-ring-gai Chase National Park.

The biodiversity study area spans two principal surface water catchments: the Hawkesbury-Nepean Catchment and Sydney Metropolitan Catchment areas. Surface water quality across the biodiversity study area is variable as a result of the suburban nature of the two principal surface water catchments, with the quality of water, watercourses and riparian areas influenced by the extent of adjacent development. Further discussion of surface water quality is provided in **Section 7.9** (Surface water).

Terrestrial flora

Much of the vegetation around Sydney, including within the biodiversity study area, has been cleared or disturbed to varying extents. It is common for fragmented vegetation communities to be present along highways and major roads where they have been preserved as part of the road reserve or as part of riparian buffers and gully systems associated with sandstone landforms. The literature review for the project has identified several vegetation communities previously recorded within the biodiversity study area, some of which are threatened ecological communities.

Vegetation communities

Vegetation communities identified through database searches and literature views, and verified through ecological field surveys carried out for the project, are shown in **Figure 7-64** to **Figure 7-71**.

Some areas could not be accessed during ecological field surveys because they are located on private property. Vegetation on private properties has not been verified through field surveys, but is expected to contain limited, complete natural vegetation communities with most flora likely to be planted or managed vegetation.

Blue Gum High Forest within the Sydney Basin Bioregion is listed as a critically endangered ecological community (CEEC) under both the EPBC Act and the TSC Act. The definition of this community under the EPBC Act differs to that under the TSC Act. In particular, the EPBC Act has stricter requirements in terms of patch size and community composition. As a consequence, although Blue Gum High Forest has been identified in the biodiversity study area, it meets the definition of this community under the TSC Act but not under the more restrictive requirements of the EPBC Act. Further details of the definitions of this community under the EPBC Act and the TSC Act are provided in the technical working paper: biodiversity (**Appendix J**).

Vegetation communities identified and verified as occurring within the biodiversity study area are summarised in **Table 7-148**. The location of each community relative to key project components is also provided.

Table 7-148 Vegetation communities within the biodiversity study area

Vegetation community	Windsor Road compound (C1)	Hills M2 Motorway integration works	Southern interchange (C5)	Wilson Road compound (C6)	Trelawney Street compound (C7)	Pioneer Avenue compound (C8)	Northern interchange (C9)
Blue Gum High Forest and derivatives							
Blue Gum High Forest (varying conditions, including CEEC under the TSC Act)		✓	✓			✓	✓
Patches of Blue Gum							✓
Blue Gum individuals		✓	✓	✓			
Patches of Blue Gum / Red Gum			✓				
Sydney Turpentine-Ironbark Forest and derivatives							
Sydney Turpentine-Ironbark Forest (CEEC under the TSC Act)				✓			
Sydney Turpentine-Ironbark Forest (highly disturbed understorey and CEEC under the TSC Act)			✓				
Hinterland Sandstone Gully Forest and derivatives							
Hinterland Sandstone Gully Forest (in varying conditions)		✓	✓				✓
Coastal Sandstone Forest and derivatives							
Coastal Enriched Sandstone Moist Forest		✓	✓				
Coastal Enriched Sandstone Sheltered Forest		✓					
Coastal Sandstone Gallery Rainforest		✓					
Coastal Shale-Sandstone Forest		✓					
Cumberland Riverflat Forest and derivatives							
Cumberland Riverflat Forest		✓					
Epacris purpurascens var. purpurascens							
Regeneration area <i>Epacris purpurascens</i> var. <i>purpurascens</i> (vulnerable under TSC Act)		✓					
Disturbed, landscape and non-native vegetation							
Roadside batter / spoil vegetation							✓
Roadside cutting vegetation							✓
Urban / street planting					✓		✓
Landscaped vegetation			✓				
Regrowth on disturbed land		✓	✓				
Cleared		✓					
Weeds / exotics		✓				✓	

Threatened ecological communities

Two threatened ecological communities (TECs) have been identified within the biodiversity study area namely:

- Blue Gum High Forest (critically endangered) (EPBC Act and TSC Act).
- Sydney Turpentine-Ironbark Forest (critically endangered) (EPBC Act and TSC Act).

Specifically, the threatened ecological communities present within each region of the study area are described in **Table 7-149**.

Table 7-149 Vegetation communities within the study area

Project area	Threatened ecological community	Description
Windsor Road compound (C1)	Nil	N/A
Hills M2 Motorway integration works	Blue Gum High Forest	<ul style="list-style-type: none">• Patch size is significantly less than one hectare.• Vegetation is in poor condition with an exotic understorey.• Likely to be consistent with the TSC Act definition of the community.• Does not meet the EPBC Act definition of the community.
Southern interchange	Blue Gum High Forest	<ul style="list-style-type: none">• Patch size is significantly less than one hectare.• Vegetation is generally in poor condition with an exotic understorey.• One small patch located off Lisle Court is in moderate condition.• Likely to be consistent with the TSC Act definition of the community.• Does not meet the EPBC Act definition of the community.• Several patches have been mapped as 'Blue Gum / Red Gum' but could not be conclusively identified due to access restrictions. These areas may be consistent with Blue Gum High Forest or Sydney Turpentine-Ironbark Forest as defined under the TSC Act.
Wilson Road compound (C6)	Sydney Turpentine-Ironbark Forest	<ul style="list-style-type: none">• A limited survey of the Wilson Road site has been conducted due to access restrictions.• The patch consists of several tree species with a mown / managed understorey.• Likely to be consistent with the TSC Act definition of the community.• Does not meet the EPBC Act definition of the community.• Several Blue Gum individuals have been identified that may be remnants of either Blue Gum High Forest or Sydney Turpentine-Ironbark Forest. These individuals are likely to meet the definition of either Blue Gum High Forest or Sydney Turpentine-Ironbark Forest under the TSC Act.

Project area	Threatened ecological community	Description
Trelawney Street compound (C7)	Nil	N/A
Pioneer Avenue compound (C8)	Blue Gum High Forest	<ul style="list-style-type: none"> Occurs in two small areas of the site. Patch size is less than one hectare Vegetation is in poor conditions with an exotic understorey. Likely to be consistent with the TSC Act definitions of the community. Does not meet EPBC Act definition of the community.
Northern interchange	Blue Gum High Forest	<ul style="list-style-type: none"> The community occurs in varying conditions across the site. The patch size of the community within the northern interchange construction compound (C9) area is greater than one hectare. However, the patch is in poor condition with an exotic understorey. Likely to be consistent with the TSC Act definition of the community. Does not meet the EPBC Act definition of the community.

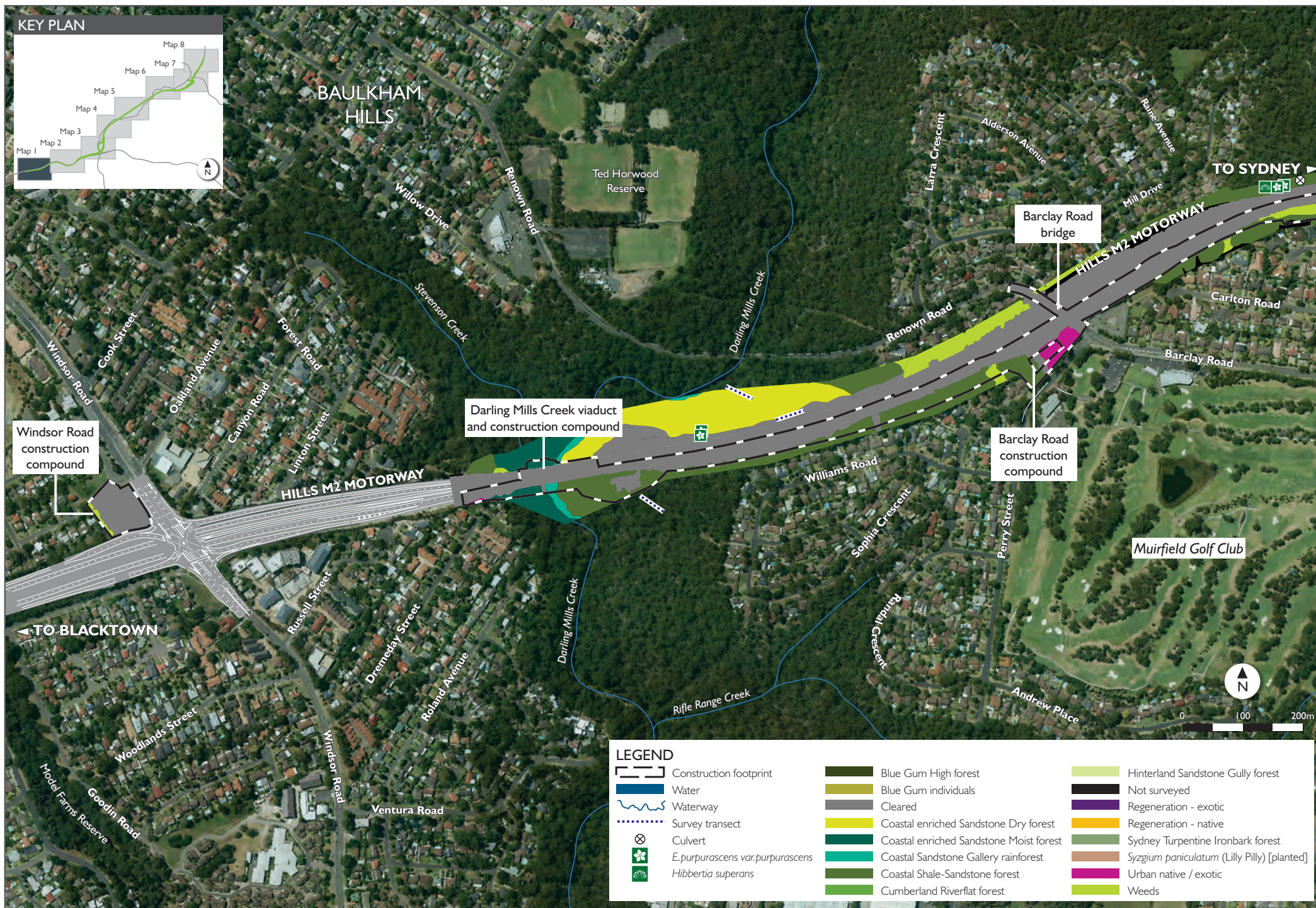
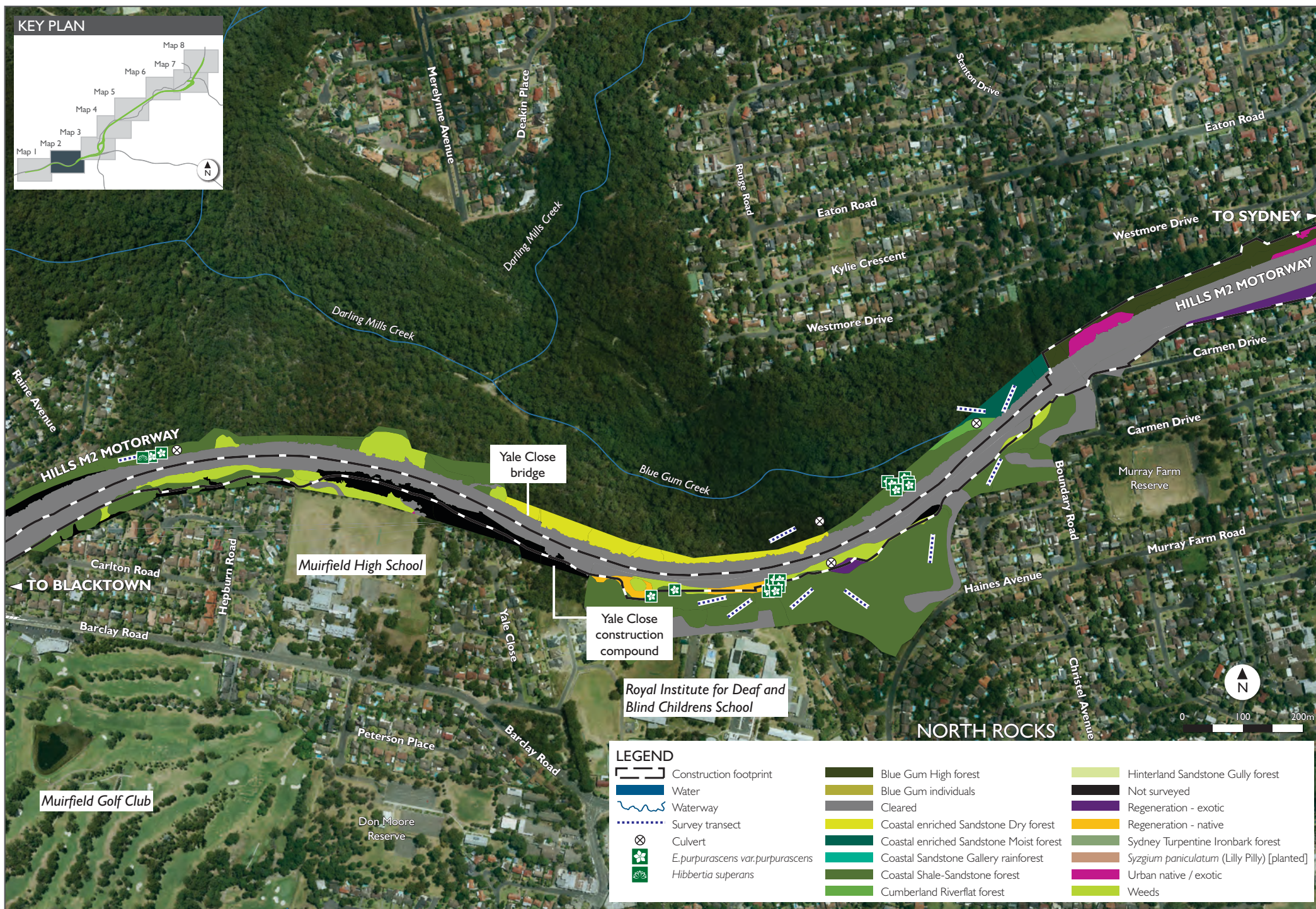


Figure 7-64 Vegetation communities identified - Map 1

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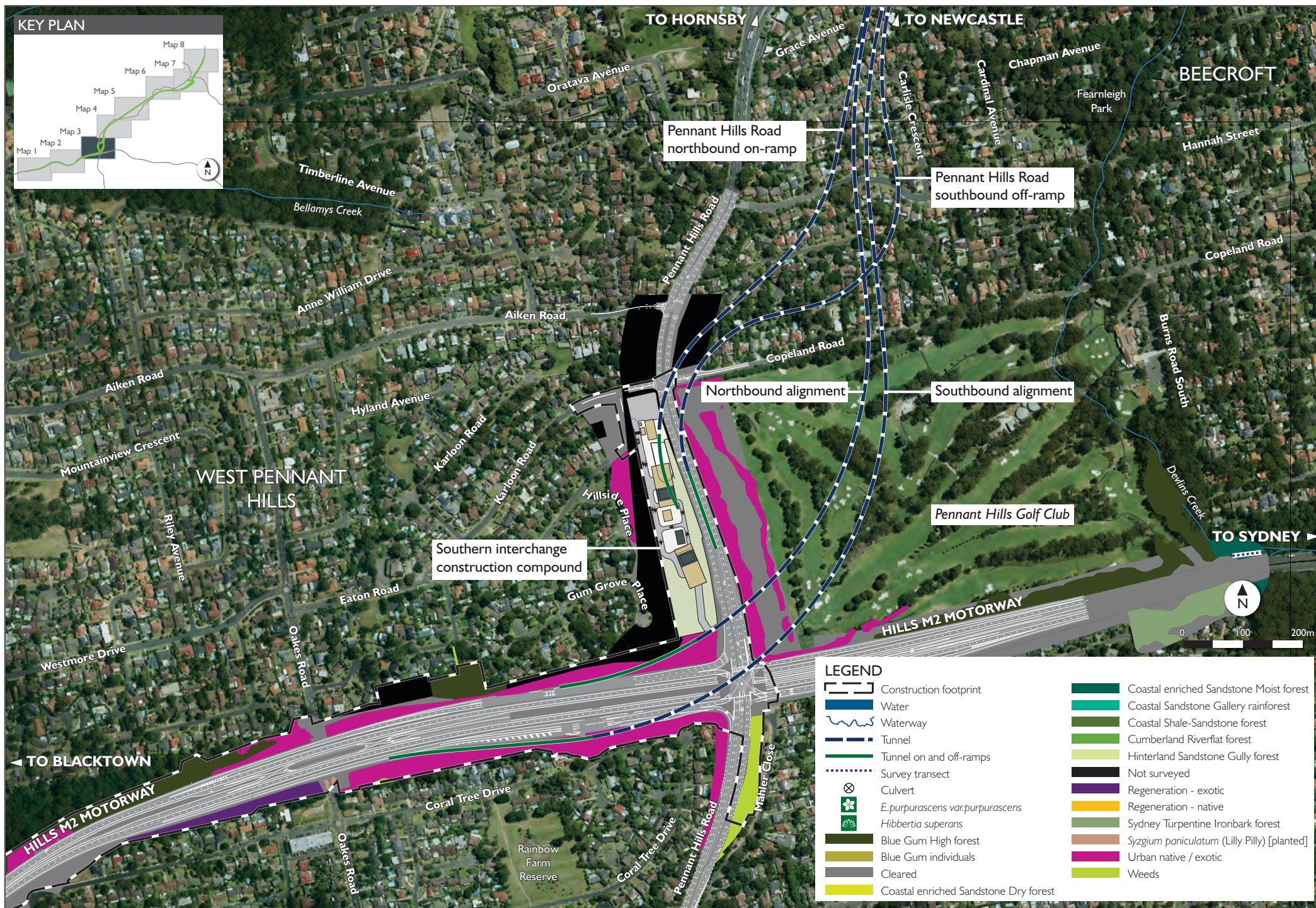


Figure 7-66 Vegetation communities identified - Map 3

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Figure 7-67 Vegetation communities identified - Map 4

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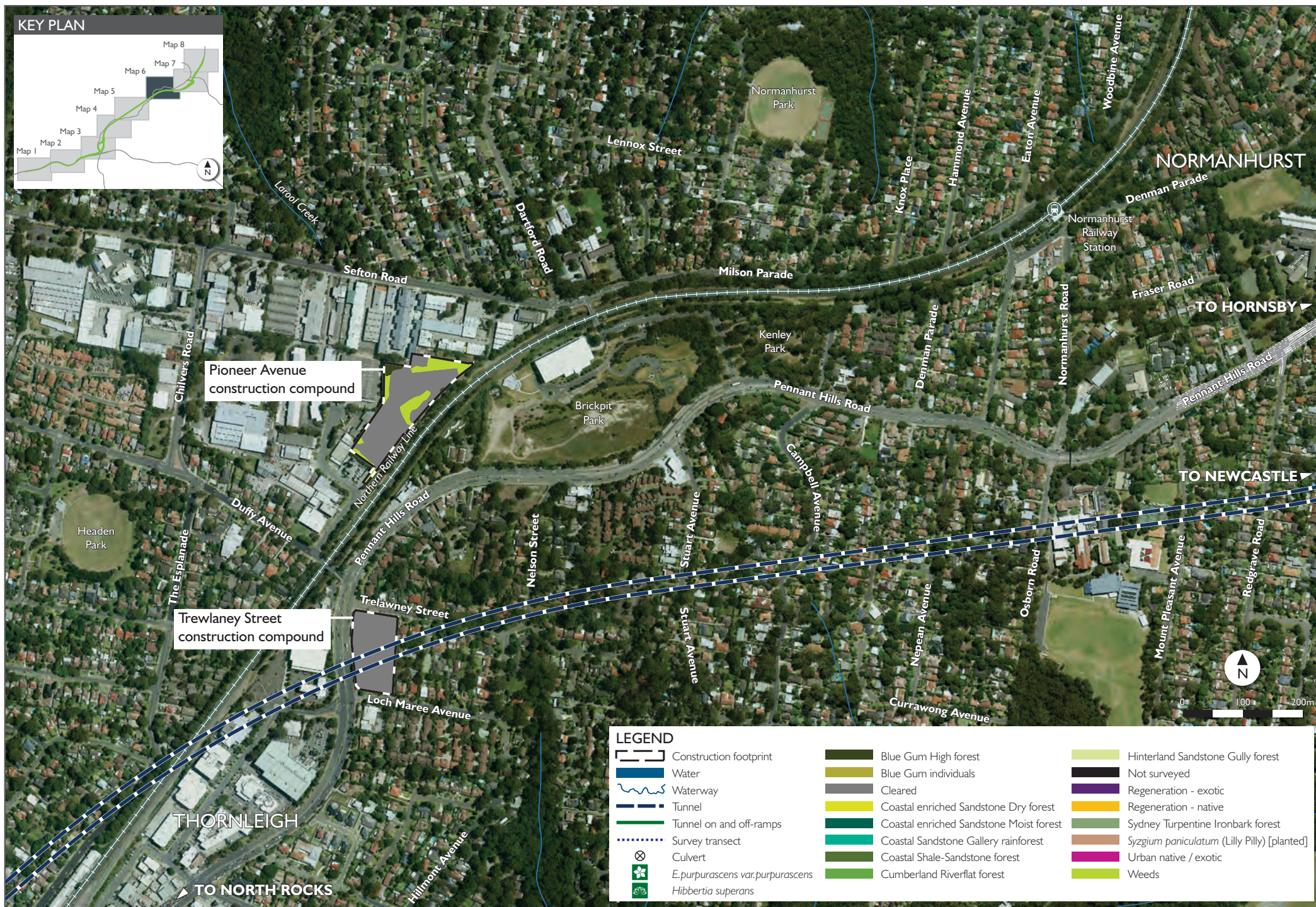


Figure 7-69 Vegetation communities identified - Map 6

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