Hamilton Environmental Services
ABN: 89 108 410 911

BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT (BDAR) – PROPOSED PUMP STATION, EUSTON

priceamerrett CONSULTING

Biodiversity Development Assessment Report – Proposed Pump Station, Euston

Submitted to:

Samantha Grainger
Price Merrett Consulting
PO Box 313
Kerang VIC 3579

Phone: 03 5452 2490
Email: samantha.grainger@pricemerrett.com.au

Submitted by:

Steve Hamilton
Hamilton Environmental Services
2345 Benalla-Tatong Rd.
TATONG VIC 3673

Phone: 03 5767 2358
Mobile: 0409 356 331
Email: steve.hamilton@hamiltonenvironmental.com.au
ABN: 89 108 410 911

Version 1, 3rd February 2021

Cover Photo: Looking north across the proposed development site from near the Murray River bank.

TABLE OF CONTENTS

1. INTRODUCTION

Lake Lucas Almonds Pty. Ltd. are proposed the establishment of a river pump bank of the Murray River to provide water to the Meilman East Proposed Almond Development at Euston (Samantha Grainger pers. comm. 2020).

However, the proposed pump station site on the riverbank is wholly mapped as an area of mapped Biodiversity Value. The Biodiversity Offset Scheme Entry Threshold (BOSET) tool was used, and based on this, this proposal is required to enter the Biodiversity Offset Scheme, and a Biodiversity Development Assessment Report (BDAR) was required.

The area of mapped Biodiversity Value has a width of 25 m from the top of the riverbank, which is approximately coincident with the footprint of the proposed pump station, which has the dimensions of 22 m x 10 m. Beyond this mapped boundary, the proposed pipeline works will pass through grazed land to the north-west, for which Local Land Services (LLS) have already provided a permit for the clearance of any native vegetation (Peter Ryan pers. comm. 2021).

In November 2020, Hamilton Environmental Services (HES) was engaged to undertake a Biodiversity Development Assessment Report (BDAR) to supplement the works application to Balranald Shire Council.

Field assessment of the site using the Biodiversity Assessment Method (BAM) was conducted on the 12th January 2021 by Dr. Steve Hamilton.

This BDAR has been prepared by Steve Hamilton, an Accredited Assessor (BAAS18106), and is consistent with the BAM (OEH 2017a).

Sources of information for this report included:

- BioNet Atlas of NSW Wildlife (NSW Department of Planning, Industry and Environment [DPIE] 2021a);
- State Vegetation Type Map (SVTM). Riverina Region version 1.2 – VIS_ID 4469 (DPIE 2021d);
- The VIS Plant Community Type Identification Tool Version 1.0. (NSW Office of Environment and Heritage [OEH] 2012);
- SIX Maps (Land and Property Information 2021).

1.1 Consultant Background

Steve Hamilton (Dr.)

AssocDipAppBiol, BAppSc(AppBiol), MAppSc (RMIT), PhD (University of Melbourne), BAM accredited Assessor (OEH NSW), Vegetation Quality Assessment Certified (DSE/DEPI/DELWP Victoria),Bush Broker Assessor (DELWP Victoria),Certificate IV in Training and Assessment.

Steve is an ecologist specialising in flora and fauna inventory, auditing, monitoring and surveying, as well as soil typing, analysis and mapping. He has 16 years of consulting experience, associated with a range of ecological evaluations and monitoring processes across all of Victoria, and southern and western New South Wales, which includes assessing and mapping vegetation condition, vegetation type, targeted threatened species surveys, habitat quality assessment (in Victoria, Habitat Hectares assessment and 'Net Loss and Gain' evaluations), across the range of terrestrial, riparian and wetland ecosystems.

He has vast experience in the assessment of native vegetation and species, and habitat loss assessment, for irrigation, residential, infrastructure and mining (including sand, rock and ore extraction) developments, and the successful negotiation of the appropriate legislative, regulatory

and statutory frameworks across the three levels of Government to provide suitable outcomes for clients across both States to allow developments to proceed. In Victoria, this involves the production of Net Loss Reports, Vegetation Offset Management Plans and Work Plans, and in NSW, reporting for potential native vegetation/habitat losses and threatened species threats in Development Applications (DAs), Tests of Significance (ToS), and in more detailed situations where, implementation of the Biodiversity Assessment Method (BAM) and the production of Biodiversity Development Assessment Reports (BDARs), Environmental Impact Statements (EISs) or Reviews of Environmental Factors (REFs).

Beyond statutory requirements and reporting, Steve is often called upon to provide technical reporting into particular issues, such as research/survey investigations into vegetation-soil-fauna management issues in natural areas or for development proposals, such as weed management surveys and strategies, kangaroo survey and management, potential mining pollution impacts, sustainability of timber resources, soil mapping and land capability assessment, ecosystem restoration, or revegetation design.

Prior to consulting, Steve spent 20 years as a senior teaching/research academic, and has more than 30 peer-reviewed papers and many technical reports, most focussing on the impacts of disturbance on the ecology and floristics of woodlands and grasslands.

1.2 Location and Site Identification

The site is found on the north bank of the Murray River, 25 km south-east of the township of Euston (Fig. 1-1).

Figure 1-1 Aerial image of the general location of where the proposed pump station is located, shown by a red dot and indicated by an arrow (Google Earth 2021).

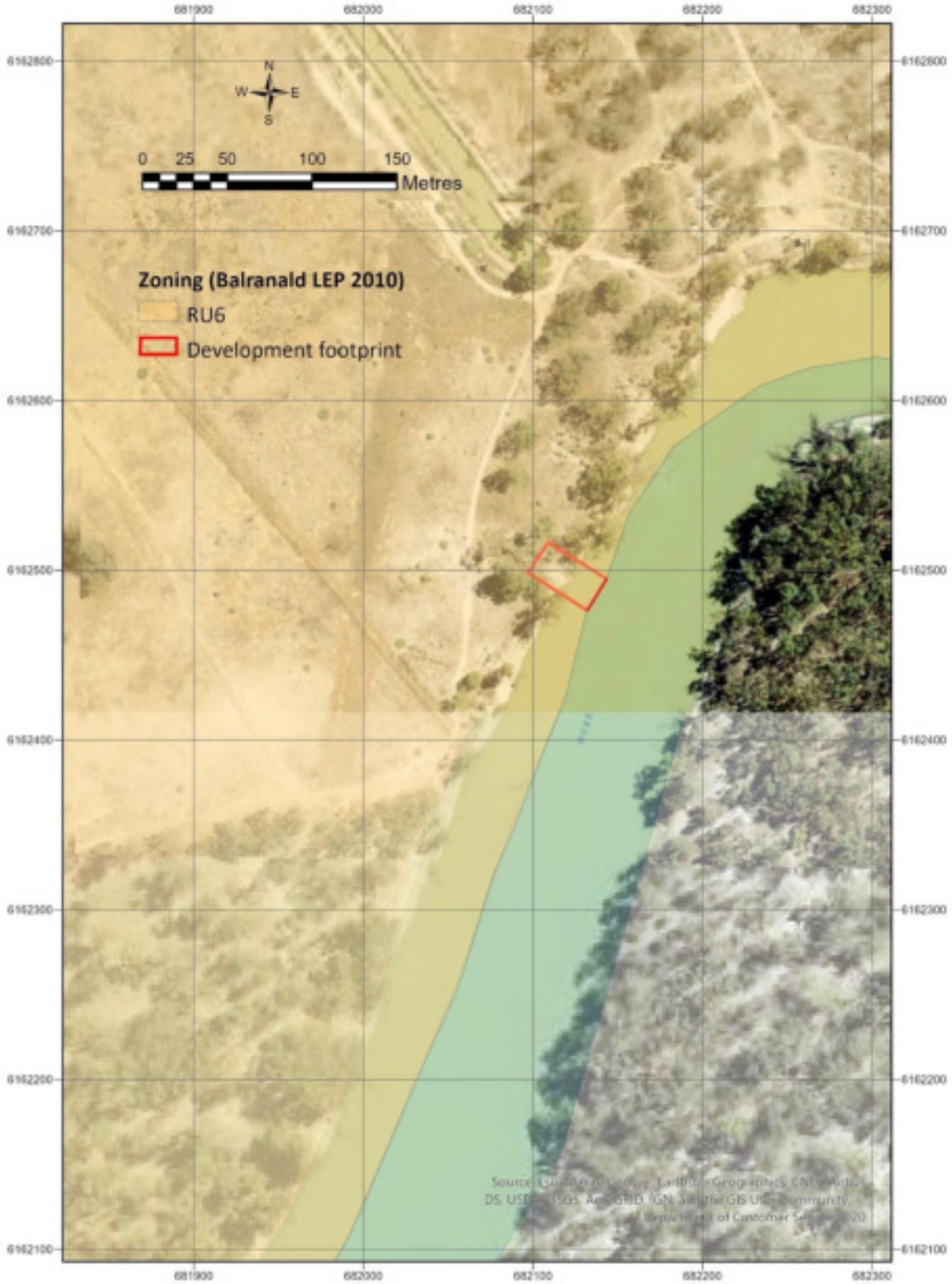

Figure 1-2 Site location (Image copyright NSW Land and Property Information 2021).

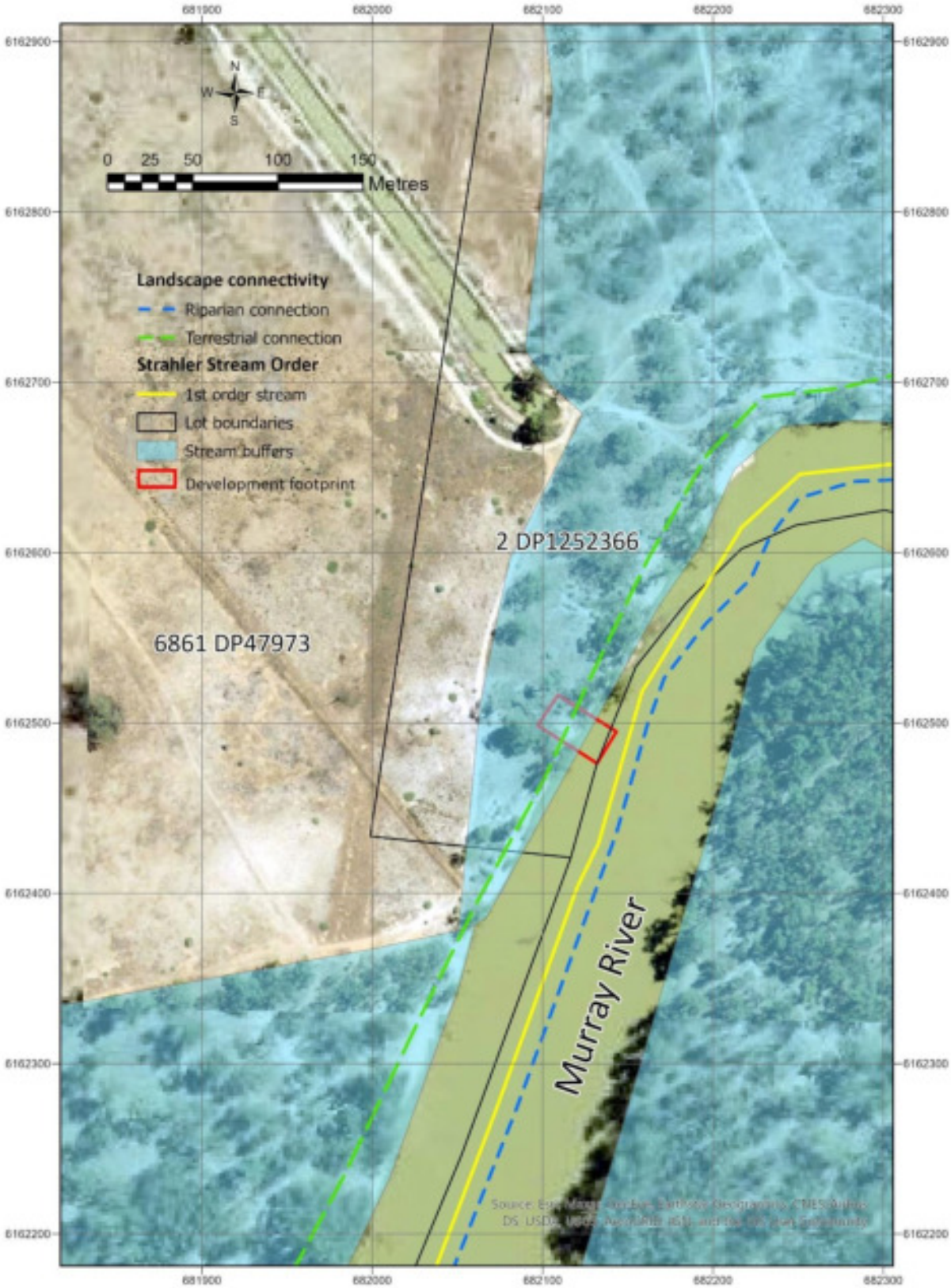

Figure 1-3 Site map (Image copyright NSW Land and Property Information 2021).

The subject land for this BDAR covers a total area of 0.04 ha (400 m^2), which is the estimated total area of development impact (see Fig. 1-2).

The subject land is situated within the Balranald Shire Council, and zoned RU6 Primary Production 6.

The proposed development site is found wholly on Lot 2 DP 1252366 (see Fig. 1-3).

The rectangular site of approximate dimensions of 22 m north-west/south-east and 20 m north-west/south-west and 0.04 ha (400 m^2) is located on the levee/raised area on the northern bank of the Murray River; the western half of this site is a scour area that in the past has been excavated to provide level access to the river's edge, and is already significantly disturbed.

While there are mature River Red Gum (*Eucalyptus camaldulenisis*) in proximity to the site (close to the water's edge), and juvenile and mature Black Box *(E. largiflorens*) surrounding the site, there are no tree individuals within the development footprint (see Fig. 3-2). Without a tree canopy, the tallest vegetation within the proposed disturbance footprint is a sparse shrub layer of Nitre Goosefoot (*Chenopodium nitrariaceum*) and Lignum (*Duma florulenta*), with a sparse indigenous ground layer of Soft Rolypoly (*Salsola kali*), Curly Windmill Grass (*Enteropogon acicularis*), Rough Spear-grass (*Austrostipa scabra*), Ruby Saltbush (*Enchylaena tomentosa*), Small-leaf Bluebush (*Maireana brevifolia*), Quena (*Solanum esuriale*), Flat-top Saltbush (*Atriplex lindleyi*), Hairy Bluebush (*Maireana pentagona*), Hairy Sida (*Sida trichopoda*), Corrugated Sida (*Sida corrugata*), Small Crumbweed (*Dysphania pumilio*), Yellow Eclipta (*Eclipta platyglossa*), Caustic Weed (*Chaemaesyce drummondii*), Black Rolypoly (*Sclerolaena muricata*) and White Sunray (*Rhodanthe corymbifolia*)(15 % projective foliage cover). Some small patches and scattered individuals of the introduced ground layer species Smooth Mustard (*Sisybrium erysimoides*) and Sandspurry (*Spergularia rubra*) are found across the proposed development area (6 % projective foliage cover).

On the water's edge within the proposed development area to a maximum width of 2 m, are patches of the aquatic emergent Tall Flat-sedge (*Cyperus exaltatus*) and the floating aquatic Water Primrose (*Ludwigia peploides*).

1.3 Proposed Development Background

The proposed pump station is required to provide irrigation water from the Murray River to the proposed almond orchards to be planted on the property to the west and north-west; irrigation water will be delivered by three dam fill mainlines, and then managed by storage and piped delivery.

The development site of 0.04 ha is shown in Fig. 1-4, and while no tree individuals will be removed, the proposed development is likely to result in the loss of all indigenous shrubs and indigenous ground layer species found within the site (Peter Ryan pers. comm. 2021).

The location of the proposed pump station has been chosen to coincide with the previously disturbed scour area and to avoid any juvenile or mature tree individuals to ensure that native loss has been minimised.

As indicated, beyond the proposed pump station footprint, the proposed pipeline works will pass through grazed land to the north-west, for which Local Land Services (LLS) have already provided a permit for the clearance of any native vegetation (Peter Ryan pers. comm. 2021).

Figure 1-4 Layout for proposed river pump station for Lake Lucas Almonds (from North West Irrigation Systems dated 10/10/20).

2. LANDSCAPE FEATURES

2.1 Identification of Landscape features

In accordance with the BAM, a number of features are assessed within and surrounding the subject site. Provided below are details related to IBRA region and subregion and NSW landscape regions (Mitchell Landscapes). Other features, such as rivers, streams, estuaries and wetlands, habitat connectivity, karst areas or areas of outstanding biodiversity value are considered where appropriate.

2.1.1 IBRA bioregions and IBRA subregions

Interim Biogeographic Regionalisation of Australia (IBRA) regions represent a landscape based approach to classifying the land surface, including attributes of climate, geomorphology, landform, lithology, and characteristic flora and fauna species present. The subject land is located entirely within the Riverina IBRA Region (version 7) and the Robinvale Plains Subregion (version 7).

2.1.2 NSW landscape regions (Mitchell Landscapes)

The subject site occurs in only one NSW Mitchell Landscape, being the *Murray Channels and Floodplain* landscape (Mitchell Landscape version 3.1; see Fig. 2-1).

2.1.3 Other features

There is clearly one main watercourse within the study area; the Murray River, a 1st order stream (Fig. 1-4).

The riparian buffers associated with this onsite watercourse have been calculated in accordance with Appendix 3 of the BAM and are shown in Figure 1-4.

2.2 Determining Site Context

2.2.1 Assessing native vegetation cover

A layer of native vegetation cover is required for a 1,500 m buffer radius around the study area to determine the context of the site. The extent of native vegetation on the subject site and immediate surrounds was mapped using the Riverina VTM (DPIE 2021d), with edits made to the layer where obvious changes to vegetation extent had occurred.

The total area of the 1,500 m radius buffer around the study area is 706 ha, with the area of vegetation mapped within the buffer being approximately 600 ha (see Fig. 2-1). This is a native vegetation cover of 85 %, falling in the > 70 % class, which was entered into the BAM calculator.

2.2.2 Assessing patch size

Patch size as defined by the BAM as 'an area of native vegetation that:

a) occurs on the development site or biodiversity stewardship site, and

b) includes native vegetation that has a gap of less than 100 m from the next area of moderate to good condition native vegetation (or ≤ 30 m for non-woody ecosystems).'

Patch size may extend onto adjoining land that is not part of the development site or biodiversity stewardship site.

In assessing patch size, stands of native vegetation within 100 m (where in a moderate to good condition) but which are separated by hard barriers including permanent artificial structures, wide roads or other barriers have been treated as separate patches. These highly modified breaks in

vegetation connectivity would significantly alter ecological function of these areas of native vegetation such that these areas warrant recognition as separate patches.

Patch size was calculated for the vegetation on the development site using the field validated map of vegetation types identified and the updated native vegetation extent data layer prepared for the 1,500 m radius buffer (based on OEH 2017a). Patch size is required to be assessed as one of four classes per vegetation zone mapped, being < 5 ha, 5-24 ha, 25-100 ha or > 100 ha.

One patch was identified for vegetation within the subject land. Native vegetation within the subject land was located connecting to vegetation extending to both the north-east and north-west along the northern bank of the Murray River. Based upon vegetation mapping and aerial photo interpretation beyond the subject land, the total area of this patch of native vegetation was calculated as > 100 ha, and is therefore within the > 100 ha class.

3. NATIVE VEGETATION

Assessment and mapping of Plant Community Types (PCTs) were undertaken on the 12th January 2021. The study area was traversed to identify the vegetation structure and dominant species of the one patch of native vegetation. The extent of the patch of vegetation was traversed 500 m to the west and east to sample any spatial variation, identify any boundaries with other vegetation communities, and to identify and map vegetation zones in accordance with the BAM (variation in the broad condition state of vegetation polygons).

Based upon traverses of the development area and the continuation of this patch to the east, only one vegetation community was present. The floristics of each of this vegetation community was then sampled within a 20 x 20 m plot-based floristic vegetation survey, consistent with Section 5.2.1.9 of the BAM. This is also the location of the one surveyed vegetation integrity plot in accordance with Section 5.3 of the BAM. The location of the floristic vegetation plot was located across the full extent of the proposed pump station on the edge of the Murray River, whilst ensuring that the plot-based survey included representative areas within the community and avoided, where possible, edge effects (i.e. located close to the edges of vegetation extent).

The identification of PCTs was in accordance with the NSW PCT classification as described in the BioNet Vegetation Classification (OEH 2012). Determination of the most appropriate PCTs for vegetation communities within the study area used the BioNet Vegetation Classification database to identify PCT types which matched the geographic distribution (based upon IBRA subregions), vegetation formation and floristics of vegetation within the subject land. The data for each potential PCT including vegetation formation, descriptive attributes and distribution information were then reviewed to determine the most appropriate PCT for each of the vegetation communities sampled within the subject land. Observations of vegetation structure and composition made during traverses of the study area as well as adjacent areas also informed the determination of most appropriate PCTs for the vegetation communities within the subject land.

The identification of the appropriate PCT was not a difficult task given the landscape position of the proposed development site and the expert opinion of an experienced observer of riverine vegetation types.

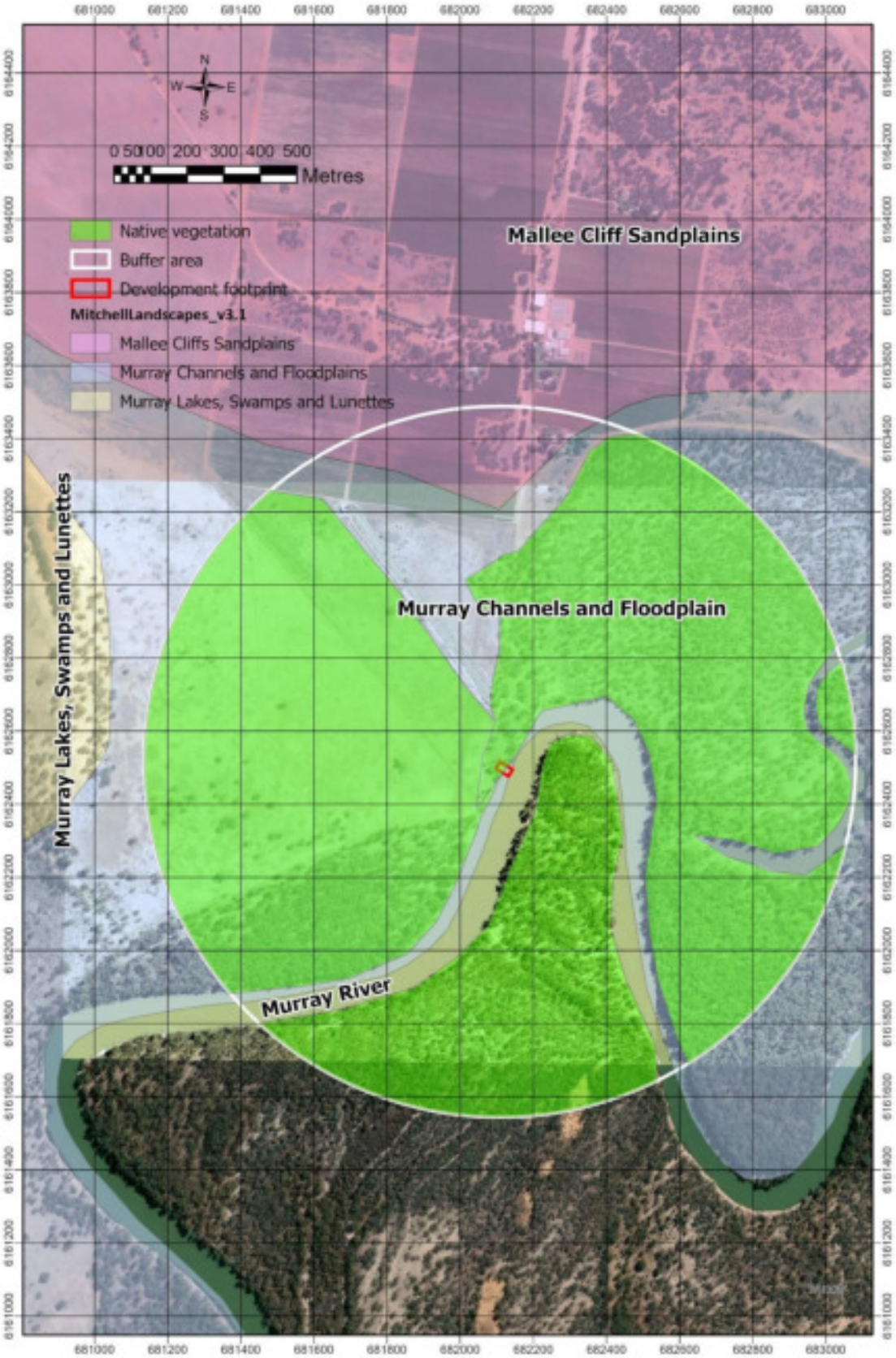

Figure 2.1 Location map (Image copyright NSW Land and Property Information 2021).

3.1 Plant Community Types (PCTs) and Threatened Ecological Communities (TECs)

Identification of vegetation communities within the subject land followed the vegetation classification of OEH (2012). Mapping of vegetation communities provided in the *State Vegetation Type Map Western NSW Region version 1.2* (see Fig. 3-1; DPIE 2021d), it was concluded that vegetation community of the proposed development site was wholly *River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)*(PCT 11); this PCT was confirmed based on the floristic composition of the vegetation within the study area and its immediate proximity.

This community is not listed as a Threatened Ecological Community (TEC) under the *Biodiversity Conservation Act 2016*.

A search of Matters of National Environmental Significance (MNES)(Department of Agriculture, Water and Environment [DAWE] 2021) concluded that such a community is not listed under the EPBC Act, and will not require assessment in accordance with the *Significant Impact Guidelines* of the Commonwealth Department of the Environment (DoE)(2013).

A summary of the PCT within the subject land including areas of vegetation zones, the percent cleared for the PCT and Serious and Irreversible Impacts (SAII) candidate entities is included in Table 3-1.

Table 3-1 Details of PCTs within the proposed development area of vegetation zones and candidate SAII entities.

Plant Community Types (PCTs	Vegetation formation & class	Vegetation zones	Area (ha)	PCT percent cleared	Threatened Ecological Communities (TECs)	SAII candidate entity
PCT 11 - *River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)*	Inland Riverine Forests	Modified	0.04	42	N/A	No

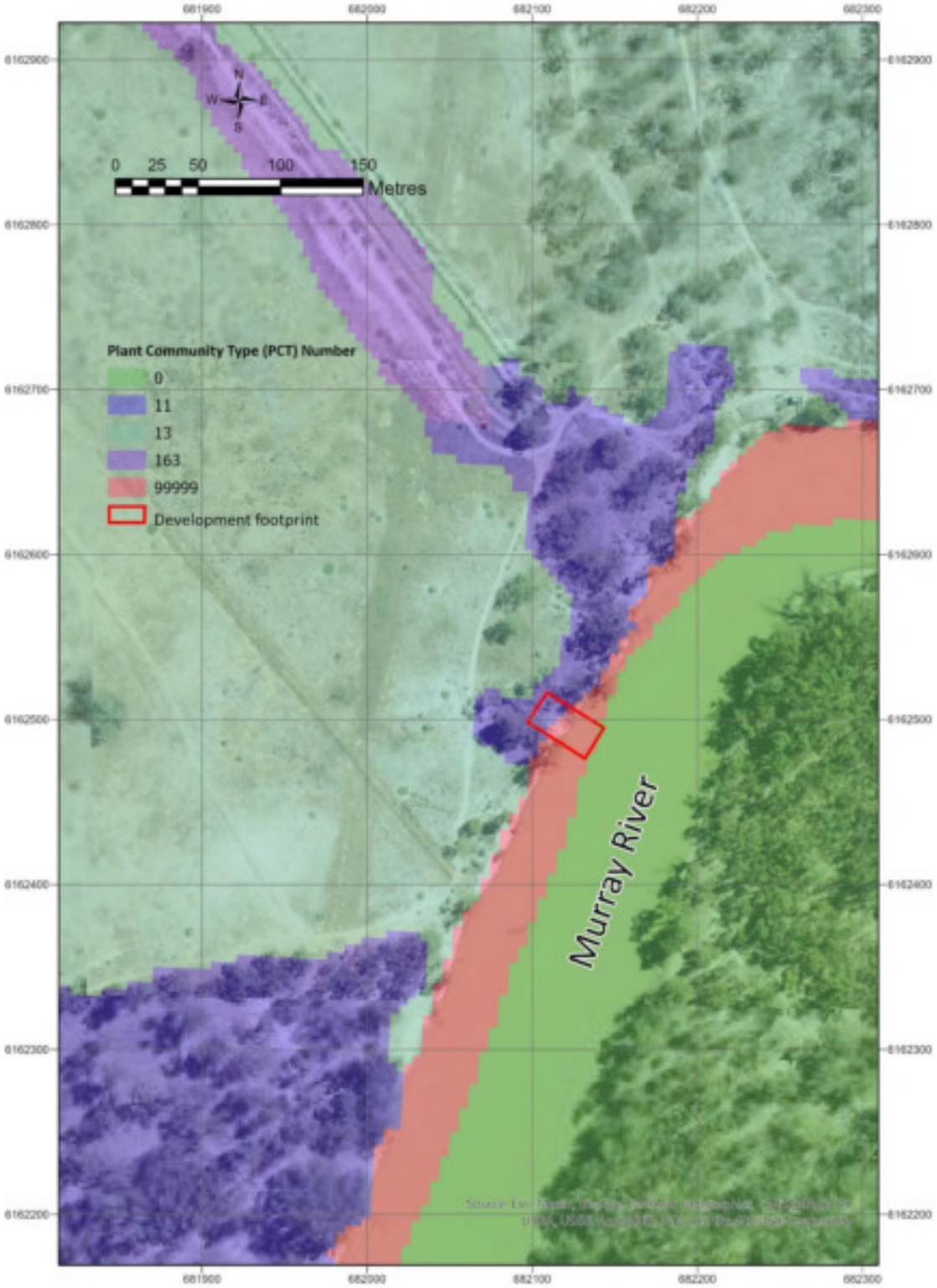

Figure 3.1 **PCTs at the proposed development site (shown as a solid red line) and environs; PCT 0 is Non-native, PCT 11 is River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion), PCT 13 is Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion), PCT 163 is Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones, and PCT 99999 is Water (Image copyright NSW Land and Property Information 2021 and PCT data from DPIE 2021d).**

3.1.1 River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)(PCT 11)

As indicated, the rectangular site of approximate dimensions of 22 m north-west/south-east and 20 m north-west/south-west and 0.04 ha (400 m^2) is located on the levee/raised area on the northern bank of the Murray River; the western half of this site is a scour area that in the past has been excavated to provide level access to the river's edge.

While there are mature River Red Gum (*Eucalyptus camaldulenisis*) in proximity to the site (close to the water's edge), and juvenile and mature Black Box *(E. largiflorens*) surrounding the site, there are no tree individuals within the development footprint (see Fig. 3-2). Without a tree canopy, the tallest vegetation within the proposed disturbance footprint is a sparse shrub layer of Nitre Goosefoot (*Chenopodium nitrariaceum*) and Lignum (*Duma florulenta*), with a sparse indigenous ground layer of Soft Rolypoly (*Salsola kali*), Curly Windmill Grass (*Enteropogon acicularis*), Rough Spear-grass (*Austrostipa scabra*), Ruby Saltbush (*Enchylaena tomentosa*), Small-leaf Bluebush (*Maireana brevifolia*), Quena (*Solanum esuriale*), Flat-top Saltbush (*Atriplex lindleyi*), Hairy Bluebush (*Maireana pentagona*), Hairy Sida (*Sida trichopoda*), Corrugated Sida (*Sida corrugata*), Small Crumbweed (*Dysphania pumilio*), Yellow Eclipta (*Eclipta platyglossa*), Caustic Weed (*Chaemaesyce drummondii*), Black Rolypoly (*Sclerolaena muricata*) and White Sunray (*Rhodanthe corymbifolia*)(15 % projective foliage cover).

On the water's edge within the proposed development area to a maximum width of 2 m is the aquatic emergent Tall Flat-sedge (*Cyperus exaltatus*) and the floating aquatic Water Primrose (*Ludwigia peploides*).

3.1.2 Other vegetation

As indicated, some small patches and scattered individuals of the introduced ground layer species Smooth Mustard (*Sisybrium erysimoides*) and Sandspurry (*Spergularia rubra*) are found across the proposed development area (6 % projective foliage cover).

3.2 Vegetation Zones

3.2.1 Condition classes, subcategories and area

The development site was categorised into one vegetation zone for credit calculation purposes – PCT 11 - *River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)*. The vegetation zone is based on the condition description above with the area of the vegetation zone shown in Table 3.1.

3.2.2 Vegetation integrity survey plots

One Vegetation integrity survey plot was completed on-site, with this being used to meet the requirements of the BAM (see Appendix A for the Vegetation integrity survey plot data).

One plot was completed for the native vegetation zone (see Fig. 3-1 for the location of vegetation the integrity survey plot).

The number of plots surveyed within each vegetation zone is consistent with the requirements as outlined within Table 4 of the BAM.

Plate 3-1 **Views of the proposed development area: looking west across the site from the south-east corner (top left), looking north east along the top of the riverbank (top right), looking north-west along the scour on the western edge of the site (middle left), looking north-west from the northern edge of the site (middle right), looking south from beyond the northern edge of the site (bottom left), and looking west across the section of the river bank where the piping will exit the river (bottom right). Selected trees are numbered in white, and approximate boundaries of the maximum extent of the development area shown as red lines.**

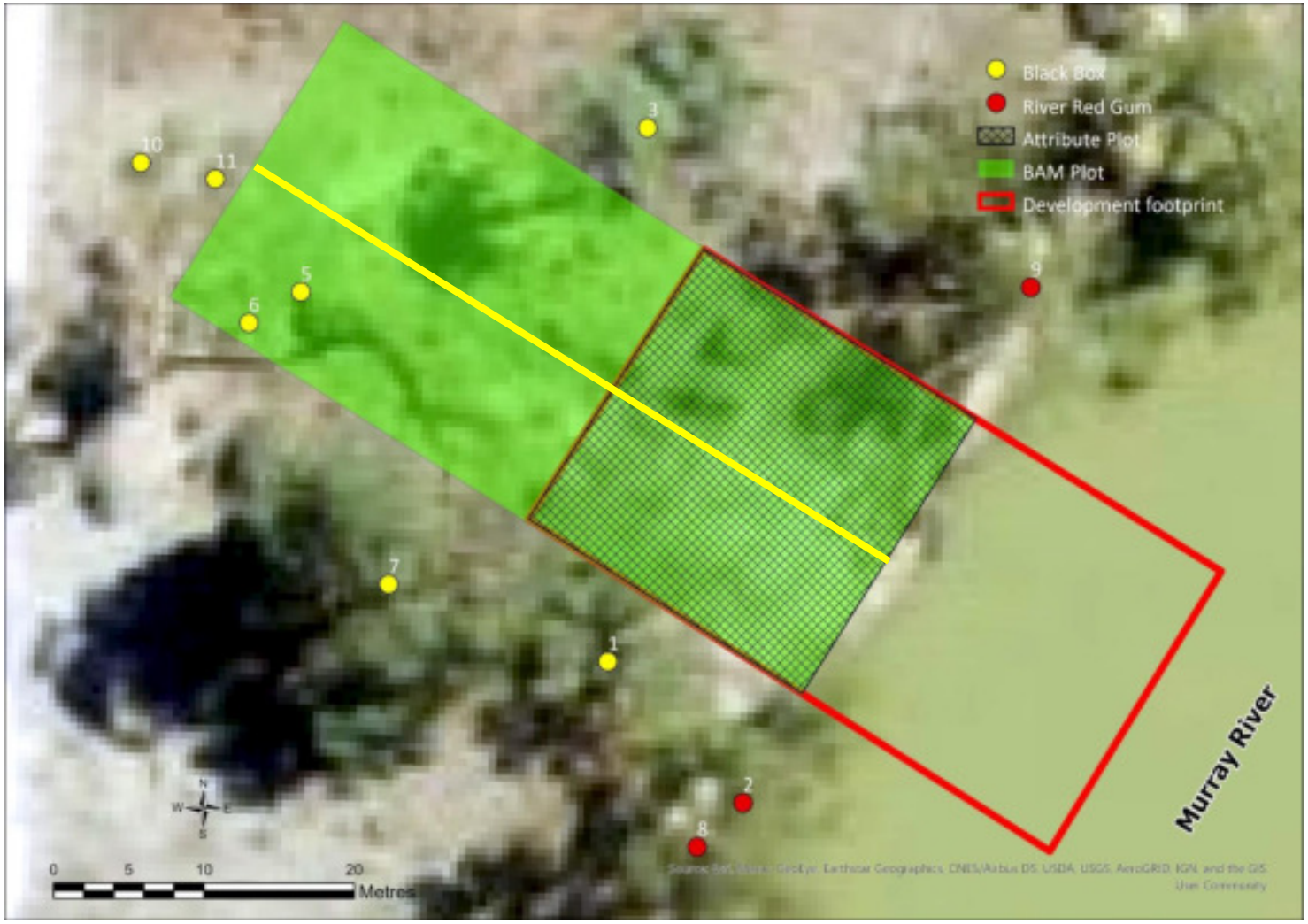

Figure 3-2 **The proposed development site/footprint and location of the proposed structure, the location of trees across this site, and the location of the central transect (yellow line), 400 m^2 composition and structure plot and 1,000 m^2 vegetation integrity plot (Image copyright NSW Land and Property Information 2021).**

3.2.3 Current and future vegetation integrity scores

The Vegetation integrity scores were calculated based on the vegetation integrity survey plot collected for the vegetation zone assigned to a native PCT.

The vegetation integrity scores for PCT 11 'Modified' vegetation zone is provided in Table 3-2. The Vegetation integrity score for this zone was 27.8/100. For this vegetation zone, while no tree individuals will be cleared, all shrub and ground layer vegetation will be removed, and on this basis, the Vegetation integrity score after development was calculated as 0/100.

Table 3-2 Vegetation integrity scores.

Vegetation Zone number	Plant Community Types (PCTs	Condition Class	Area (ha)	Vegetation integrity score – before development	Vegetation integrity score – after development
1	PCT 11 - *River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)*	Modified	0.04	27.8	0

4. THREATENED SPECIES

Section 6 of the BAM, details the process for determining the habitat suitability for threatened species.

Under the BAM, threatened species are separated into two classes, 'ecosystem' and 'species' credit species. Those threatened species where the likelihood of occurrence of a species or elements of the species' habitat can be predicted by vegetation surrogates and landscape features, or for which a targeted survey has a low probability of detection, are identified as 'ecosystem' credit species. Targeted surveys are not required for ecosystem species and potential impacts to these species are assessed in conjunction with impacts to PCTs.

Threatened species where the likelihood of occurrence of a species or elements of suitable habitat for the species cannot be confidently predicted by vegetation surrogates and landscape features and can be reliably detected by survey are identified as 'species' credit species. A targeted survey or an expert report is required to confirm the presence or absence of these species on the subject land.

For some threatened species, they are identified as both ecosystem and species credit species, with different aspects of the habitat and life cycle representing different credit types. Commonly,

threatened fauna species may have foraging habitat as an ecosystem credit, while their breeding habitat represents a species credit.

The following sections outline the process for determining the habitat suitability for threatened species within the subject lands, and the results of targeted surveys for candidate threatened species.

4.1 Identification of threatened species for assessment

Threatened species that require assessment are initially identified based upon the following criteria:

- the distribution of the species includes the IBRA subregion in which the subject land (Robinvale Plains IBRA subregion);
- the study area is within any geographic constraints of the distribution of the species within the IBRA subregion;
- the species is associated with the PCT identified within the study area;
- the native vegetation cover within an assessment area including, a 1,500 m radius buffer around the study area, is equal to or greater than the minimum required for the species;
- the patch size that each vegetation zone is part of is equal to or greater than the minimum required for that species;
- the species is identified as an ecosystem or species credit species in the Threatened Biodiversity Data Collection.

The process for identifying threatened species which meet the above criteria is completed through the BAM Calculator. The PCT identified within the study area, patch sizes and native vegetation cover, as outlined in Section 3, were entered into the BAM Calculator and a preliminary list of threatened species were identified.

4.1.1 Ecosystem Credit Species

The ecosystem credit species predicted on site are provided in Table 4-1.

Common name	Scientific name	NSW listing status[1]	National listing status[1]
Australian Painted Snipe	*Rostratula australis*	E	E
Barking Owl	*Ninox connivens*	V	
Australasian Bittern	*Botaurus poiciloptilus*	E	E
Black-breasted Buzzard	*Hamirostra melanosternon*	V	
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	V	
Brolga	*Grus rubicunda*	V	
Diamond Firetail	*Stagonopleura guttata*	V	
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	V	
Freckled Duck	*Stictonetta naevosa*	V	
Gilbert's Whistler	*Pachycephala inornata*	V	

Common name	Scientific name	NSW listing status[1]	National listing status[1]
Grey Falcon	*Falco hypoleucos*	E	
Hooded Robin (south-eastern form)	*Melanodryas cucullata cucullata*	V	
Little Eagle	*Hieraaetus morphnoides*	V	
Little Pied Bat	*Chalinolobus picatus*	V	
Major Mitchell's Cockatoo	*Lophochroa leadbeateri*	V	
Pied Honeyeater	*Certhionyx variegatus*	V	
Purple-crowned Lorikeet	*Glossopssita porphyrocephala*	V	
Regent Parrot (eastern subspecies)	*Polytelis anthopeplus monarchoides*	V	
Spotted Harrier	*Circus assimilis*	V	
Square-tailed Kite	*Lophoictinia isura*	V	
Swift Parrot	*Lathamus discolor*	E	CE
Varied Sittella	*Daphoenositta chrysoptera*	V	
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	V	
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V	

From DPIE (2021b) – CE = critically endangered, E = endangered, V = vulnerable.

Based on records within BioNet (DPIE 2021a) within a 20 km radius of the proposed development site, Australasian Bittern, Black-breasted Buzzard, Hooded Robin, and Black-chinned Honeyeater were de-selected as Predicted Credit Species based on:

- Lack of records within 20 km (all 4 species);
- Lack of suitable habitat (Australasian Bittern and Black-breasted Buzzard); or;
- Lack of connectivity to known locations/records (Hooded Robin and Black-chinned Honeyeater).

4.1.2 Species Credit Species

Species credit species are predicted in the BAM Calculator following assessment of geographic and habitat features in the credit calculator, such as site location (IBRA subregion), PCTs and condition, patch size and the area of surrounding vegetation within the 1,500 m radius buffer of the study area. Some species require further assessment of habitat constraints and/or geographic limitations before being confirmed as candidate species for assessment.

Table 4-2 outlines the questions asked for the two Species credit species that have been predicted by the BAM Calculator, the response to whether this species is likely to be present at the proposed site, whether the species is confirmed as a candidate species, and if not, then a justification for that decision.

Table 4-2 Assessment of habitat constraints and geographic limitations of Species Credit Species, and justifications for decision-making.

Common name	Scientific name	Habitat constraints/geographic limitations	Response to BAM tool question	Maintained as candidate species
Swamp She-oak	*Casaurina obesa*	• Waterbodies • Brackish or saline areas within 100 m from rivers or lakes	No	No (surveyed). The site and adjacent areas are not suitable habitat – neither saline or brackish. There are saline lakes to the north-west which are suitable habitat.
Swift Parrot	*Lathamus discolor*		Yes	Yes (not surveyed – assumed presence). No records within 20 km. However, the site does contain suitable habitat, and there is limited connectivity to known locations.

4.2 Identification of candidate species credit species for further assessment

In accordance with Section 6.4.1.17 of the BAM, a predicted candidate species can be considered unlikely to occur within the subject land (or specific vegetation zones) where habitat is substantially degraded such that the species is unlikely to utilise area, or where an expert report identifies that the species is unlikely to be present within the subject land (or a vegetation zone within the subject land). A predicted candidate species credit species that is not considered to have suitable habitat on the subject land (or specific vegetation zones) does not require further assessment on the subject land (or specific vegetation zones). The reasons for determining that a predicted species credit species is unlikely to have suitable habitat on the subject land (or specific vegetation zones) must be documented.

In this case, the Swamp She-oak is not found within proximity to the site, and the site and its environs do not contain brackish or saline habitats that are its preference; it is noted that saline lakes to the north-west (e.g. Lake Caringay, Lake Benanee or Dry Lake), and these wetland systems are more likely to offer suitable habitat for the species.

Therefore, based upon the assessment of available habitat for predicted candidate species within the subject land, there is only one species that may use the site – Swift Parrot.

4.3 Determination of presence or absence of a candidate species credit species

4.3.1 Targeted field surveys – flora

Following vegetation survey and habitat assessment undertaken on 12th January 2021 by Steve Hamilton, the subject land was considered unsuitable habitat for the candidate flora species credit species (Swamp She-oak) in accordance with Section 6.4.1.17 of the BAM (see Table 4-3).

The candidate threatened flora species was not recorded on the subject land or within 400 m radius of the site.

4.3.2 Targeted field surveys – fauna

The only candidate threatened fauna species listed is Swift Parrot.

A targeted search was not conducted for the species on the 12th January 2021, as it is known that the species will be breeding in Tasmania during the summer months.

It has been assumed that the species would utilise the site.

5. AVOIDING AND MINIMISING IMPACTS ON BIODIVERSITY VALUES

5.1 Avoiding and minimising impacts on native vegetation and habitat during project planning

As indicated in Sec. 1.3, no tree individuals will be removed with the proposed development; however, the development is likely to result in the loss of all indigenous shrubs and indigenous ground layer species found within the site (Peter Ryan pers. comm. 2021).

The location of the proposed pump station has been chosen to coincide with the previously disturbed scour area and to avoid any juvenile or mature tree individuals to ensure that native loss has been minimised.

As indicated, beyond the proposed pump station footprint, the proposed pipeline works will pass through grazed land to the north-west, for which Local Land Services (LLS) have already provided a permit for the clearance of any native vegetation (Peter Ryan pers. comm. 2021).

5.2 Avoiding and minimising prescribed biodiversity impacts during project planning

As described in Section 2.1.3, other than the waterway itself, there are no other features of geological significant within the subject land, and therefore, no prescribed biodiversity impacts are anticipated from the proposed development.

6. ASSESSING AND OFFSETTING IMPACTS

6.1 Assessment of impacts

6.1.1 Assessing impact to native vegetation and habitat, threatened ecological communities and threatened species habitat

There will be the loss of the sparse indigenous shrub layer and indigenous ground layer found across the 400 m^2 site within the construction footprint of the proposed development.

No tree individuals will be lost.

It is concluded that there will not be any significant impacts on any threatened species or community as a consequence of the proposed works; the loss of the shrubs and ground layer in the development area does not substantially change the landscape connectivity of the area, and there are significant areas of mixed River Red Gum and Black Box forest containing many large hollow-bearing trees and with a well-structured understorey to the north-east and south-west, and these areas will remain for utilisation by these species.

6.1.2 Assessing indirect impacts on native vegetation and habitat

There are a number of indigenous trees in proximity to the proposed development footprint, and there is a risk that these trees could be indirectly impacted by the construction process. Therefore, care must be taken in close proximity to all retained trees. Projects that involve soil disturbance – such as the construction process for the pump station - can cause indirect losses of native vegetation that are retained during construction due to root damage and soil modification within the zone where roots occur. Of particular concern is the longer-term impact of soil compaction and excavation (e.g. through vehicle movement) close to trees and the effects of this on immediate and longer-term tree health. Standards Australia (2009) has provided guidance and clarity on this issue, and has defined an acceptable distance for tree retention in order to prevent indirect losses of native vegetation during and after construction activities as a guiding principle. These designated Tree Protection Zones (TPZs) should be implemented for the duration of construction activities as part of the development conditions.

A TPZ is a specific area above and below the ground, with a radius 12 times the Diameter at Breast Height (dbh; 1.3 m) of any individual tree; the TPZ of trees should be no less than 2 m or greater than 15 m, and it is recommended that physical barriers be erected to delineate the TPZ during construction activities. Should a development impinge on the TPZ area for > 10 % of its area, the tree shall be considered a loss (Standards Australia 2009).

On this basis, for retained trees that are in close proximity to the development area, the use of safety mesh or tape to demark the TPZ distance is strongly recommended.

As this development is taking place on the riverbank, some work on the northern Murray River bank and in the adjacent shallows of the river is required. These works will be undertaken with appropriate sediment immobilisation techniques at low flow during construction, and post-construction work will ensure the stabilisation of the site with geo-textile fabric and potentially appropriate planting.

6.2 Assessing prescribed biodiversity impacts

As described in Section 2.1.3, other than the waterway itself, there are no other features of geological significant within the subject land, and therefore, no prescribed biodiversity impacts are anticipated from the proposed development.

6.3 Mitigating and managing impacts on biodiversity values

6.3.1 Preclearance protocols

There are several non-threatened fauna species such as mammals, birds and reptiles that are likely to be present at the development site, and potentially utilising the indigenous shrubs that are to be removed. Appropriate pre-clearance protocols will be put in place at the time of construction to avoid and mitigate any potential harm or injury to these individuals. These protocols will include, as a minimum, pre-clearance surveys and clearing supervision when shrubs are being removed.

As indicated in Sec. 6.1.2, this development is taking place on the riverbank, some work on the northern Murray River bank and in the adjacent shallows of the river is required. These works will be undertaken with appropriate sediment immobilisation techniques at low flow during construction, and post-construction work will ensure the stabilisation of the site with geo-textile fabric and potentially appropriate planting.

It is recommended that direction and process for fauna management and riverbank work be included in a site Construction and Environmental Management Plan (CEMP), prior to any construction works taking place.

The CEMP will be required to span the pre, during and post-construction period, and will include the above pre-clearance and fauna management protocols, and issues associated with construction procedures on the riverbank.

6.3.2 Habitat augmentation and monitoring

As outlined in Sec. 6.1.1, given that it has been proposed that will not be any significant impacts on any threatened species or community as a consequence of the proposed development (HES 2019a; see Sec. 6.1.2), there is no need for habitat augmentation and monitoring.

6.4 Adaptive management for uncertain impacts

Excluding the need for a CEMP, no additional adaptive management measures are proposed.

6.5 Thresholds for the assessment and offsetting of impacts of development

6.5.1 Serious and Irreversible impacts

River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)(PCT 11) has not been identified as an SAII entity in the Guidance to assist a decision-maker to determine a serious and irreversible impact (OEH 2017b) or within the BioNet database as entities at risk of a serious and irreversible impact.

6.5.2 Impacts which require an offset

Impacts associated with the Modified PCT 11 zone will require offset under the BAM (see Table 6-1).

Table 6-1 Vegetation zones which require offsets.

Vegetation zone number	Plant community type	Condition class	Area impacted (ha)	Veg integrity score
Vegetation zone which requires impacts to be offset				
1	*River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)(PCT 11)*	Modified	0.04	27.8

The BAM Calculator has allocated Species credits for Swift Parrot with the proposed development.

7. FINAL CREDIT CALCULATIONS

7.1 Credit calculations and classes

7.1.1 Ecosystem credits

The ecosystem credits required to offset the proposal are provided in Table 7.1. A total of 1 credit is required to offset the development.

Table 7-1 Ecosystem credits summary and credit profile.

Veg zone number	Plant community type	Condition class	Area impacted (ha)	Credits required
1	*River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)(PCT 11)*	Modified	0.04	1
		Total credits required		1

The following offset rules apply:

- For credit class 11:
  - any Inland Riverine Forest PCTs, including PCTs 2, 5, 7, 8, 9, 10, 11, 36, 78, 112, 233, 234, 249, 356, 362;
  - In the following IBRA subregions: *Robinvale Plains, Murray Fans, Murray Scroll Belt, Murrumbidgee and South Olary Plain*, or*, Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site*.

7.1.2 Species credits

Species credits have been calculated for Swift Parrot, and require offsetting with the proposed development (Table 7-2).

The following offset rules apply to each of these Species credits:

- Any IBRA region in NSW.

7.2 Credit costs

The total cost of credits, should the Biodiversity Conservation Trust (BCT) be used to offset the impacts, are currently (3rd February 2021) estimated to be $8,614.89 (inc. GST). The credits and payment summaries from the BAM Calculator are provided in Table 7.3 and Appendix B.

The proponent may also wish to purchase credits available on the market, or may wish to pursue other offset sites as required.

Table 7-2 Species credits summary and credit profile.

Veg zone number	Plant community type	Species Credit species	Area impacted (ha)	Credits required
1	*River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)(PCT 11)*	Swift Parrot	0.04	1

Table 7-3 Credit requirements and estimated credit costs, as calculated on the 3rd February 2021.

Ecosystem credits				
PCT	**Administrative cost**	**Price per credit**	**Number of credits**	**Finals credit price (ex GST)**
River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)(PCT 11)	$239.69	$7,377.62	1	$7,377.62
Ecosystem credits sub-total (inc GST)				$8,115.38
Species credits				
Swift Parrot	$80.00	$309.97	1	$454.10
Species credits sub-total (inc GST)				$499.51
Total price including GST				$8,614.89

8. REFERENCES

Department of Agriculture, Water and Environment (DAWE) 2021. *Species Profile and Threats Database*. Accessed on the 5th January 2021 from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

Department of the Environment (DoE) 2013. *Matters of National Environmental Significance. Significant Impact Guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999*. Department of the Environment, Canberra.

Harden, G.J. (ed) 1990. *Flora of New South Wales*: Volume 1, NSW University Press, Kensington.

Harden, G.J. (ed) 1991. *Flora of New South Wales*: Volume 2, NSW University Press, Kensington.

Harden, G.J. (ed) 1992. *Flora of New South Wales*: Volume 3, NSW University Press, Kensington.

Harden, G.J. (ed) 1993. *Flora of New South Wales*: Volume 4, NSW University Press, Kensington.

Hero, J., Littlejohn, M. & Marantelli, G. 1991. *Frogwatch Field Guide to Victorian Frogs*. Department of Natural Resources and Environment, Melbourne.

Hnatiuk, R.J. 1990. *Census of Australian Vascular Plants. Australian Flora and Fauna Series Number 11.* Bureau of Flora and Fauna, Canberra.

Menkhorst, P. (ed.) 1995. *Mammals of Victoria. Distribution, Ecology and Conservation*. Oxford University Press, Melbourne.

New South Wales Government 2010. *Balranald Local Environmental Plan 2010*. Accessed on the 31st January 2021 from: https://www.legislation.nsw.gov.au/#/view/EPI/2011/682/full

New South Wales Office of Environment and Heritage (OEH) 2012. *The VIS Plant Community Type Identification Tool Version 1.0.0.0*. New South Wales Office of Environment and Heritage, Sydney.

New South Wales Office of Environment and Heritage (OEH) 2017a. *Biodiversity Assessment Method*. Office of Environment and Heritage for the NSW Government, Sydney.

New South Wales Office of Environment and Heritage (OEH) 2017b. *Guidance to assist a decision-maker to determine a serious and irreversible impact*. Office of Environment and Heritage for the NSW Government, Sydney.

New South Wales Department of Planning, Industry and Environment 2021a. *The website for the Atlas of NSW Wildlife*. Accessed on the 5th June 2019 from: http://www.bionet.nsw.gov.au/

New South Wales Department of Planning, Industry and Environment 2021b. *Threatened Species Profile search*. Accessed on the 5th June 2019 from: http://www.environment.nsw.gov.au/threatenedSpeciesApp/

New South Wales Department of Planning, Industry and Environment 2021c. *Biodiversity Offset and Agreement Management System* (BOAMS). Accessed at: https://customer.lmbc.nsw.gov.au/assessment/

New South Wales Department of Planning, Industry and Environment 2021d. *State Vegetation Type Map (SVTM). Vegetationwesternnswsvtm4492.* Accessed at: https://www.environment.nsw.gov.au/vegetation/state-vegetation-type-map.htm

New South Wales Department of Planning, Industry and Environment 2021e. *Native Vegetation Regulatory Map.* Accessed at: https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=NVRMap

New South Wales Department of Planning, Industry and Environment 2021f. *Biodiversity Values Map and Threshold Viewer.* Accessed at: https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap

New South Wales Department of Planning, Industry and Environment 2021g. *The Bioregions of New South Wales – their biodiversity, conservation and history.* Accessed from: https://www.environment.nsw.gov.au/bioregions/BioregionsPrintable.htm

Royal Botanic Gardens Sydney 2021. *PlantNet. New South Wales Flora On-line*. http://plantnet.rbgsyd.nsw.gov.au/

Simpson, K. and Day, N. 1998. *The Claremont Field Guide to the Birds of Australia*, 5th edition. Penguin Books, Sydney.

Standards Australia 2009. *Australian Standard AS 4970-2009. Protection of trees on development sites*. Standards Australia, Sydney.

Triggs, B. 1996. *Tracks, Scats and Other Traces: a Field Guide to Australian Mammals*. Oxford University Press, Melbourne.

8.1 Personal communications

Grainger, Samantha (2020). Price Merrett Consulting, Kerang, Victoria.

Ryan, Peter (2021). Farm Manager, Lake Lucas Almonds, Euston.

APPENDIX A VEGETATION INTEGRITY PLOT DATA

BAM Plot – Field Survey Form

Site Sheet no: 1 of 2

		Survey Name	Plot Identifier	Recorders
Date	12/1/21	Euston Pump Station	Plot 1	Steve Hamilton BAAS18106

Zone 54	Datum GDA 94	**IBRA region**	Riverina	**Photo #**	P1520117	**Zone ID**	01
Easting 682111	Northing 6162502	**Plot Dimensions**	20 x 20 in 20 x 50	**Orientation of midline from the 0 m point.**	300 degrees Magnetic °		

Likely Vegetation Class	Inland Floodplain Swamps		Confidence: H
Plant Community Type	PCT 11 - River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	**TEC: No**	Confidence: H

BAM Attribute (400 m² plot)		Sum values
Count of **Native Richness**	**Trees**	0
	Shrubs	2
	Grasses etc.	1
	Forbs	12
	Ferns	0
	Other	1
Sum of **Cover** of native vascular plants by growth form group	**Trees**	0
	Shrubs	10
	Grasses etc.	< 1
	Forbs	9
	Ferns	0
	Other	1
High Threat Weed cover %		6

This table may be completed after entering data into available tools. It is not required while in the field.

BAM Attribute (20 x 50 m plot)	Stem Classes and Hollows		
dbh	Euc*	Non Euc	Hollow trees†
80 + cm	1		1
50 – 79 cm	0		
30 – 49 cm	0		
20 – 29 cm	0		
10 – 19 cm	1	tick	No Raptor Nests
5 – 9 cm	0	tick	
< 5 cm	0	tick	
Length of logs (m) (≥10 cm diameter, >50 cm in length)	15		Total 15

Record **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

Data needed is presence only (tick) unless a 'large tree' for that veg class.

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

Each size class is noted as present by the **living tree stems** only. Depending on the Vegetation Class, DBH values and counts may be needed for a size class. For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate if it is required by the large tree category for that vegetation class.

Hollows at least 20cm across are recorded for the purposes of habitat of some threatened species.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	50	60	45	35	60	40	35	45	20	50	0	0	0	0	0	0	0	0	0	0
Average of the 5 subplots	50					38					0					0				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Disturbance	Severity	Age
Clearing (inc. logging)		
Cultivation (inc. pasture)		
Soil erosion		
Firewood / CWD removal		
Grazing (id. native/stock)		
Fire damage		
Storm damage		
Weediness		
Other		

Free Text Section for brief site description

Previously cleared for grazing. Regrowth unmanaged since 1950's. Bush regeneration efforts present. At least a decade since a fire. Feral goats and rabbits.

Emergents heights (m)			Upper Stratum Heights (m)			Middle Stratum Heights (m)			Lower Stratum Heights (m)		
Top	Mode	Bottom	Top	Mode	Bottom	Top	Mode	Bottom	Top	Mode	Bottom

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet 1 of 1		Survey Name	Plot Identifier	Recorders
Date	12 / 1 / 21	Euston Pump Station	Plot 1	Steve Hamilton BAAS18106

GF Code	*Full species name mandatory, or a unique means of identifying separate taxa within a survey. Data from here will be used to assign growth form counts and covers.*	N, E or HTE	Cover	Abund	stratum	voucher
s	*Duma florulenta*	N	< 1	5		
s	*Chenopodium nitrariaceum*	N	10	20		
f	*Salsola kali* var. *kali*	N	< 1	50		
f	*Chamaesyce drummondii*	N	< 1	10		
f	*Sida corrugata*	N	1	50		
f	*Sida trichopoda*	N	1	20		
c	*Sclerolaena muricata*	N	2	20		
f	*Solanum esuriale*	N	1	100		
f	*Maireana brevifolia*	N	< 1	5		
f	*Maireana pentagona*	N	< 1	5		
c	*Enchylaena tomentosa*	N	5	20		
f	*Rhodanthe corymbifolia*	N	< 1	20		
f	*Atriplex lindleyi*	N	1	10		
g	*Austrostipa scabra*	N	< 1	5		
v	*Cyperus exaltatus*	N	1	15		
f	*Ludwigia peploides* ssp. *montevidensis*	N	2	5		
f	*Eclipta platyglossa*	N	1	100		
f	*Dysphania pumilio*	N	1	100		
	Sisymbrium erysimoides	E	1	30		
	Spergularia rubra	E	5	200		

GF Code: see Growth Form definitions in BAM Appendix 1. Identify top 3 dominants in the veg zone. **N:** native, **E:** exotic, **HTE:** high threat exotic.

Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

Print more copies of this sheet to allow for higher species counts at a plot. All species at a plot need to be recorded.

APPENDIX B BAM CALCULATOR REPORTS

BAM Vegetation Zones Report

Proposal Details

Assessment Id	Assessment name	BAM data last updated *
00023885/BAAS18106/21/00023886	Euston pump station on Murray River	21/12/2020
Assessor Name	Report Created	BAM Data version *
Steve Hamilton	02/02/2021	36
Assessor Number	Assessment Type	BAM Case Status
BAAS18106	Part 4 Developments (Small Area)	Open
Assessment Revision	Date Finalised	BOS entry trigger
0	To be finalised	BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones

1	11_11_Modified_1	11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	11_Modified_1	0.04	1	

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00023885/BAAS18106/21/00023886	Euston pump station on Murray River	21/12/2020
Assessor Name	**Report Created**	**BAM Data version ***
Steve Hamilton	02/02/2021	36
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS18106	Part 4 Developments (Small Area)	Open
Assessment Revision	**BOS entry trigger**	**Date Finalised**
0	BOS Threshold: Biodiversity Values Map	To be finalised

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Barking Owl	Ninox connivens	11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Brolga	Grus rubicunda	11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Dusky Woodswallow	Artamus cyanopterus cyanopterus	11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Gilbert's Whistler	Pachycephala inornata	11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Grey Falcon	Falco hypoleucos	11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)

Little Eagle	Hieraaetus morphnoides	11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Little Pied Bat	Chalinolobus picatus	11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Major Mitchell's Cockatoo	Lophochroa leadbeateri	11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Pied Honeyeater	Certhionyx variegatus	11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Purple-crowned Lorikeet	Glossopsitta porphyrocephala	11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Purple-gaped Honeyeater	Lichenostomus cratitius	11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Regent Parrot (eastern subspecies)	Polytelis anthopeplus monarchoides	11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Spotted Harrier	Circus assimilis	11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Square-tailed Kite	Lophoictinia isura	11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Swift Parrot	Lathamus discolor	11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)

Varied Sittella	Daphoenositta chrysoptera	11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
White-bellied Sea-Eagle	Haliaeetus leucogaster	11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Common Name	Scientific Name	Plant Community Type(s)
Australasian Bittern	Botaurus poiciloptilus	11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Australian Painted Snipe	Rostratula australis	11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Black-breasted Buzzard	Hamirostra melanosternon	11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Diamond Firetail	Stagonopleura guttata	11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Freckled Duck	Stictonetta naevosa	11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)

Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C
Australasian Bittern	Botaurus poiciloptilus	Refer to BAR
Australian Painted Snipe	Rostratula australis	Refer to BAR
Black-breasted Buzzard	Hamirostra melanosternon	Refer to BAR
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	Refer to BAR
Diamond Firetail	Stagonopleura guttata	Refer to BAR
Freckled Duck	Stictonetta naevosa	Refer to BAR
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	Refer to BAR

BAM Candidate Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00023885/BAAS18106/21/00023886	Euston pump station on Murray River	21/12/2020
Assessor Name	**Report Created**	**BAM Data version ***
Steve Hamilton	02/02/2021	36
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS18106	Part 4 Developments (Small Area)	Open
Assessment Revision	**Date Finalised**	**BOS entry trigger**
0	To be finalised	BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

List of Species Requiring Survey

Name	Presence	Survey Months
Lathamus discolor Swift Parrot	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Swamp She-oak	Casuarina obesa	Refer to BAR

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00023885/BAAS18106/21/00023886

Proposal Name
Euston pump station on Murray River

BAM data last updated *
21/12/2020

Assessor Name
Steve Hamilton

Assessor Number
BAAS18106

BAM Data version *
36

Proponent Names

Report Created
02/02/2021

BAM Case Status
Open

Assessment Revision
0

Assessment Type
Part 4 Developments (Small Area)

Date Finalised
To be finalised

BOS entry trigger
BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Lathamus discolor / Swift Parrot

Additional Information for Approval

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Botaurus poiciloptilus / Australasian Bittern
Hamirostra melanosternon / Black-breasted Buzzard
Rostratula australis / Australian Painted Snipe
Melanodryas cucullata cucullata / Hooded Robin (south-eastern form)
Melithreptus gularis gularis / Black-chinned Honeyeater (eastern subspecies)
Stagonopleura guttata / Diamond Firetail
Stictonetta naevosa / Freckled Duck

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Not a TEC	0.0	1	0	1

BAM Biodiversity Credit Report (Like for like)

11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Inland Riverine Forests This includes PCT's: 2, 5, 7, 8, 9, 10, 11, 36, 78, 112, 233, 234, 249, 356, 362	Inland Riverine Forests <50%	11_11_Modified_1	Yes	1	Robinvale Plains, Murray Fans, Murray Scroll Belt, Murrumbidgee and South Olary Plain. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Lathamus discolor / Swift Parrot	**11_11_Modified_1**	0.0	1.00

Credit Retirement Options

Like-for-like credit retirement options

	Spp	IBRA subregion
Lathamus discolor / Swift Parrot	**Lathamus discolor /** Swift Parrot	Any in NSW

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id
00023885/BAAS18106/21/00023886

Proposal Name
Euston pump station on Murray River

BAM data last updated *
21/12/2020

Assessor Name
Steve Hamilton

Assessor Number
BAAS18106

BAM Data version *
36

Proponent Name(s)

Report Created
02/02/2021

BAM Case Status
Open

Assessment Revision
0

Assessment Type
Part 4 Developments (Small Area)

Date Finalised
To be finalised

BOS entry trigger
BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Lathamus discolor / Swift Parrot

Additional Information for Approval

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Botaurus poiciloptilus / Australasian Bittern
Hamirostra melanosternon / Black-breasted Buzzard
Rostratula australis / Australian Painted Snipe
Melanodryas cucullata cucullata / Hooded Robin (south-eastern form)
Melithreptus gularis gularis / Black-chinned Honeyeater (eastern subspecies)
Stagonopleura guttata / Diamond Firetail
Stictonetta naevosa / Freckled Duck

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Not a TEC	0.0	1	0	1.00

11-River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Inland Riverine Forests This includes PCT's: 2, 5, 7, 8, 9, 10, 11, 36, 78, 112, 233, 234, 249, 356, 362	Inland Riverine Forests <50%	11_11_Modified_1	Yes	1	Robinvale Plains,Murray Fans, Murray Scroll Belt, Murrumbidgee and South Olary Plain. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Forested Wetlands	Tier 4 or higher threat status	11_11_Modified_1	Yes (including artificial)	1	IBRA Region: Riverina, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Lathamus discolor / Swift Parrot	**11_11_Modified_1**	0.0	1.00

Credit Retirement Options

Like-for-like options

Lathamus discolor/ Swift Parrot	Spp		IBRA region
	Lathamus discolor/Swift Parrot		Any in NSW
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Endangered	Robinvale Plains, Murray Fans, Murray Scroll Belt, Murrumbidgee and South Olary Plain. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Credit Summary Report

Proposal Details

Assessment Id 00023885/BAAS18106/21/00023886	Proposal Name Euston pump station on Murray River	BAM data last updated * 21/12/2020
Assessor Name Steve Hamilton	Report Created 02/02/2021	BAM Data version * 36
Assessor Number BAAS18106	BAM Case Status Open	Date Finalised To be finalised
Assessment Revision 0	Assessment Type Part 4 Developments (Small Area)	BOS entry trigger BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	BC Act Listing status	EPBC Act listing status	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits
River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)											
1	11_11_Modified_1	Not a TEC	27.8	27.8	0.04			High Sensitivity to Potential Gain	1.50		1
										Subtotal	**1**
										Total	**1**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Species credits
Lathamus discolor / Swift Parrot (Fauna)								
11_11_Modified_1	27.8	27.8	0.04	Endangered	Critically Endangered	3	True	1
							Subtotal	**1**

Biodiversity payment summary report

Assessment Id	Payment data version	Assessment Revision	Report created
00023885/BAAS18106/21/00023886		0	02/02/2021

Assessor Name	Assessor Number	Proposal Name	BAM Case Status
Steve Hamilton	BAAS18106	Euston pump station on Murray River	Open

Assessment Type	Date Finalised	BOS entry trigger
Part 4 Developments (Small Area)	To be finalised	BOS Threshold: Biodiversity Values Map

PCT list

Price calculated	PCT common name	Credits
Yes	**11 -** River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	1

Species list

Price calculated	Species	Credits
Yes	***Lathamus discolor*** (Swift Parrot)	1

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Biodiversity payment summary report

IBRA sub region	PCT common name	Threat status	Offset trading group	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Robinvale Plains	**11 -** River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	No	Inland Riverine Forests <50%	19.12%	$239.69	2.2502	$7,377.62	1	$7,377.62
								Subtotal (excl. GST)	**$7,377.62**
								GST	**$737.76**
								Total ecosystem credits (incl. GST)	**$8,115.38**

Species credits for threatened species

Species profile ID	Species	Threat status	Price per credit	Risk premium	Administrative cost	No. of species credits	Final credits price
10455	***Lathamus discolor*** (Swift Parrot)	Endangered	$309.97	20.6900%	$80.00	1	$454.10
						Subtotal (excl. GST)	**$454.10**
						GST	**$45.41**

Total species credits (incl. GST)	**$499.51**

Grand total	**$8,614.89**