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BASELINE TERRESTRIAL VEGETATION REPORT

Report for 28 South Environmental

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Contents

List of Tables

List of Figures

Appendices

Symbols and Abbreviations

*	(Preceding a plant species name) plant species not native to Australia
±	With or without, more or less
AHD	Average Height Datum
BoM	Bureau of Meteorology
BPA	Biodiversity Planning Assessment
CI	Crown Intercept
DAF	(Queensland) Department of Agriculture and Fisheries
DotE	(Commonwealth) Department of the Environment
DSITIA	(Queensland) Department of Science, Information Technology, Innovation and the Arts
EA	Environmental Authority
EDL	Ecologically Dominant Layer
EEM	Ecological Equivalence Methodology
EHP	(Queensland) Department of Environment and Heritage Protection
EO Act	(Queensland) Environmental Offsets Act 2014
EOP	(Commonwealth) Environmental Offsets Policy
EP Act	(Queensland) Environmental Protection Act 1994
EPBC Act	(Commonwealth) Environment Protection and Biodiversity Conservation Act 1999
ESA	Environmentally Sensitive Area
GDE	Groundwater dependent ecosystem
GPS	Global positioning system
ha	Hectares
HES	High ecological significance
km	Kilometres
LP Act	(Queensland) Land Protection (Pest and Stock Route Management) Act 2002
MLES	Matters of local environmental significance (EO Act)
MNES	Matters of national environmental significance (EPBC Act)
MSES	Matters of state environmental significance (EO Act)
NC Act	(Queensland) Nature Conservation Act 1992
NC Regulation	(Queensland) Nature Conservation (Wildlife) Regulation 2006
NRM	(Queensland) Department of Natural Resources and Mines
PFC	Projective Foliage Cover
QEOP	Queensland Environmental Offsets Policy 2014
RE	Regional Ecosystem as defined under the Queensland Vegetation Management Regulation 2000

REDD	Regional Ecosystem Description Database
SEWPaC	Former (Commonwealth) Department of Sustainability, Environment, Water, Populations and Communities
SPRAT	Species Profile and Threats Database
TEC	(Commonwealth) Threatened Ecological Community
TSSC	Threatened Species Scientific Committee
VM Act	(Queensland) Vegetation Management Act 1999
WoNS	Weeds of National Significance

Glossary

Term	Definition
Biodiversity Status	This is an EHP classification dependent on condition of remnant vegetation *in addition* to the criteria used to determine class under the Queensland *Vegetation Management Act 1999*. This classification is used for a range of planning and management applications, i.e. to determine environmentally sensitive areas. A regional ecosystem is listed as 'endangered' if: ▪ Less than 10% of its pre-clearing extent remains unaffected by severe degradation and/or biodiversity loss; or ▪ 10-30% of its pre-clearing extent remains unaffected by severe degradation and/or biodiversity loss and the remnant vegetation is less than 10,000 ha; or ▪ It is a rare regional ecosystem subject to a threatening process. A regional ecosystem is listed as 'of concern' if: ▪ 10-30% of its pre-clearing extent remains unaffected by moderate degradation and/or biodiversity loss. A regional ecosystem is listed as 'no concern at present' if: ▪ The degradation criteria listed above for 'endangered' or 'of concern' regional ecosystems is not met.
Benchmark condition	Benchmark condition describes the standard or typical condition of a particular RE in an undisturbed condition and is determined from an average value from mature and long undisturbed reference of 'Best on Offer' sites (Eyre et al. 2011). Benchmarks are developed by EHP for various vegetation communities, but not all at this stage.
Bioregion	A geographically distinct biological region, which is a reporting unit for assessing the status of native ecosystems and their level of protection. Australia is divided into 89 bioregions. Bioregions form part of the regional ecosystem classification code system. The study area is located in the Southern Coastal Lowlands sub-region of the South-east Queensland Bioregion.
Declared pests	Plants and animals listed under the Queensland Land Protection (Pest and Stock Route Management) Act 2002.
Endangered	Prescribed to a threatened ecological community, regional ecosystem or species under the Queensland *Vegetation Management Act 1999*, *Nature Conservation Act 1992* or Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
Environmentally Sensitive Area (ESA)	Defined under the Environmental Protection Regulation 2008, a Category A Environmentally Sensitive Area is: ▪ a national park, conservation park or forest reserve under the *Nature Conservation Act 1992*

Term	Definition
	▪ the wet tropics area under the Wet Tropics World Heritage Protection and Management Act 1992 ▪ the Great Barrier Reef Region under the *Great Barrier Reef Marine Park Act 1975* ▪ a marine park under the *Marine Parks Act 2004*. A Category B Environmentally Sensitive Area is: ▪ a coordinated conservation area, a wilderness area, a World Heritage management area, an international agreement area, an area of critical habitat or major interest identified under a conservation plan or an area subject to an interim conservation order under the *Nature Conservation Act 1992* ▪ an area subject to the Bonn, Ramsar or Paris Conventions ▪ a zone of a marine park under the *Marine Parks Act 2004* ▪ an area to the seaward side of the highest astronomical tide ▪ a place of cultural heritage significance or a registered place under the *Queensland Heritage Act 1992* ▪ an area recorded in the Aboriginal Cultural Heritage Register under the *Aboriginal Cultural Heritage Act 2003* ▪ a feature protection areas, State forest park or scientific area under the *Forestry Act 1959* ▪ a declared fish habitat or place of a marine plant area under the *Fisheries Act 1994* ▪ an endangered regional ecosystem identified in the database known as the 'Regional ecosystem description database'.
EPBC Act conservation status	The Environment Protection and Biodiversity Conservation Act 1999 lists species and communities: Extinct in the wild: ▪ It is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or ▪ It has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a timeframe appropriate to its life cycle and form. Critically Endangered: ▪ It is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria. Endangered: ▪ It is not critically endangered; and it is facing a very high risk

Term	Definition
	of extinction in the wild in the near future, as determined in accordance with the prescribed criteria. Vulnerable: ▪ It is not critically endangered or endangered; and ▪ It is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.
Least Concern	Prescribed to regional ecosystems listed under the Queensland *Vegetation Management Act 1999*.
Matter of National Environmental Significance (MNES)	A matter protected under the EPBC Act, including: ▪ World heritage properties ▪ National heritage places ▪ Wetlands of international importance ▪ Listed threatened species and ecological communities ▪ Migratory species ▪ Commonwealth marine areas ▪ The Great Barrier Reef Marine Park ▪ Nuclear actions ▪ A water resource, in relation to coal seam gas development and large coal mining development.
Matter of State Environmental Significance (MSES)	A matter of State environmental significance listed in Schedule 2 of the Queensland Environmental Offsets Regulation 2014 including: ▪ Regulated vegetation ▪ Connectivity areas ▪ Wetlands and watercourses ▪ High preservation areas of wild river areas ▪ Protected wildlife habitat ▪ Protected areas ▪ Highly protected zones of State marine parks ▪ Fish habitat areas ▪ Waterways providing for fish passage ▪ Marine plants ▪ Legally secured offset areas.
Matter of	A matter described in Section 5(3) of the Queensland Environmental

Term	Definition
National Environmental Significance (MLES)	Offset Regulation 2014 as a matter of local environmental significance for which an environmental offset is required under a local planning instrument.
NC Act conservation status	Under the *Nature Conservation Act 1992*, native wildlife may be prescribed as: Extinct in the wild: ▪ There have been thorough searches conducted for the wildlife; and ▪ The wildlife has not been seen in the wild over a period that is appropriate for the life cycle or form of the wildlife. Endangered: ▪ There have not been thorough searches conducted for the wildlife and the wildlife has not been seen in the wild over a period that is appropriate for the life cycle or form of the wildlife; or ▪ The habitat or distribution of the wildlife has been reduced to an extent that the wildlife may be in danger of extinction; or ▪ The population size of the wildlife has declined, or is likely to decline, to an extent that the wildlife may be in danger of extinction; or ▪ The survival of the wildlife in the wild is unlikely if a threatening process continues. Vulnerable: ▪ The population size or distribution of the wildlife has declined, or is likely to decline, to an extent that the wildlife may become endangered because of a threatened process; or ▪ The population size of the wildlife has been seriously depleted and the protection of the wildlife is not secured; or ▪ The population of the wildlife is low or localised and dependent on habitat that has been, or is likely to be, adversely affected, in terms of quantity or quality, by a threatening process. Near Threatened: ▪ The population size or distribution of the wildlife is small and may become smaller; or ▪ The population size of the wildlife has declined, or is likely to decline, at a rate higher than the usual rate for population changes for the wildlife; or ▪ The survival of the wildlife in the wild is affected to an extent

Term	Definition
	that the wildlife is in danger of becoming vulnerable. Least Concern: ▪ The Wildlife is common or abundant and is likely to survive in the wild. Special Least Concern Plant: ▪ A least concern plant for which the taking or use of the plant is at risk of not being ecologically sustainable, including, for example, because of— ▪ (a) high commercial demand for the plant or a part of the plant; or ▪ (b) the biological traits of the plant.
Near Threatened	Prescribed to species listed under the Queensland *Nature Conservation Act 1992*.
Of Concern	Prescribed to regional ecosystems listed under the Queensland *Vegetation Management Act 1999*.
Region	The local area surrounding the study area, including the landscape within 25 km of the study area.
Regional ecosystem (RE)	A vegetation community within a bioregion that is consistently associated with a particular combination of geology, landform and soils.
Regulated vegetation	Vegetation regulated through the *Sustainable Planning Act 2009*
Remnant vegetation	Defined under the Queensland *Vegetation Management Act 1999* as, woody vegetation that has not been cleared or vegetation that has been cleared but where the dominant canopy has >70 % of the height and >50 % of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy.
Significant species and vegetation	Refers to: ▪ Species listed as Endangered, Vulnerable or Near Threatened under the Queensland Nature Conservation (Wildlife) Regulation 2006 or Critically Endangered, Endangered or Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* ▪ Threatened ecological community listed as Critically Endangered, Endangered or Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* ▪ Regional ecosystems with an Endangered or Of Concern biodiversity status or *Vegetation Management Act 1999* status.

Term	Definition
Study Area	An area defined for the purposes of this baseline study and which comprises the following land parcels, or part thereof, which are specifically described as Lots on Plan: - 1, 4 and 10 on SP255141 - 2 on RP64371 - 2 on SP204478 - 10 on SP2551412 - 15 on SL10426 - 781 on SP255139.
Threatened ecological community (TEC)	A community listed under the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
Vegetation management Act status	This is a statutory classification under the Queensland *Vegetation Management Act 1999*. A regional ecosystem is listed as 'endangered' if: ▪ Remnant vegetation for the regional ecosystem is less than 10 % of its pre-clearing extent across the bioregion; or 10-30 % of its pre-clearing extent remains and the remnant vegetation for the regional ecosystem is less than 10,000 ha. A regional ecosystem is listed as 'of concern' if: ▪ Remnant vegetation for the regional ecosystem is 10-30 % of its pre-clearing extent across the bioregion; or more than 30 % of its pre-clearing extent remains and the remnant vegetation extent for the regional ecosystem is less than 10,000 ha. A regional ecosystem is listed 'least concern' if: ▪ Remnant vegetation for the regional ecosystem is over 30 % of its pre-clearing extent across the bioregion, and the remnant vegetation area for the regional ecosystem is greater than 10,000 ha.
Vulnerable	Prescribed to a threatened ecological community or species under the Queensland *Nature Conservation Act 1992* or Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

1 Introduction

Ecological Survey & Management was engaged by 28 South Environmental on behalf of Moreton Bay Regional Council to assess the existing vegetation and flora values of the historic Petrie Mill site.

This baseline assessment has been undertaken as part of preliminary feasibility studies and may form part of an impact assessment and be used to inform the offset liability of any future development of the Petrie Mill site.

1.1 Assessment objectives

The purpose of this assessment is to assess the threatened species, vegetation communities and habitat that occur or are likely to occur in the study area. Specifically, this assessment included:

- review of desktop information sources, including databases, mapping and aerial photography to identify vegetation and potential biodiversity matters known from the local area and broader region
- validation and mapping of remnant regional ecosystem (RE) mapping
- targeted searches for threatened flora species
- identification of and mapping of potential habitat for threatened species protected under the Queensland *Nature Conservation Act 1996* (NC Act) and Commonwealth *Environment Protection and Biodiversity Conservation 1999* (EPBC Act)
- assessment of constraints and opportunities of the study area in relation to potential future development and rehabilitation.

1.2 Description of the study area

The study area for this assessment included three specific areas. These encompassed:

- potential development area in the central and northern portions of the Petrie Mill site
- residual areas of remnant vegetation
- disused waste-water storage ponds and surrounding degraded vegetation.

1.2.1 Regional context

The study area is located in the Moreton Regional Council local government area (LGA) and comprises the following land parcels, or part thereof, which are specifically described as: Lots 1, 4 and 10 on SP255141; Lot 2 on RP64371; Lot 2 on SP204478; Lot 10 on SP2551412; Lot 15 on SL10426; and, Lot 781 on SP255139 (Figure 1).

The study area is located in the Southern Coastal Lowlands sub-region of the South-east Queensland Bioregion and comprises 209.2 ha.

1.2.2 Topography

The study area is located on the southern edge of a broad gently undulated plain that flows downslope onto a moderately to markedly modified alluvial plain of the North Pine River. The study area falls from elevations of between 34 m and 38 m average height datum (AHD) along the northern boundary to 2 m on the banks of the North Pine River.

The floodplain has been excavated in numerous places to provide storage capacity for wastewater produced by the historic mill. In other areas of the broad floodplain, the soil has been stockpiled to produce flood levees, stockpiles and/or caps for dumped refuse produced by the historic mill. These stockpiles ranged from 1 to 10 m in height.

1.2.3 Surface water

The North Pine River forms the southern boundary of the study area.

Yebri Creek enters the study area from the west and dissects the central portion of the study area. This watercourse discharges into the North Pine River along the southern boundary of the study area.

Two large bodies of water are located in the southern portion of the study area. These artificially created lakes are utilised by various public groups for recreational purposes (e.g. model boat racing, triathlon training).

As stated above, the floodplain has been excavated in numerous places to provide storage capacity for wastewater produced by the historic mill.

2 Methodology

2.1 Nomenclature and taxonomy

Application of flora scientific names in this report follows Bostock and Holland (2010). In the first occurrence in the text, accepted common names (if one exists) will be followed by its scientific name. Common names for flora were derived from Harden et al. (2006; 2007), Brooker and Kleinig (2008), Maslin (2001), Hacker (1990), Tothill and Hacker (1996), Sharp and Simon (2002), and Auld and Medd (2002). Use of an asterisk (*) indicates the species is not native to Queensland, e.g. Common Lantana (**Lantana camara* var. *camara*). Following the first in-text reference, species will be referred to by common name only, where one exists.

2.2 Review of existing information

2.2.1 Database searches

Commonwealth and state database searches were undertaken for the study area and surrounds to identify records or potential occurrences of threatened, near threatened, migratory and/or special least concern flora species and TECs. Database searches were undertaken within a 10 km radius of the boundary of the study area. The search area is considered to be representative of the broader region.

Desktop searches covered the following databases and government mapping sources:

- EPBC Act Protected Matters Search Tool, accessed 27 May 2016 (DotE 2016)
- Queensland Wildlife Online database, accessed 27 May 2016 (DSITIA 2016)
- Remnant 2016 regional ecosystem mapping Version 8.0 and Essential Habitat Mapping and Database Version 4.0, maps at 1:100 000 scale (NRM 2016)
- Protected Plants Flora Survey Trigger Map, accessed 27 May 2016 (EHP 2016a)
- Biodiversity Planning Assessments – South-east Queensland Version 1.1 (EHP 2015)
- Geological Survey of Queensland 1:100,000 mapping (NRM 2011)
- Map of referrable wetlands, accessed 27 May 2016 (EHP 2016b)
- Queensland Groundwater Dependent Ecosystems and Potential GDE Aquifer Mapping (DSITIA 2015).

2.2.2 Review of aerial photographs

The most recent aerial photography (0.5 m resolution photography sourced from Digital Queensland Globe) was used to identify features for ground-truthing during the field surveys, to identify appropriate survey locations and for determining and characterising potential terrestrial flora habitats.

2.3 Field assessment

A post-wet season flora field survey was undertaken throughout the study area on 16, 17 and 22 June 2016. This survey was supplemented with Quaternary site data that was collated as part of the koala habitat assessment (28 South Environmental, unpublished) that was undertaken throughout the study area between 18, 19 and 23 May 2016.

2.3.1 Survey Conditions

Rainfall totals for the region during and 12 months prior to these survey periods are presented in Table 1. The nearest weather station is Redcliffe weather station, which is approximately 12.5 km north-east of the study area. Given that this weather station is located in close proximity to the coastline, the Brisbane weather station was also used to provide an indication of variability in totals within the region. The Brisbane weather station is located approximately 22 km south of the study area.

The data presented in Table 1 clearly indicates that the study area had received less than average falls during the six moths prior to the survey, that is the normal wet season period. However, the study area received excessive falls during and following the survey period. The survey conditions were considered to be sub-optimal given the poor rainfall totals preceding the survey period.

Table 1: Monthly rainfall for the local area (2015-2016)

Month	Average Monthly Rainfall (mm) - Redcliffe		Average Monthly Rainfall (mm) - Brisbane	
	Actual	Long-term (32 years)	Actual	Long-term (17 years)
June 2016	172.8	61.7	264.8	68.4
May 2016	17.6	103.9	27.6	67.9
April 2016	37.8	120.2	12.8	67.4
March 2016	97.4	127.2	117.4	109.7
February 2016	53.4	163.2	13.8	142.5
January 2016	71.0	111.6	51.4	147.9
December 2015	120.0	117.8	36.2	132.7
November 2015	111.4	101.6	74.2	104.6
October 2015	112.6	70.4	55.8	71.4
September 2015	45.4	30.2	54.2	30.4
August 2015	37.8	39.7	27.6	41.2
July 2015	8.8	51.3	9.2	23.7
Total	886	1098.8	745	1007.8

Source: Redcliffe Station (no. 040958), Brisbane Station (no. 040913) (BoM 2016)

2.3.2 Assessment Techniques

The field flora survey methods were developed in order to:

- validate existing Queensland Government Version 8.0 remnant RE mapping, and better define the distribution and proportionate composition of REs within mixed polygons of more than one RE type
- target threatened flora species and communities (listed under Commonwealth and State legislation) and their habitats identified from database searches
- produce a comprehensive floral inventory for all vegetation assessment sites and the study area as a whole.

The study area was surveyed in compliance with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland, Version 3.2* (Neldner et al. 2012). Assessment sites were performed throughout the entire study area so as to thoroughly assess Queensland Government mapped remnant vegetation.

The validation and mapping of remnant vegetation was undertaken at a total of 41 vegetation assessment sites. Multiple sites were conducted within each RE type.

Of the 41 assessment sites in total, 12 were detailed secondary sites, 7 tertiary sites, 5 modified quaternary sites and 17 quaternary photo assessment sites (Figure 2). A further 49 modified quaternary sites that were conducted as part of the koala habitat assessment prior to the flora survey were also used to validate the Queensland Government mapping. The less detailed sampling (tertiary and quaternary assessment sites) was conducted to provide additional information relating to the vegetative structure and composition and to assist in mapping the extent and distribution of the identified REs within the study area.

Detailed flora species lists were collated at all secondary sites and traverse lists were compiled to account for additional species that were recorded outside of the secondary site plots.

In order to facilitate the assessment of the ecological condition and habitat quality, as well as offset liability of potential impact areas or offset opportunity of retained areas, certain patches were assessed using the *Guide to determining terrestrial habitat quality: a toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy, Version 1.1* (EHP, 2014). This methodology is largely based on the *Ecological Equivalence Methodology (EEM) Version 1: Policy for Vegetation Management Offsets, Biodiversity Offset Policy* (DERM, 2011). Nine of the twelve secondary sites were upgraded to habitat quality plots.

The following sections describe the data collected at each of the survey sites and throughout the study area.

Secondary sites

Data recorded at each secondary site included:

- date and precise location (with reference to handheld GPS)
- soils, slope, aspect and landform observations
- ground-layer, mid-stratum and canopy species composition and abundance
- structural characteristics
- condition and disturbance of existing vegetation communities (including distribution of weed species)
- quantitative and qualitative species composition within a 1,000 m2 quadrat, and documentation of ancillary species identified within the immediate area or during foot traverse
- basal area of vegetation (Bitterlich Stick methodology)
- photographs of the community (north, east, south, west, groundcover and soils).

Tertiary sites

Data recorded at each tertiary site included:

- date and precise location (with reference to handheld GPS)
- soils, slope, aspect and landform observations
- ground-layer, mid-stratum and canopy species composition and abundance
- structural characteristics
- basal area of vegetation (Bitterlich Stick methodology)
- condition and disturbance of existing vegetation communities (including distribution of weed species)
- photographs of the community.

Quaternary sites

Data recorded at each quaternary site included:

- precise location (with reference to handheld GPS)
- ground-cover, mid-stratum and canopy species composition and abundance
- structural characteristics of the ecologically dominant layer (EDL)
- condition
- limited photographs of the community.

Habitat Quality Assessment Plots

These assessments were undertaken in a 100 x 50 m plot centred on 9 of the 12 Secondary sites. In addition to the information collated at the Secondary sites, the following parameters were also assessed: groundcover composition and cover; projected cover of woody vegetation, length of fallen woody debris, presence and number of hollows, number of large trees; habitat potential; and, habitat suitability for koala.

Targeted flora species surveys

Threatened flora species listed under the EPBC Act and/or NC Act that were recorded or predicted to occur from database searches (Section 3.4) were reviewed and, where relevant, formed the focus of targeted flora species surveys. The likelihood of occurrence of these species within the study area is discussed in Section 4.3 and Appendix B.

Detailed traverses of habitat that was considered suitable for threatened flora species were undertaken. Targeted surveys focussed on flora species that are commonly associated with *Melaleuca* swamps or vine forest communities within the study area. Surveys considered the relevant conservation and listing advices published on the DotE website and the *Queensland Flora Survey Guidelines – Protected Plants* (EHP 2014c).

Mapping

Queensland Government mapped REs were validated in the field using the survey data previously described in combination with the latest geology mapping (NRM 2011). The boundaries of vegetation types were mapped in the field using a GPS and/or aerial photograph interpretation (e.g. riverside edge of the mangrove communities).

Positional data was collected using a geographic positioning system; with an accuracy of 1 to 3 m. Positional locations were recorded using the UTM and Latitude/Longitude coordinate systems. All locations presented in this report are within zone 56 J. The map datum used was WGS84.

Random traverses

In addition to secondary, tertiary and quaternary assessment sites, large portions of the study area were traversed on foot and the random meander technique applied (Cropper 1993). The purpose of random traverses was to ensure adequate site coverage and to establish a comprehensive floral species list for the study area. This method is also essential for the detection of cryptic, pest and significant species.

Flora inventory and abundance

A comprehensive flora species list, including native and introduced species, was compiled for the study area. Relative abundance of flora species was assessed on a site-by-site basis, with detailed inventories compiled at all secondary assessment sites (Appendix A).

In relation to vegetation structure, abundance estimates were determined for species within each stratum of the community, with particular focus on the ecologically dominant layer (EDL) as it is by these species that the community is defined and from this, the RE determined (Neldner et al. 2012).

The status (remnant/non-remnant) of existing vegetation was determined by comparing the existing predominant canopy with the undisturbed predominant canopy. The Queensland Herbarium defines the predominant canopy under the VM Act, as the EDL, namely, that stratum of the vegetation which contains the most above ground biomass. The EDL can be defined in terms of growth form, height, cover density and species. In the majority of cases, the EDL is equivalent to the upper stratum (Walker and Hopkins 1990).

The crown cover definitions and associated crown separation descriptions (e.g. sparse) were also applied to the lower strata to allow a consistent description of the spatial distribution of the respective vegetation layers.

The landform description upon which the field-validated vegetation communities occurred was based on simple erosional landform patterns characterised by relief and modal slope and described by Speight (1990).

The relative abundance of species was based on the Braun-Blanquet technique, (Mueller-Dombois and Ellenberg 2003; Whittaker 1975).

Ancillary information

Other field characteristics such as areas of weed infestation, habitat areas for threatened species and regional connectivity were recorded and described. Photographic records were taken throughout the study area, capturing each community type, habitat type and the broader landscape.

2.4 Likelihood of occurrence assessment

Ecological community assessment

The flora survey was conducted across the study area at a scale and intensity to sufficiently identify ecological communities present. Threatened ecological communities that were not recorded during the field survey were therefore considered to have a low likelihood to occur within the study area.

Significant species assessment

Database searches identified threatened species that potentially occur in the study area. The likelihood of such species occurring was then assessed based on the results of the field survey (Appendix B).

The likelihood of species occurring in the study area was classified using the criteria presented in Table 2. The assessment was based on the species known ranges and habitat preferences that were evaluated based on characteristics of the study area observed during the field survey.

Table 2: Criteria to assess potential for threatened species to occur in the study area

Likelihood to Occur	Definition
Present	The species was recorded in the study area during the field survey.
High	The species was not recorded within the study area during the field survey but is known to occur within the surrounding area (i.e. within, and habitat of suitable quality exists within the study area.
Moderate	The species was not recorded in the study area during the field survey, although it is known to occur in the wider region (i.e. within 100 km). Habitat was identified for the species in the study area during the field survey; however, it is marginal, fragmented and/or small in size, or degraded.
Low	The species was not recorded in the study area during the field survey and considered unlikely to occur as, either: a) there are no known records in the wider region (i.e. within 100 km) and there is limited or extremely poor quality habitat in the study area; or b) the species is distinctive and would have been detected if present, due to the detailed survey conducted.

2.5 Limitations

Less than average rainfall during the wet season period leading into the survey resulted in a reduced level of observed flora species richness and plant vigour.

Ecological survey often fails to record all species of flora present in a study area for a variety of reasons, including seasonal absence or reduced flowering during certain seasons. Furthermore, the ecology and nature of some significant and/or cryptic species means that such species are potentially not recorded during short survey periods. This assessment overcomes these limitations by assessing impacts not only on species recorded during the field survey, but also on species that are assessed as potentially present (based on known distribution and habitat availability).

3 Desktop review

3.1 Geology mapping

Geology mapping was obtained from the 1:100,000 Queensland Geological Mapping Dataset (NRM 2011). Five geological units are currently mapped within or immediately adjacent to the study area (Figure 3). These are described as follows:

- Qa – Clay, silt, sand, gravel: flood-plain alluvium (corresponding to land zone 3)
- Qha/1 – lowest river terrace: gravel, sand, silt, clay (corresponding to land zone 3)
- Qha/2 – second river terrace: sand, silt, clay, gravel
- Qpa/1 – Stranded river terrace(above flood plain): clay, sil=t, sand, gravel
- RJl – Landsborough Sandstone: feldspathic labile to sublabile sandstone; minor pebble to cobble conglomerate, shale siltstone (corresponding to land zone 9).

A deep weathering profile of the Brisbane and Woodford surfaces overlays the majority of the RJl map unit within the study area. This profile corresponds to ferruginised, mottled and kaolinised rocks, which is more consistent with landzone 5.

Equivalent Land Zones (as defined under the VM Act and in Wilson and Taylor (2012)) are provided as these are relevant to assigning field-validated vegetation communities to REs within the study area.

3.2 Commonwealth threatened ecological communities

Two TECs were identified from the EPBC Act Protected Matters Search Report as likely to occur in the search area. These included:

- Lowland Rainforest of Subtropical Australia TEC, which is listed as critically endangered under the EPBC Act
- Subtropical and Temperate Coastal Saltmarsh TEC, which is listed as vulnerable under the EPBC Act.

The vegetation types or REs that are considered components of these TECs (e.g. RE 12.1.2 for the Saltmarsh TEC and RE 12.3.1 for the Lowland Rainforest TEC) have the potential to occur within the study area. These REs are known from the broader region as well as one polygon of remnant vegetation that has been mapped by the Queensland government on Yebri Creek. This polygon is considered to have a 5 % chance of supporting RE 12.3.1 (see Section 3.3).

3.3 Queensland Government vegetation mapping

The study area is currently mapped by the Queensland Government (Version 8.0) as supporting remnant vegetation throughout. Queensland government mapping indicates that a total of three REs occur within the study area (Figure 4). The status and short descriptions for each of these REs is provided below in Table 3. None of these REs contribute to the TECs listed under the EPBC Act.

The Version 9.0 Queensland Government mapping became available in April 2015. This mapping has been produced by the Queensland Herbarium to provide updated mapping for the biodiversity status and broad vegetation groups (BVGs), but is non-statutory at present. This version of mapping is discussed within this report and included in Table 3 due to the potential presence an RE that is a component of a TEC.

The distribution of REs 12.3.1 and 12.3.6 (Version 9.0, 2015) is limited to one location on Yebri Creek where they represent a 5 and 45 % chance of occurring as part of a mixed polygon with RE 12.3.11.

Table 3: Queensland Government mapped remnant regional ecosystems in the study area

RE Code	Short Descriptions (Queensland Herbarium 2015b)	VM Act Class[1]	Biodiversity Status[1]	EPBC Act Status[2]	Wetland
Version 8.0, 2013					
12.1.3	Mangrove shrubland to low closed forest. Occurs on Quaternary estuarine deposits. [BVG1M: 35a]	Least Concern	No concern at present	Not listed	Estuarine wetlands (e.g. mangroves).
12.3.11	*Eucalyptus tereticornis* +/- *Eucalyptus siderophloia, Corymbia intermedia* open forest on alluvial plains usually near coast [BVG: 16c]	Of Concern	Of Concern	Not listed	Contains palustrine wetland (e.g. in swales).
12.5.3	*Eucalyptus racemosa* subsp. *racemosa* woodland on remnant Tertiary surfaces [BVG: 9g]	Endangered	Endangered	Not listed	-
Version 9.0, 2015					
12.3.1	Gallery rainforest (notophyll vine forest) on alluvial plains [BVG: 4b]	Endangered	Endangered	Endangered	Riverine wetland or fringing riverine wetland.
12.3.6	*Melaleuca quinquenervia* +/- *Eucalyptus tereticornis,*	Least Concern	No concern at present	Not listed	Palustrine wetland (e.g.

RE Code	Short Descriptions (Queensland Herbarium 2015b)	VM Act Class[1]	Biodiversity Status[1]	EPBC Act Status[2]	Wetland
	Lophostemon suaveolens open forest on coastal alluvial plains [BVG: 22a]				vegetated swamp).

[1] VM Act Class and Biodiversity status defined under the Regional Ecosystem Description Database (REDD) (Queensland Herbarium 2015b).

[2] EPBC Act status is only relevant if the RE meets the EPBC Act condition thresholds and key diagnostic criteria for the relevant TEC (TEC status current as at July 2016). Queensland REs are not individually listed under the EPBC Act, but may contribute to a TEC listed under the EPBC Act.

3.3.1 Groundwater dependent ecosystems

No known groundwater dependent ecosystems (GDE) or GDE springs have been mapped within the study area by The Department of Science, Information Technology and Innovation (DSITIA 2015).

3.3.2 Vegetation management wetlands

No vegetation management wetlands are mapped for the study area on the vegetation management wetlands map.

3.3.3 Watercourse vegetation

The North Pine River forms the southern boundary of the study area.

Yebri Creek enters the study area from the west and dissects the central portion of the study area. This watercourse discharges into the North Pine River along the southern boundary of the study area.

Two large bodies of water are located in the southern portion of the study area. These artificially created lakes are utilised by various public groups for recreational purposes (e.g. model boat racing, triathlon training). A narrow, overflow channel cuts across the floodplain on the northern side of these lakes.

As stated above, the floodplain has been excavated in numerous places to provide storage capacity for wastewater produced by the historic mill.

Queensland Government vegetation management watercourse mapping does not identify stream order in this region.

3.4 Significant flora

Database searches encompassing the study area (i.e. 10 km radial search area) identified 15 threatened flora species potentially occurring within the search area. A discussion of these threatened species is provided in Section 3.4.1 and 3.4.2 and Appendix B.

3.4.1 EPBC Act listed flora

Database searches identified one critically endangered, five endangered and nine vulnerable flora species listed under the EPBC Act as potentially occurring within the search area, as follows:

- *Acacia attenuata* (no common name) – vulnerable (EPBC Act & NC Act)
- Hairy Joint Grass (*Arthraxon hispidulus*) – vulnerable (EPBC Act & NC Act)
- Three-leaved Bosistoa (*Bosistoa transversa s. lat*)- – vulnerable (EPBC Act)
- Native Jute (*Corchorus cunninghamii*) – endangered (EPBC Act & NC Act)
- Stinking Laurel (*Cryptocarya foetida*) – vulnerable (EPBC Act & NC Act)
- Leafless Tongue Orchid (*Cryptostylis hunteriana*) – vulnerable (EPBC Act)
- Ball Nut (*Floydia praealta*) – vulnerable (EPBC Act & NC Act)
- Wandering Peppercress (*Lepidium peregrinum*) – endangered (EPBC Act)
- *Leucopogon* sp. (Coolamunda D. Halford Q1635) – endangered (EPBC Act & NC Act)
- Queensland Nut (*Macadamia integrifolia*) – vulnerable (EPBC Act & NC Act)
- Small-fruited Queensland Nut (*Macadamia ternifolia*) – vulnerable (EPBC Act & NC Act)
- Lesser Swamp Orchid (*Phaius australis*) – endangered (EPBC Act & NC Act)
- Yellow Swamp Orchid (*Phaius bernaysii*) – endangered (EPBC Act & NC Act)
- Mt Berryman Phebalium (*Phebalium distans*) – critically endangered (EPBC Act), endangered (NC Act)
- Austral Toadflax (*Thesium australe*) – vulnerable (EPBC Act & NC Act)

These species, along with a description of their preferred habitat, and likelihood of occurrence within the study area are outlined in Appendix B.

3.4.2 NC Regulation listed flora

Twelve of the fifteen EPBC Act listed species discussed in Section 3.4.1, are also listed under the NC Act. The other three species are listed as least concern and include: Three-leafed Bosistoa; Leafless Tongue Orchid; and, Wandering Peppercress.

3.4.3 Protected plants high risk areas

No high risk areas (HRA) are mapped within or adjacent to the study area on the Protected Plants Flora Survey Trigger Map (EHP 2016a). A HRA is located approximately 5 km to the south-east of the study area.

3.4.4 Essential habitat

A small area of essential habitat has been applied to a patch of Queensland Government mapped RE 12.5.3 on the western boundary of the study area. This patch is mapped as essential habitat for Koala (*Phascolarctos cinereus*) [ID 29186] and is associated with Yebri Creek.

3.4.5 Council declared priority species

The Moreton Bay Regional Council has identified a total of 119 priority plants and animals because of their perceived values in the Moreton Bay region, such as threatened status, iconic status, habitat value and/or conservation status. Of the 119 priority species, 35 are plants. Only one of these, Moreton Bay Fig (*Ficus macrophylla*), is not currently listed as a threatened species under the EPBC Act and/or NC Act.

3.5 Biodiversity Planning Assessment Mapping

The EHP has prepared a Biodiversity Planning Assessment (BPA) for the region. This draws on remnant vegetation mapping and database information to characterise areas into one of three biodiversity significance levels:

- State biodiversity significance – areas assessed as being significant for biodiversity at the bioregional or state scales
- regional biodiversity significance – areas assessed as being significant for biodiversity at the sub-bioregional scale
- local biodiversity significance and/or other values – local values that are of significance at the local government scale.

BPA mapping indicates that all government mapped remnant areas within the study area are classified as being of State Biodiversity Significance. The North Pine River and flanking terraces up to 200 m from the high bank are mapped as a state significant ecological corridor. The remainder of the study area is recognised as a regionally significant ecological corridor (Figure 5).

The areas identified in a BPA are not protected under Queensland legislation.

3.6 Wetlands

As part of the Queensland Government's management of wetlands, the EHP has prepared a map of referable wetlands which includes:

- Wetland protection area (WPAs) within the Great Barrier Reef catchment comprising;
    - Wetland of high ecological significant (HES) wetlands

    - Trigger areas that represent the area of hydrological influence of HES wetlands

- Wetlands of general ecological significance (GES).

A search of the referable wetlands map shows there are no WPAs within or adjacent to the study area.

4 Field results

Approximately 22 % of the study area was found to support remnant vegetation predominantly comprised of mixed *Eucalyptus* and *Corymbia* woodland communities or mangrove closed forest. Clearing associated with industrial activity has considerably fragmented the historic cover of vegetation in the study area.

A total of 248 flora species were recorded during the field surveys representing 81 families and 201 genera. The dominant family group was Poaceae with Fabaceae, Asteraceae, and Malvaceae and Myrtaceae also prominent. The dominant family groups exemplify the overall composition and condition of the vegetation communities surveyed, with the ground layer being the most diverse. The species inventory included 77 (31 %) exotic species, 13 of which are listed as declared pests under the *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act).

A list of the flora species recorded during the field surveys is presented in Appendix A. The relative abundance of each species is assigned to their occurrence in the REs identified during the field surveys.

4.1 EPBC Act listed threatened ecological communities

Vegetation that was representative of the Lowland Rainforest of Subtropical Australia TEC or the Saltmarsh TEC was not recorded in the study area. Elements of these communities were identified as small patches and/or mesic shifts within riparian corridors but none of these areas satisfied the specific diagnostic criteria or condition thresholds for these TECs.

Small patches of Saltwater Couch grassland were adjacent to or within some patches of mangrove closed forest. However, these patches never exceed the minimum size requirement of 1,000 m^2.

Common vine forest species or generalists were commonly encountered in the various patches of remnant and non-remnant eucalypt woodland fringing Yebri Creek and the North Pine River. Similarly, relic figs (*Ficus spp.*) were scattered throughout the study area. These species, although associated with RE 12.3.1 and the Lowland Rainforest TEC did not occur at density or diversity that would be considered a mappable entity.

4.2 Queensland regulated vegetation

Four remnant REs were identified in the study area during the field survey (Figure 6) and included REs 12.1.3b, 12.3.5, 12.3.11 and 12.5.3. Table 4 lists the REs that have been validated as occurring in the study area. The field data that was used to allocate RE type and remnant status of the field-validated vegetation mapping is presented in Appendices C and D.

Field mapping was found to be moderately consistent with Queensland Government mapping, primarily in the spatial extent of mapped remnant vegetation and allocation of REs outside of Yebri Creek. The inconsistencies included:

- increased spatial distribution of RE 12.5.3 in the north-western edge of the study area and to the south of Yebri Creek on the western boundary
- increased spatial distribution of RE 12.1.3b in Yebri Creek
- less area of RE 12.1.3b in the south-western portion of the study area
- less area of RE 12.3.11 in Yebri Creek
- no RE 12.5.3 in Yebri Creek
- no REs 12.3.1 or 12.3.6 in Yebri Creek (Version 9.0 mapping)

Table 4 presents the area of each RE in the study area and Table 5 provides a description of the field-validated vegetation communities.

Table 4: Field-validated remnant vegetation communities recorded in the study area

RE Code	Short Descriptions	VM Act Class	Biodiversity Status	Wetland	Area (ha)
12.1.3b	*Avicennia marina* subsp. *australasica* dominated shrubland to low closed forest. Occurs on Quaternary estuarine deposits. [BVG1M: 35a]	Least Concern	No concern at present	Estuarine wetlands (e.g. mangroves)	11.56
12.3.5	*Melaleuca quinquenervia* open forest on coastal alluvium [BVG: 22a]	Least Concern	Of Concern	Palustrine wetland (e.g. vegetated swamp)	4.84
12.3.11	*Eucalyptus tereticornis* +/- *Eucalyptus siderophloia, Corymbia intermedia* open forest on alluvial plains usually near coast [BVG: 16c]	Of Concern	Of Concern	Contains palustrine wetland (e.g. in swales)	1.15
12.5.3	*Eucalyptus racemosa* subsp. *racemosa* woodland on remnant Tertiary surfaces [BVG: 9g]	Endangered	Endangered	*not listed*	29.37
Total					46.92

A total of 5.13 ha of non-remnant, high value regrowth RE 12.5.3 was also recorded within the study area.

4.2.1 Watercourse vegetation

In accordance with the Queensland Offsets Regulation 2014 remnant vegetation within the defining distance of a relevant watercourse on a vegetation management watercourse map is a MSES. There are two watercourses identified

on this map (Figure 4). The relevant watercourses in the study area comprise Yebri Creek (predicted to be a 3rd order stream) and the North Pine River (predicted to be a 6th order stream).

Appendix 3 of the *Queensland Environmental Offsets Policy 2016 Version 1.2* (EHP, 2016c), lists the defining distance for watercourses in a coastal bioregion as:

- 10 m for 1st and 2nd order streams
- 25 m for 3rd or 4th order streams
- 50 m for 5th or greater order streams.

4.2.1 Wetland Communities

Three of the field-validated REs are also recognised as wetlands in their descriptions (Queensland Herbarium 2015). None are lacustrine (large, open, water-dominated systems larger than 8 ha, e.g. lakes). Standing water was observed in the entire length of Yebri Creek within the study area and comprised both tidal water (RE 12.1.3b) and flowing fresh water (RE 12.3.11). The entire length of the North Pine River is influenced by tidal flows and supports a fragmented distribution of Grey Mangrove (*Avicennia marina* subsp. *australasica*) low closed forest (RE 12.1.3b).

The small patch of field-validated Broad-leaved Paperbark (*Melaleuca quinquenervia*) closed forest in the north-western portion of the study area was flanked by two small dams in the east and west, but was not holding water at the time of survey. The mounding of soil at tree bases and complete absence of groundcover species would suggest that this patch retains surface water for extended periods of time.

Table 5: Descriptions of field-validated vegetation communities identified in the study area

Regional Ecosystem	Remnant Status	Species and Structural Composition	Condition	Location	Representative Photograph
12.1.3b Grey Mangrove (*Avicennia marina* subsp. *australasica*) open forest VM Act Class – Least Concern Biodiversity Status – No concern at present EPBC Act Status – *not applicable*	Remnant	This community supported a canopy layer that was primarily comprised of Grey Mangrove, with Swamp Oak (*Casuarina glauca*) and to a lesser extent Queensland Blue Gum (*Eucalyptus tereticornis* subsp. *tereticornis*) occurring as emergents at the edge of the community. The canopy layer had a height range of 10 to 17 m (median 14 m). The canopy cover intercept ranged from 10 to 70 %. Two shrub layers were generally present. The tall shrub layer was variously comprised of Grey Mangrove, Orange Mangrove (*Bruguiera gymnorhiza*) Blind-your-eye Mangrove (*Excoecaria agallocha*) and/or River Mangrove (*Aegiceras corniculatum*). In some areas the tall shrub layer was representative of the ecologically dominant layer, wherein the projected cover exceeded 80 %. The low shrub layer was generally comprised of juvenile upper strata species, particularly River Mangrove. The groundcover layer, where present was primarily comprised of juvenile River Mangrove, however dense patches of Mangrove Fern (*Acrostichum speciosum*) and/or Saltwater Couch (*Sporobolus virginicus*) were commonly recorded at the periphery or upstream reach of this community.	This community was relatively intact across most of its distribution but became less dense in the upstream limit of its distribution in Yebri Creek. Weed infiltration was negligible and species richness very low.	This community was associated with the banks of the North Pine River and the downstream reach of Yebri Creek. Assessment sites within this community included S1, S3, T1 and T3.	 S1 – looking north  S3 – looking south; groundcover (below) 

Regional Ecosystem	Remnant Status	Species and Structural Composition	Condition	Location	Representative Photograph
12.3.5 Broad-leaved Paperbark (*Melaleuca quinquenervia*) closed forest VM Act Class – Least Concern Biodiversity Status – Of concern EPBC Act Status – *not applicable*	Remnant	This community supported a canopy layer that was primarily comprised of Broad-leaved Paperbark, with the native vine, Monkey Rope (*Parsonsia straminea* var. *straminea*), also common in some parts of the community. The canopy layer had a height range of 10 to 16 m (median 15 m). The canopy cover intercept was greater than 90 %. The shrub layer was limited to scattered juvenile specimens of Broad-leaved Paperbark and Swamp Box (*Lophostemon suaveolens*). The groundcover layer was virtually absent.	This community presents as an interesting anomaly due to the marked levels of disturbance fringing the patch and potential that the community has been artificially created. Two small dams flank the community, which is positioned in a narrow basin. There is some uncertainty as to whether this community was situated in an historical flow path of is simply a depression in a broad, gently undulating plain. However, the patch does appear to retain surface water and sub-soil moisture for considerable periods. Weed infiltration limited to the edge of the dams. Species richness was also extremely low.	This community was limited to a small patch inn the north-western extent of the study area. Assessment sites within this community were limited to EEM 9.	 EEM 9 – looking east  EEM 9 – looking east  EEM 9 – canopy

Regional Ecosystem	Remnant Status	Species and Structural Composition	Condition	Location	Representative Photograph
12.3.11 Queensland Blue Gum +/- Northern Grey Ironbark (*Eucalyptus siderophloia*), Pink Bloodwood (*Corymbia intermedia*) woodland to open forest on alluvial plains VM Act Class – Of Concern Biodiversity Status – Of concern EPBC Act Status – *not applicable*	Remnant and non-remnant	The canopy layer was primarily comprised of Queensland Blue Gum Northern Grey Ironbark and Pink Bloodwood. Less commonly encountered canopy species included Carbeen (*Corymbia tessellaris*), Swamp Oak native vines, such as Monkey Rope, Burney Vine (*Trophis scandens*) and Cockspur Vine (*Maclura cochinchinensis*). The canopy layer had a height range of 18 to 25m (median 24 m), with some specimens exceeding 30 m. The canopy cover intercept ranged from 10 to 50 % (on average 40 %). Commonly recorded species in the sub-canopy included Foambark (*Jagera pseudorhus*) and mid-mature canopy species. Other species included the exotic pest, Chinese Celtis (**Chinese Celtis*), Swamp Box and Tuckeroo (*Cupaniopsis anacardioides*). Two shrub layers were present in some areas, particularly where Common Lantana was prevalent. Commonly recorded shrub layer species included vine forest generalists, such as Tuckeroo, Foambark, Red Kamala (*Mallotus philippensis*), Coastal Canthium (*Cyclophyllum coprosmoides*) and Shiny-leaved Canthium, as well as Red Ash (*Alphitonia excelsa*), Hickory Wattle (*Acacia disparrima*), and exotic shrubs and vines such as Easter Cassia (**Senna pendula* var. *glabrata*), Mickey-mouse Bush (**Ochna serrulata*) and Cat's Claw Creeper.	This community, although usually narrow, was markedly affected by weed infiltration associated with a disproportionate perimeter to area ratio. Common Lantana was frequently recorded at the edge of the community, while weeds such as Ruellia (**Ruellia tuberosa*), Cat's Claw Creeper (**Macfadyena unguis-cati*), Singapore Daisy (**Sphagneticola trilobata*) and Live-leaf (**Bryophyllum pinnatum*) were commonly recorded, particularly within the channel of Yebri Creek. Historic clearing and canopy damage from vigorous vines, both native and exotic, have also affected the community. The community has the potential to recover with initial and sustained weed management. However, the distribution of	This community was associated with the terraces and alluvial plains of the North Pine River in the south-eastern portion of the study area. This community was also prominent on the terraces of Yebri Creek. Assessment sites within this community included S2, T2, T4, T5, T6, Q1, Q2, Q4 and Q5.	 S2 – looking east  T4 – looking west  T6 – looking north

Regional Ecosystem	Remnant Status	Species and Structural Composition	Condition	Location	Representative Photograph
		The composition of the groundcover layer was also variable. Common species included Graceful Grass (*Ottochloa gracillima*) and exotic species, particularly Guinea Grass (**Megathyrsus maximus* var. *maximus*).	vegetative propagules and seeds of exotic species during high flow events will continue to be a problem in Yebri Creek.		
12.5.3 Scribbly Gum (*Eucalyptus racemosa* subsp. *racemosa*) woodland on remnant Tertiary surfaces VM Act Class – Endangered Biodiversity Status – Endangered EPBC Act Status – *not applicable*	Remnant and non-remnant	The canopy layer was primarily comprised of Scribbly Gum. Other common species included Pink Bloodwood, Northern Grey Ironbark and Brush Box (*Lophostemon confertus*). The latter was particularly prevalent in the southern extent of the central patch. The canopy layer had a height range of 18 to 29 m (median 23 m). The canopy cover intercept ranged from 30 to 70 % (on average 60 %). The composition of the sub-canopy was moderately variable. Common species included canopy species, Swamp Box, Hickory Wattle and/or the exotic tree species, Camphor Laurel (**Cinnamomum camphora*). Black She-oak (*Allocasuarina littoralis*) was common in certain areas. Two shrub layers were common. The composition of the tall shrub layer was variable but was commonly comprised of Swamp Box, Hickory Wattle, Red Ash and/or Camphor Laurel. The low shrub layer, where present, was generally comprised of Common Lantana. The groundcover layer was generally comprised of Graceful Grass and Blady	The condition of this community was highly variable. As with other patches of remnant vegetation within the study area, the edges of this community were frequently dominated by Common Lantana. However, weed infiltration and dominance within the patches was more variable. Large mature trees were commonly encountered, many with numerous hollows of variable diameter and depth. The patch in the north-western portion of the study area are not currently mapped by the Queensland government. However, detailed surveys found that this patch satisfied the VM Act 70/50	This community was associated with the southern edge of a broad gently undulated plain that flows downslope onto a moderately to markedly modified alluvial plain of the North Pine River. Assessment sites within this community included EEM 1 EEM 2, EEM 3, EEM 4 and EEM 5.	 EEM 1 – looking south  EEM 2 – looking south

Regional Ecosystem	Remnant Status	Species and Structural Composition	Condition	Location	Representative Photograph
		Grass (*Imperata cylindrica*). A patch of mid-mature regrowth was identified to the west of the central patch. Although generally lacking large mature trees the patch supported a reasonably consistent cover of mid-mature Scribbly Gum, Pink Bloodwood and Northern Grey Ironbark (median height 19 m, canopy cover intercept 20 %). This patch currently fails the criteria for remnant status, but has been excluded from the non-remnant groupings listed below due to its higher ecological value. The eastern patch was situated on the lower slopes of the rise in close proximity to the floodplain. At this location (EEM 8), the canopy layer was comprised of Queensland Blue Gum and associated Northern Grey Ironbark and Pink Bloodwood (median height 24 m, 20-60 %). The sub-canopy of this patch was potentially more representative of the EDL and was commonly comprised of Broad-leaved Paperbark). This patch possessed elements of RE 12.3.11, but given the underlying geology and slope position, this community is more aligned with the lower slope ecotonal variation of RE 12.5.3.	criteria for remnant status.		 EEM 3 – looking north  EEM 5 – looking south  EEM 8 – looking east

Regional Ecosystem	Remnant Status	Species and Structural Composition	Condition	Location	Representative Photograph
Non-remnant – Unit 1 VM Act Class – *not applicable* Biodiversity Status – No concern at *not applicable* EPBC Act Status – *not applicable*	Non-remnant	The structural composition of this patch was highly variable. Generally, much of the slope supporting the patch has been re-contoured and planted with a variety of timber species. Common canopy species included Flooded Gum (*Eucalyptus grandis*), Blackbutt (*Eucalyptus pilularis*), Slash Pine (**Pinus elliottii*) and Queensland Blue Gum. Species such as Brush Box, Northern Grey Ironbark, Pink Bloodwood, Chinese Celtis and Camphor Laurel (**Cinnamomum camphora*) were also commonly recorded, but it is anticipated that these have germinated from the soil seedbank or infiltrated the patch from adjoining remnant vegetation. The mid-stratum was variously composed of the aforementioned canopy species, Hickory Wattle, Foambark, Red Ash and Monkey Rope. The shrub layers were commonly comprised Common Lantana, Orange Jessamine (**Murraya paniculata*), juvenile upper strata species, Small-leaved Privet (**Ligustrum sinense*), Yellow Bells (**Tecoma stans*) and Mickey-mouse Bush (**Ochna serrulata*). The composition of the groundcover was variable, but commonly comprised of Graceful Grass, Blady Grass and Corky Passionvine (**Passiflora suberosa*).	The community has a variable composition and disturbance history, with much of the patch having been historically cleared and converted to plantation. Intervening areas have regrown with various disturbance specialists, while two areas have been retained as mechanically maintained exotic grassland areas. Numerous vehicle tracks dissect and flank this community. Numerous declared pest species were encountered in this patch. Of particular concern was the prevalence of Common Lantana, Chinese Celtis and Camphor Laurel.	This community was associated with the southern edge of a broad gently undulated plain that flows downslope onto a moderately to markedly modified alluvial plain of the North Pine River. The patch is located in the north-eastern portion of the site Assessment sites within this community included EEM 6 and EEM 7.	 EEM 6 – looking west  EEM 7 – looking north  EEM 7 – looking east

Regional Ecosystem	Remnant Status	Species and Structural Composition	Condition	Location	Representative Photograph
Non-remnant – Unit 2 VM Act Class – *not applicable* Biodiversity Status – No concern at *not applicable* EPBC Act Status – *not applicable*	Non-remnant	The floodplain in this portion of the study area was historically cleared of all woody vegetation and with the development of the mill, excavated to create water storage and treatment ponds. Woody vegetation within this area is now limited to narrow strips of regrowth fringing these water bodies. Common species included Swamp Oak, Broad-leaved Paperbark and Queensland Blue Gum (median height 15 m). Mature specimens of Queensland Blue Gum were commonly recorded in the western and southern portions of this area (median height 24 m).	Weed infiltration was prevalent throughout this area, due to the historic clearing and poor maintenance. Common Lantana and numerous exotic grasses and herbs were prevalent in the eastern portion of this area, primarily due to minimal management (i.e. wasteland).	This area was associated with a broad floodplain of the North Pine River in the eastern portion of the study area. Much of this floodplain has been excavated to create water storage and treatment ponds. No detailed assessment sites were undertaken in this area.	 PP 3 – looking north  PP3 looking east  PP-6 looking north

Regional Ecosystem	Remnant Status	Species and Structural Composition	Condition	Location	Representative Photograph
Non-remnant – Unit 3 VM Act Class – *not applicable* Biodiversity Status – No concern at *not applicable* EPBC Act Status – *not applicable*	Non-remnant	The floodplain in this portion of the study area was historically cleared of all woody vegetation and also excavated to create two large lakes. However, these lakes do not appear to have been utilised by the mill. Woody vegetation within this area is now limited to narrow strips of regrowth fringing these water bodies. Common species included Queensland Blue Gum, Swamp Oak, Broad-leaved Paperbark and, in the western portion of the area, Slash Pine (median height 15 m). Mature specimens of Queensland Blue Gum were recorded throughout the area (median height 24 m) but generally in low numbers. Several large figs (*Ficus spp.*) were also recorded.	Weed infiltration was prevalent throughout this area, due to the historic clearing and poor maintenance. Common Lantana was prevalent.	This area was associated with a broad floodplain of the North Pine River in the western portion of the study area. No detailed assessment sites were undertaken in this area.	 KHS 2 – looking south  KHS 4 – looking west  KHS 9 – looking east

Regional Ecosystem	Remnant Status	Species and Structural Composition	Condition	Location	Representative Photograph
Non-remnant – Unit 4 VM Act Class – *not applicable* Biodiversity Status – No concern at *not applicable* EPBC Act Status – *not applicable*	Non-remnant	The majority of this area was historically cleared of all woody vegetation. However, a small grove of mature eucalypts appears to have been retained on the western side of the mill. Woody vegetation within this area is now limited to scattered eucalypts and planted ornamental trees. A large Moreton Bay Fig was identified near the north-eastern boundary of this area. A small patch of Slash Pine was identified in the north-western portion of this area (median height 16 m). A small grove of Pecan Trees (**Carya illinoinensis*) was also identified on a floodplain terrace of the North Pine River in the eastern portion of this area.	Weed infiltration was limited within this area, due to the regular maintenance of the grounds in and surrounding the mill infrastructure maintenance. Common Lantana and numerous exotic grasses and herbs were prevalent in the areas fringing Yebri Creek and upon the soil stockpiles in the eastern portion of this area. Glycine (**Neonotonia wightii*) was frequently recorded in the eastern portion of this area.	This area is primarily representative of the historic Petrie Mill industrial area and associated infrastructure. No detailed assessment sites were undertaken in this area.	 KHS 39 – looking east  KHS 40 – looking north  PP 15 – Weed disturbance (soil stockpile)

Regional Ecosystem	Remnant Status	Species and Structural Composition	Condition	Location	Representative Photograph
Non-remnant – Unit 5 VM Act Class – *not applicable* Biodiversity Status – No concern at *not applicable* EPBC Act Status – *not applicable*	Non-remnant	The majority of this area was historically cleared of all woody vegetation. Woody vegetation within this area is now limited to scattered juvenile eucalypts and Hickory Wattle. At the time of survey, the southern portion of this area was being excavated to remove buried waste material from the mill. The remaining portion of the area was largely occupied by a large soil stockpile, which has become overrun and dominated by Common Lantana and associated Wild Tobacco (**Solanum mauritianum*) and Castor Oil Bush (**Ricinus communis*).	Common Lantana and numerous exotic grasses and herbs were prevalent throughout this area, particularly upon the soil stockpiles and the regrowth fringing Yebri Creek.	This area is located on the northern side of Yebri Creek and extends upslope onto the broad gently undulated plain that dominates the landscape to the north. No detailed assessment sites were undertaken in this community.	 KHS 17 – looking south  KHS 40 – looking north

4.3 Significant flora species

Fifteen threatened flora species were returned from database searches as potentially occurring in the study area (Section 3.4 and Appendix B). None of these species were recorded in the study area during the field surveys and all fifteen are considered unlikely to occur in the study area due to a lack of suitable habitat and/or the species having a very restricted distribution (Appendix B).

Historically, there may have been a potential for species such as Lesser Swamp Orchid to occur in patches of Paperbark swamps (REs 12.3.5 or 12.3.6) that are likely to have persisted on the broad floodplain. There may also have been a potential for species such as Queensland Nut, Small-fruited Queensland Nut, Ball Nut, Stinking Laurel and Hairy Joint Grass to occur in patches of gallery rainforest (RE 12.3.1). However, historical aerial imagery provides limited evidence for this type of vegetation persisting in the study area prior to historical clearing events.

One council declared priority species was identified in the study area. Numerous isolated specimens of Moreton Bay Fig were identified on the floodplain terrace flanking the North Pine River.

4.4 Exotic flora

A total of 77 exotic flora species were recorded in the study area during the field survey. Three of these are listed as weeds of national significance and eleven are listed as declared species under the Queensland *Land Protection (Pest and Stock Route Management) Act 2002* as listed in Table 6. A further 27 exotic flora species and three native flora species, that are regarded as invasive species by the Moreton Bay Regional council, were also recorded.

Table 6: Declared weeds identified in the study area

Species	Common Name	WoNS	LP Act Status	Regional ecosystems recorded within study area
**Baccharis halimifolia*	Groundsel Bush	-	Class 2	n-r (Rehab Zones)
**Bryophyllum pinnatum*	Live Leaf	-	Class 2	RE 12.3.11, n-r (Rehab Zones)
**Asparagus aethiopicus*	Ground Asparagus	Yes	Class 3	REs 12.3.11, 12.5.3
**Asparagus africanus*	Climbing Asparagus Fern	Yes	Class 3	REs 12.3.11, 12.5.3
**Celtis sinensis*	Chinese Celtis	-	Class 3	REs 12.3.11, 12.5.3, n-r (Rehab Zones)
**Cinnamomum camphora*	Camphor Laurel	-	Class 3	REs 12.3.11, 12.5.3, n-r (Rehab Zones)
**Lantana camara* var. *camara*	Common Lantana	Yes	Class 3	REs 12.3.11, 12.5.3, n-r (Rehab Zones)
**Lantana montevidensis*	Creeping Lantana	-	Class 3	RE 12.5.3

Species	Common Name	WoNS	LP Act Status	Regional ecosystems recorded within study area
**Ligustrum sinense*	Small-leaved Privet	-	Class 3	RE 12.5.3
**Macfadyena unguis-cati*	Cats Claw Creeper	-	Class 3	REs 12.3.11, 12.5.3, n-r (Rehab Zones)
**Schinus terebinthifolius*	Broad-leaved Pepper Tree	-	Class 3	REs 12.1.3, 12.3.11, 12.5.3, n-r (Rehab Zones)
**Tecoma stans*	Yellow Bells	-	Class 3	REs 12.5.3, n-r (Rehab Zones)

Exotic species were most commonly recorded in the degraded, non-remnant areas, particularly the soil stockpiles. However, Common Lantana was frequently recorded as dense thickets at the edge and, to a lesser extent within, most patches of remnant vegetation. Yellow Bells, Chinese Celtis, Camphor Laurel and Small-leaved Privet were commonly recorded in the non-remnant patches of RE 12.5.3 and the adjacent plantation patches.

Climbing Asparagus Fern, Cat's Claw Creeper and Live-leaf were commonly recorded in the various patches of RE 12.3.11.

The remaining declared pests were generally recorded as isolated individuals or small clumps.

5 Summary of ecological values of the study area

The following ecological values were identified in the study area during field surveys:

- remnant endangered vegetation (RE 12.5.3), including patches that are not currently mapped by the Queensland government
- remnant of concern vegetation (RE 12.3.11)
- remnant least concern vegetation (REs 12.1.3b and 12.3.5)
- a greater distribution of marine plants (RE 12.1.3b), particularly in Yebri Creek
- one council declared priority species was identified in the study area. Numerous isolated specimens of Moreton Bay Fig were identified on the floodplain terrace flanking the North Pine River.

No EPBC Act listed flora or TECs were identified in the study area or considered likely to occur.

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