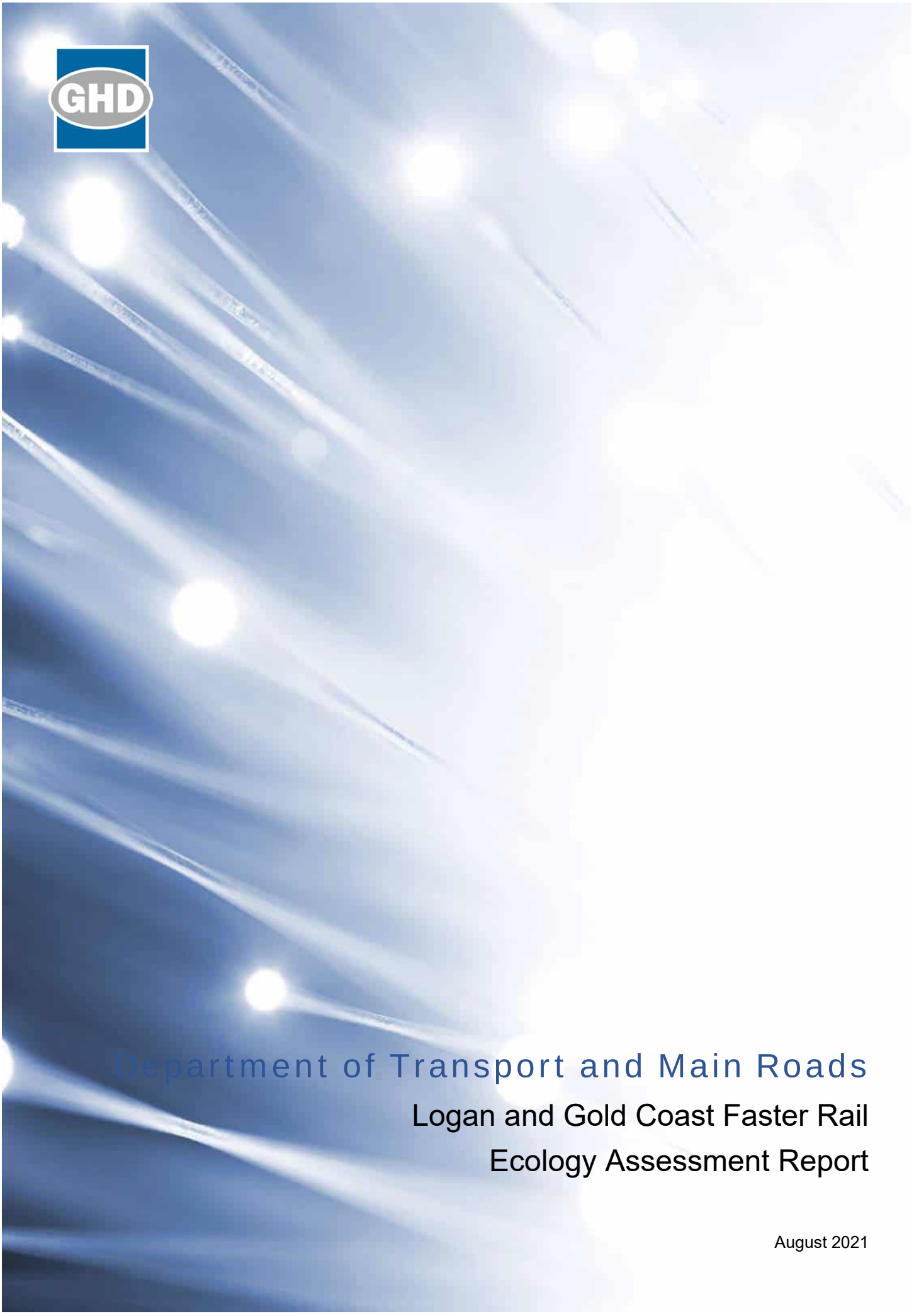

Department of Transport and Main Roads

Logan and Gold Coast Faster Rail

Ecology Assessment Report

August 2021

Executive summary

This report builds on the baseline results of the desktop assessment and field survey previously undertaken by WSP (2019) to assess the ecological values of the proposed Study corridor for the Logan and Gold Coast Faster Rail improvements. Environmental investigations completed by WSP in 2019 as part of the Review of Environmental Factors (REF) (WSP, 2019a) and Ecological Values Report (WSP, 2019b) were limited by land access restrictions. In order to further understand the ecological values of the Study corridor, subsequent ecological investigations have been undertaken in 2021 by GHD. These ecological investigations have been undertaken across areas not previously assessed, termed the 'Subsequent study areas'. The Project is proposed over 300 properties from Kuraby to Beenleigh in the Brisbane City Council and Logan City Council local government areas (LGAs), approximately 16 to 33 km south-east of the Brisbane central business district (CBD). The 200 m wide corridor extends approximately 20 km in length between these localities, along the existing Beenleigh and Gold Coast rail lines (Chainage (Ch) 21,350 m to Ch 41,300 m).

In presenting the ecological assessment, data from previous studies have been reviewed and collated, primarily to assist with the assessment of the likelihood of occurrence of conservation significant species. Information on the distribution of habitat and vegetation communities has been based on current works, as this reflects current vegetation legislation and conditions on the ground.

The surveys primarily focussed on undertaking flora and fauna assessments in publicly owned land and within areas identified as having higher ecological value. Targeted surveys for flora and fauna including identification of habitat were undertaken and focused on conservation significant species listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and/or Queensland *Nature Conservation Act 1992* (NC Act). Verification of Regional Ecosystem (RE) mapping was also undertaken and potential Threatened Ecological Communities (TEC) were assessed.

The surveys have shown that the Study corridor is located within a fragmented urban environment. The Study corridor intersects four major waterways, being the Logan River, ,Slacks Creek, Spring Creek, Scrubby Creek. Various minor tributaries of the major waterways are also located within the Study corridor and hold high ecological value. Section 5 discusses the impact of the project to water values in more detail.

Aside from the waterways and associated riparian vegetation intersected by the Study corridor, the most significant environmental feature is Acacia Forest Park associated with Karawatha Forest Park which adjoins Compton Road at Karawatha. Karawatha Forest Park is a Brisbane City Council managed reserve which includes 900 ha of remnant bushland. The Karawatha Forest Park contributes to the Flinders Karawatha Corridor which is a State Biodiversity Corridor extending from Karawatha Forest to Flinders Peak in Ipswich to Wyaralong Dam near Boonah.

During the field studies, verification of REs confirmed that tracts of remnant vegetation are present although a number of vegetation communities did not align with the mapped description. This did not impact the identification of habitat for conservation significant species as the vegetation communities held similar values. One TEC was considered to have high potential of occurring within the Study corridor, namely Coastal Swamp Oak (*Casuarina glauca*) Forest of South-east Queensland and New South Wales. However, an assessment of locations likely to contain TEC found that vegetation communities within the Subsequent study areas did not meet the key characteristics or condition threshold for this TEC.

Two conservation significant species considered to be 'in the wild' in accordance with the NC Act were confirmed present within the Subsequent study areas:

- *Macadamia integrifolia* (Macadamia), vulnerable under the EPBC Act and NC Act
- Glossy black-cockatoo (*Calyptorhynchus lathami*), vulnerable under the NC Act

One species listed as migratory under the EPBC Act, glossy ibis (*Plegadis falcinellus*) and special least concern under the NC Act was also confirmed present within the Study corridor during WSP (2019b) field survey.

Additionally, seven conservation significant species were considered likely to occur within the Subsequent study areas based on the vegetation communities, condition of habitats observed and the proximity of historical records:

- *Marsdenia coronata* (slender milk vine), vulnerable under the NC Act
- *Melaleuca irbyana* (swamp tea-tree), endangered under the NC Act
- *Gossia gonoclada* (angle stemmed myrtle), vulnerable under the NC Act
- *Coleus habrophyllus,* endangered under the EPBC Act and NC Act
- Koala (*Phascolarctos cinereus*), vulnerable under the EPBC Act and NC Act
- Grey-headed flying-fox (*Pteropus poliocephalus*), vulnerable under the EPBC Act
- Wallum froglet (*Crinia tinnula*), vulnerable under the NC Act

Numerous restricted invasive species listed under *Biosecurity Act 2014* were recorded across the Subsequent study areas.

An assessment of impacts found that works are likely to result in a significant impact to the koala due to the vegetation proposed to be cleared scoring a habitat value greater than eight (habitat critical to survival) and the extent of clearing for high value habitat will be greater than 10 ha. Additionally, there is potential for a significant impact on the grey headed flying fox and the glossy black-cockatoo. The grey headed flying fox may be impacted due to the clearing of potential winter flowering foraging resources, while the glossy black-cockatoo may be impacted through the clearing of tree species constituting the highly specialised diet for the species as well as ecological significant habitat. The significance of impacts should be confirmed at the detailed design stage when finer Project details have been confirmed.

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1. Introduction

1.1 Project background

The Logan and Gold Coast Faster Rail Project is vital to enhance the existing heavy rail connection between the Gold Coast, Logan and Brisbane central business district (CBD) through increased corridor capacity, improved travel times and reliability, enhanced passenger accessibility, and expanded connections to public and active transport modes.

With population growth in both Brisbane and the Gold Coast the network is currently experiencing the following capacity constraints:

- The existing rail line includes two tracks south of Kuraby station and three tracks to the north. This line is subject to a range of constraints, including tight curves that limit line speeds, and level crossings and lack of station infrastructure that limit additional tracks.
- Express services between the Gold Coast and Brisbane are currently required to share a single track with 'all stops trains' between Kuraby and Beenleigh. This limits the number of services that can be provided to support growth in travel demand between the cities of Brisbane, Logan and the Gold Coast. These infrastructure and operational constraints are resulting in overcrowding during peak periods.

Failure to address these capacity constraints could lead to potential rail users choosing to use the already congested M1 Motorway. This would result in additional travel times, with nationally significant impacts on productivity. Enhancing the corridor capacity between Kuraby and Beenleigh is therefore essential to achieving enhanced connectivity and accessibility across the region through the delivery of improved rail travel speeds, and service frequency. Moreover, K2B is key to fully realising the wider Cross River Rail (CRR) network benefits along the Beenleigh and Gold Coast rail corridor. It is therefore a critical Project for both the Department of Transport and Main Roads (TMR) and Cross River Rail Delivery Authority (CRRDA). The K2B capacity upgrade is also key to implementing future faster rail between the Brisbane CBD and the Gold Coast, helping to attract federal funding to the Project.

1.2 Project area

The Project area is proposed over 300 properties from Kuraby to Beenleigh in the Brisbane City Council and Logan City Council local government areas (LGAs), approximately 16 to 33 km south-east of the Brisbane CBD. The 200 m wide corridor extends approximately 20 km in length between these localities, along the existing Beenleigh and Gold Coast rail lines (Chainage (Ch) 21,350 m to Ch 41,300 m). A locality plan which shows the Project area and the Study corridor is presented as Figure 1-1.

Key planning, environmental and cultural heritage features of the Study corridor include:

- The suburbs affected by the Study corridor are (from north to south): Kuraby, Rochedale South, Woodridge, Logan Central, Kingston, Loganlea, Meadowbrook, Bethania, Edens Landing and Beenleigh. The most densely populated residential communities are located at Logan Central, Kingston, Loganlea and Beenleigh in the Logan City Council LGA.
- The existing railway corridor is zoned Special purpose (transport infrastructure) (SP3) under the Brisbane City Council planning scheme and is zoned for Community facilities under the Logan City Council planning scheme. Within the LGAs, the wider Study corridor (i.e. outside the current rail corridor) is predominantly zoned residential or open space, with a number of higher intensity zones (e.g. community facilities, industry, centre) prominent in key localities such as Logan Central, Loganlea and Beenleigh.

- The Study corridor intersects four major waterways, being the Logan River, Slacks Creek, Spring Creek and Scrubby Creek. River, Slacks Creek, Spring Creek, Scrubby Creek
- Aside from the waterways and associated riparian areas intersected by the Study corridor, the most significant environmental feature is Acacia Forest Park associated with Karawatha Forest Park which adjoins Compton Road at Karawatha. Karawatha Forest Park is a Brisbane City Council managed reserve which includes 900 ha of remnant bushland. The Karawatha Forest Park contributes to the Flinders Karawatha Corridor which is a State Biodiversity Corridor extending from Karawatha Forest to Flinders Peak in Ipswich to Wyaralong Dam near Boonah.

1.3 Definitions

The following terminology is used throughout this document to describe the Project:

- **Project area** – The Project area includes the future railway corridor required to accommodate assets comprising PE 1 (Preliminary evaluation: Option 1 as referred to in WSP 2019a), not including additional land needed to facilitate construction. This comprises a width of 20 m either side of the existing rail corridor centre line.
- **Study corridor** – The Study corridor is defined by the centre line of the existing rail corridor together with a 100 m buffer either side (200 m wide in total) between Ch 21,350 m and Ch 41,300 m together with an isolated 1,150 m^2 of land at Coopers Plains (Figure 2-1). The Study corridor referenced throughout this document aligns with the Study corridor defined during the PE phase within the Environmental Scoping Report (ESR) (WSP, 2019a). The environmental and cultural heritage values within the Study corridor have been identified and assessed to allow for the capture of both contributing and receiving environments which may be indirectly impacted by the Project. It is worth noting that the Study corridor is for environmental and cultural heritage assessment purposes only, and not all land parcels within the Study corridor will be directly impacted by the Project.
- **Subsequent study areas** – Environmental investigations completed by WSP in 2019 as part of the REF were limited by land access restrictions. In order to further understand the ecological values of the Study corridor, subsequent ecological investigations have been undertaken in 2021 by GHD. These ecological investigations have been undertaken across areas not previously assessed, termed the 'Subsequent study areas' for the purpose of this report and are shown in (Figure 2-1). The Subsequent study areas are located within the Study corridor.

1.4 Purpose of this report

This Ecological Assessment Report details the findings of the desktop assessment and field surveys undertaken within the Subsequent study areas. The purpose of the report is to detail the ecological values of the Study corridor. The report includes:

- An overview of the Project (Section 1).
- Description of assessment methodology (Section 2).
- Summary of existing ecological values including results of desktop assessment and field surveys and likelihood of occurrence for conservation significant species (Section 3).
- A Significant Impact Assessment for conservation significant fauna confirmed present or likely to occur within the Project area (Section 4)
- Conclusions and recommendations (Section 5)

1.5 Limitations

This report has been prepared by GHD for TMR and may only be used and relied on by TMR for the purpose agreed between GHD and TMR as set out in Section 1.4 of this report.

GHD otherwise disclaims responsibility to any person other than TMR arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

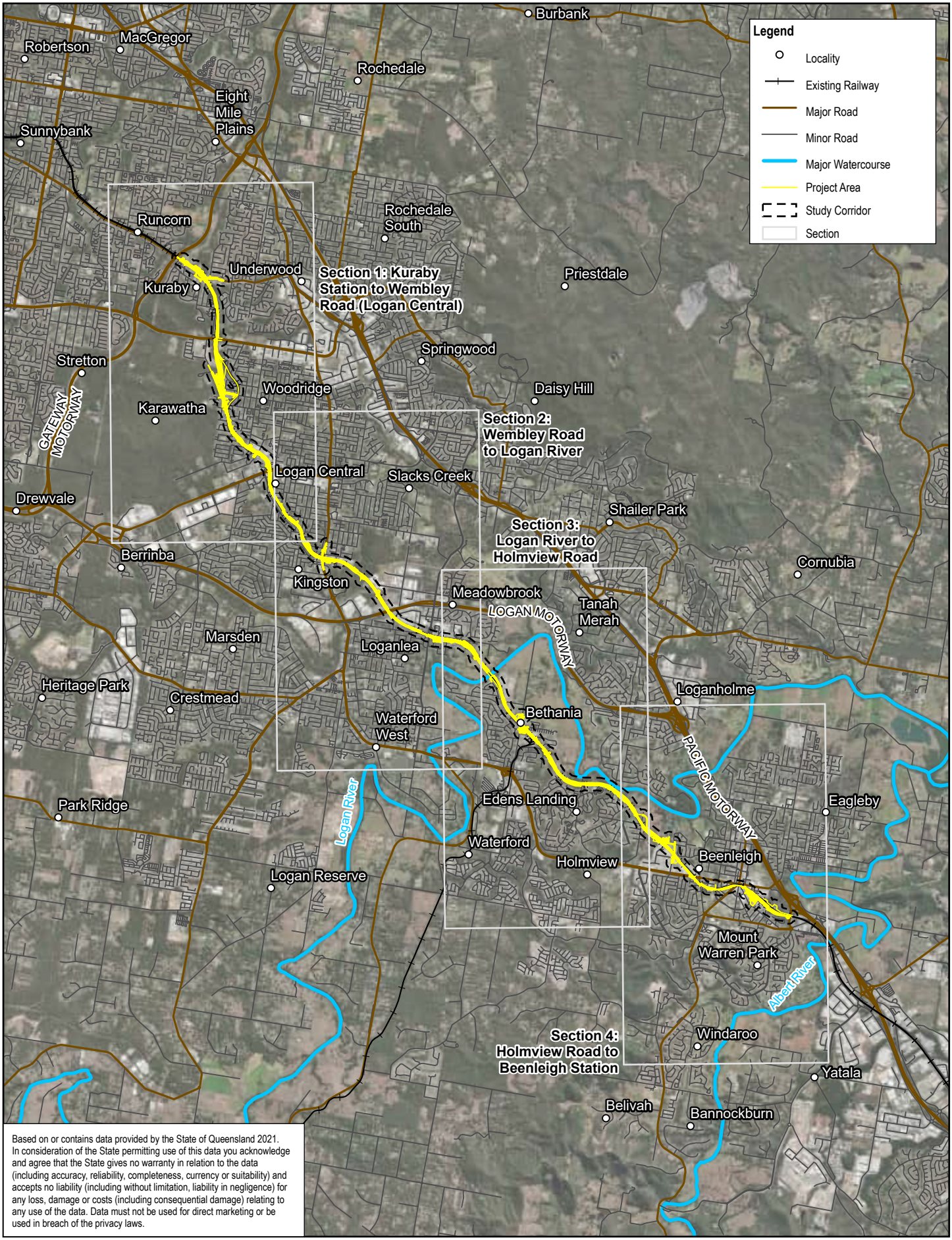
The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by TMR and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of threatened species) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.



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Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 56

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Logan and Gold Coast Faster Rail (Kuraby to Beenleigh) Project

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Project locality plan

FIGURE 1-1

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Print date: 09 Aug 2021 - 16:21

Data source: DoR: Watercourse, Road, Railway, Locality (2020); GHD: Proposed Alignment, Study Area, Section (2021); ESRI World Imagery: Earthstar Geographics.
Created by: xlee

2. Approach and methods

2.1 Approach

The ecological assessment for the Project included a desktop review of environmental databases, mapping layers and previous field survey reports, and a field assessment of the terrestrial flora and fauna ecological values within the Subsequent study areas. The desktop and field methods are detailed separately in Section 2.2.1 and 2.2.3 respectively.

2.2 Methods

2.2.1 Desktop review

A desktop review was undertaken to identify and collate existing information on the ecological values within the Study corridor. State and Commonwealth desktop information sources were reviewed so as to obtain all available information for the desktop search extent, including:

- ***Protected Matters Search Tool*** – The Department of Agriculture, Water and the Environment (DAWE) Protected Matters Search Tool (PMST) was used to identify threatened ecological communities (TECs) and conservation significant flora and fauna species listed under the *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act) that have the potential to occur within the vicinity of the Project area. The search was undertaken with a 2 km radius of the Study corridor .
- ***State Planning Policy Mapping*** – State Planning Policy (SPP) mapping was reviewed to identify Matters of State Environmental Significance (MSES) that are mapped within or adjacent to the Study corridor.
- ***Wildlife Online database*** – The Department of Environment and Science (DES) Wildlife Online database was searched to retrieve historical records of flora and fauna species previously recorded within the Study corridor (DES, 2021a).
- ***Flora Survey Trigger Mapping*** – The DES Protected Plants Flora Survey Trigger Map was viewed to determine if the Study corridor is in proximity to a high-risk trigger area buffered around a previous record of a conservation significant flora species (DES, 2021b).
- ***Species Profile Search*** – The DES Species Profile Search was used to obtain spatial records and accompanying data for conservation significant species previously recorded in proximity to the Study corridor.
- ***Regulated Vegetation Mapping*** – The Department of Resources (DoR) Vegetation Management Regional Ecosystem and Remnant Map was viewed to determine the extent and type of Regional Ecosystems (REs) mapped within the Study corridor (DoR, 2021).
- ***Essential Habitat Mapping*** – The DoR Essential Habitat Map was viewed to determine if vegetation within the Study corridor has been identified as essential habitat for a conservation significant species of wildlife listed under provisions of the *Nature Conservation Act 1992* (NC Act).
- ***Queensland waterways for waterway barrier works*** – Queensland Waterways for Waterway Barrier Works GIS data layer to identify waterways with a risk of impact which intersect the Study corridor, which may require approvals under the *Fisheries Act 1994* where structures within the waterway are considered to restrict fish passage.

2.2.2 Previous documentation

The following documentation and previous works were reviewed and incorporated within this report, including:

- WSP (2019a) Kuraby to Beenleigh Capacity Improvement Project: Environmental Scoping Report. Report prepared for TMR.
- WSP (2019b) Kuraby to Beenleigh Capacity Improvement Project: Ecological Values Report. Report prepared for TMR.

2.2.3 Field assessment

Two rounds of field studies have been completed for the Project, namely, targeted surveys across the K2B Project area by WSP (2019) and targeted ecological survey by GHD (2021) of the Subsequent study areas.

WSP 2019 field surveys

WSP conducted ecological field surveys of the Project area over three days between 3 and 5 June 2019. Field surveys were conducted by a Principal Ecologist/Zoologist and Senior Ecologist/Botanist. The survey methods for fauna were based on visual observations and scat identification with no trapping used.

GHD 2021 field surveys

Field surveys were completed over 3 days (10 to 11 and 24 February 2021) to identify and describe the existing terrestrial ecology values of the Subsequent study areas. Field work was conducted by two ecologists, being one flora ecologist and one fauna ecologist.

Subsequent study area due to access restriction, targeted ecological surveys were limited to publicly-accessible locations only. Therefore, additional surveys for sections of the alignment that intersect private property will be required at a later stage of the Project.

Survey effort was targeted towards areas deemed to be of 'ecological significance', with little time dedicated to heavily urbanised and highly disturbed areas. Ecologically significant areas were determined during the desktop assessment using historical records and environmental mapping layers. The location of field survey sites is presented in Figure 2-1.

2.2.3.1 Flora survey methods

Terrestrial flora surveys involved a combination of timed random meanders, quaternary level assessments and/or rapid vegetation assessments, as described in Table 2-1 and shown on Figure 2-1.

Table 2-1 Flora field survey techniques

Survey type	Detailed survey methodology
Threatened Ecological Community assessments	In vegetation communities that were identified as potentially constituting a TEC, assessments were undertaken to determine if the condition thresholds of the relevant TEC were met. Potential TEC extents were mapped on ground and through aerial imagery. The TEC assessment sites are displayed in Figure 2-1.
Regional Ecosystem verification	Verification of mapped RE communities was undertaken using quaternary level assessments in accordance with the methods detailed in Neldner *et al.* (2020). Data collected included species, structural estimation of height and cover of the ecological dominant

Survey type	Detailed survey methodology
	layer. Information on geology and landscape attributes was also collected. Quaternary assessments were undertaken at 58 sites across the Subsequent study areas as shown in Figure 2-1.
Recording of invasive species	Prohibited or restricted invasive species as defined under the *Biosecurity Act 2014* were opportunistically recorded and notes taken on density and extent of each species.
Targeted and opportunistic flora surveys	Targeted flora surveys were undertaken for threatened and near threatened species within protected plant high risk trigger areas and where suitable habitats for target species identified in the desktop assessment were present. Surveys were undertaken using the timed meander search method (outlined in Section 6.2.2 of the Flora Survey Guidelines) (DES, 2021b). The majority of flora species encountered were identified in the field. Where this was not possible, specimen material was collected and later identified with the assistance of diagnostic keys and references. The timing of the survey was considered appropriate for the threatened flora identified as likely to occur within the Project area.

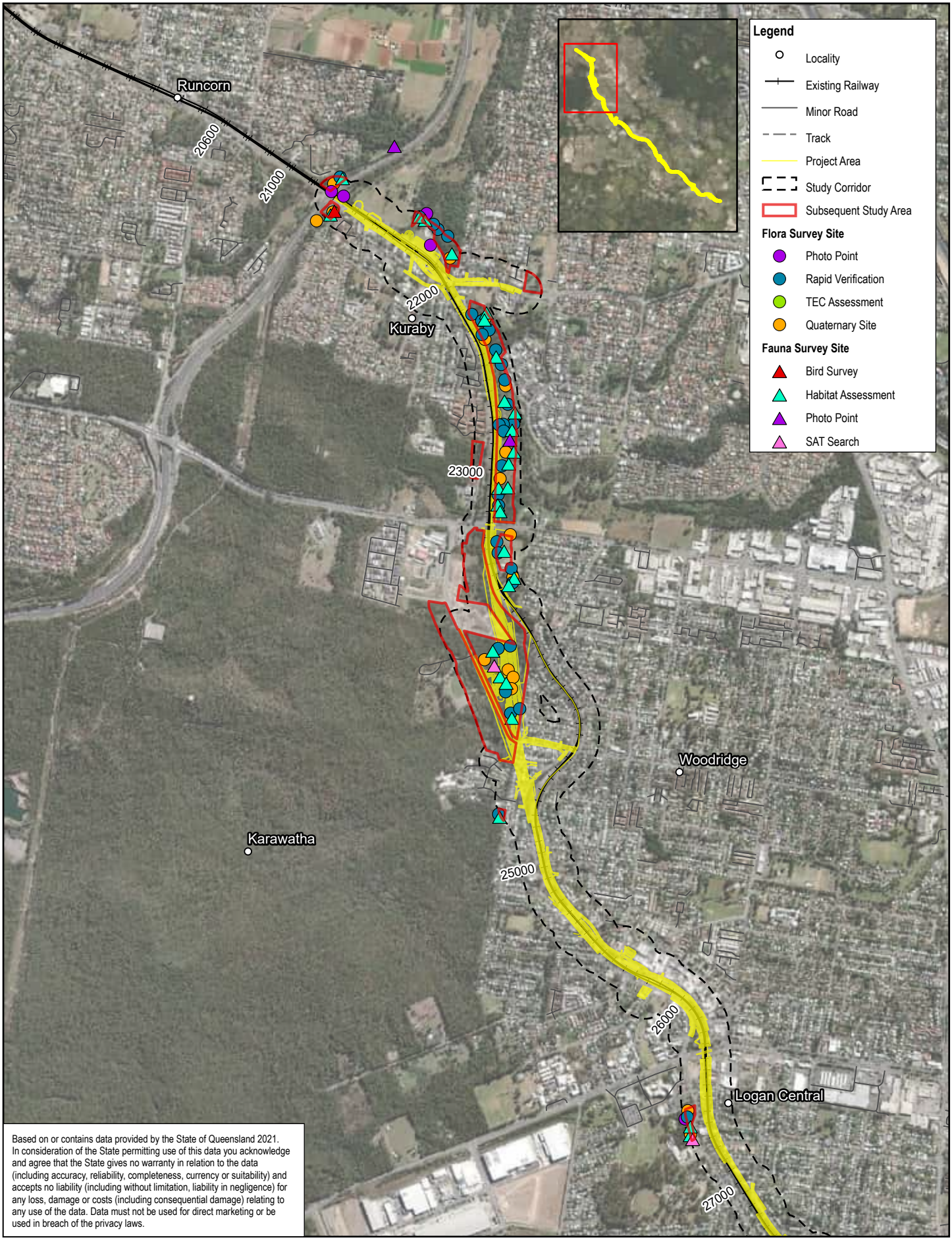
2.2.3.2 Fauna survey methods

The field surveys included predominantly rapid habitat assessments and active searches throughout areas within the Subsequent study areas. Field survey methods are detailed in Table 2-2, whilst the distribution of field survey sites is presented in Figure 2-1.

Table 2-2 Fauna field survey methods

Survey type	Detailed survey methodology
Habitat assessment surveys	Habitat assessments were undertaken at 53 survey sites. At each of the rapid survey sites, the value of habitats for terrestrial fauna was assessed based on the presence of key resources and microhabitats – as determined by the structural complexity of vegetation and the presence of features such as tree hollows, burrows, rocky outcrops, caves, leaf litter and woody debris. Key habitat features important for conservation
Targeted searches for traces of conservation significant species	Within suitable habitat, targeted searches were undertaken to detect characteristic traces of conservation significant wildlife. This included searching eucalypt woodland for evidence of koala (*Phascolarctos cinereus*) and greater glider (*Petauroides volans*) (i.e. faecal pellets and scratches) and searching beneath *Allocasuarina* trees for evidence of feeding by glossy black-cockatoos (*Calyptorhynchus lathami*).
Spot Assessment Technique	Searches for koala faecal pellets were undertaken at 6 sites using the Spot Assessment technique (SAT) (Phillips and Callaghan, 2011). Based on the results, assessments of habitat quality were undertaken using the koala habitat assessment toolkit detailed in the EPBC Act Referral guidelines for the vulnerable koala (DotE, 2014).

Survey type	Detailed survey methodology
Bird census surveys	To survey the existing passerine bird assemblage, fixed-point bird surveys were undertaken using the Birds Australia census technique (Loyn, 1986). This involved undertaking a 20 min survey of a 2 ha area recording all birds seen or heard calling. Bird census surveys were conducted at six sites, along with opportunistic aural surveys conducted during habitat assessments (n = 53).
Active searches for reptiles and frogs	Within suitable areas, a 20-minute active search was undertaken to detect reptile and amphibian species by actively searching beneath rocks, logs, bark, leaf litter and other microhabitats. Species targeted included the tusked frog (*Adelotus brevis*) and wallum froglet (*Crinia tinnula*).
Opportunist searches for wildlife and traces	All incidental records of fauna observed during surveys were recorded. Bones, feathers, skulls, sloughed skins, faecal pellets, tracks, burrows, scratches and other indirect wildlife traces were also recorded.



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Grid: GDA 1994 MGA Zone 56

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Subsequent study area and distribution of field survey sites

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FIGURE 2-1a

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Data source: DoR: Watercourse, Road, Railway, Locality (2020); GHD: Proposed Alignment, Study Area, Field Survey Site (2021); ESRI World Imagery: Earthstar Geographics
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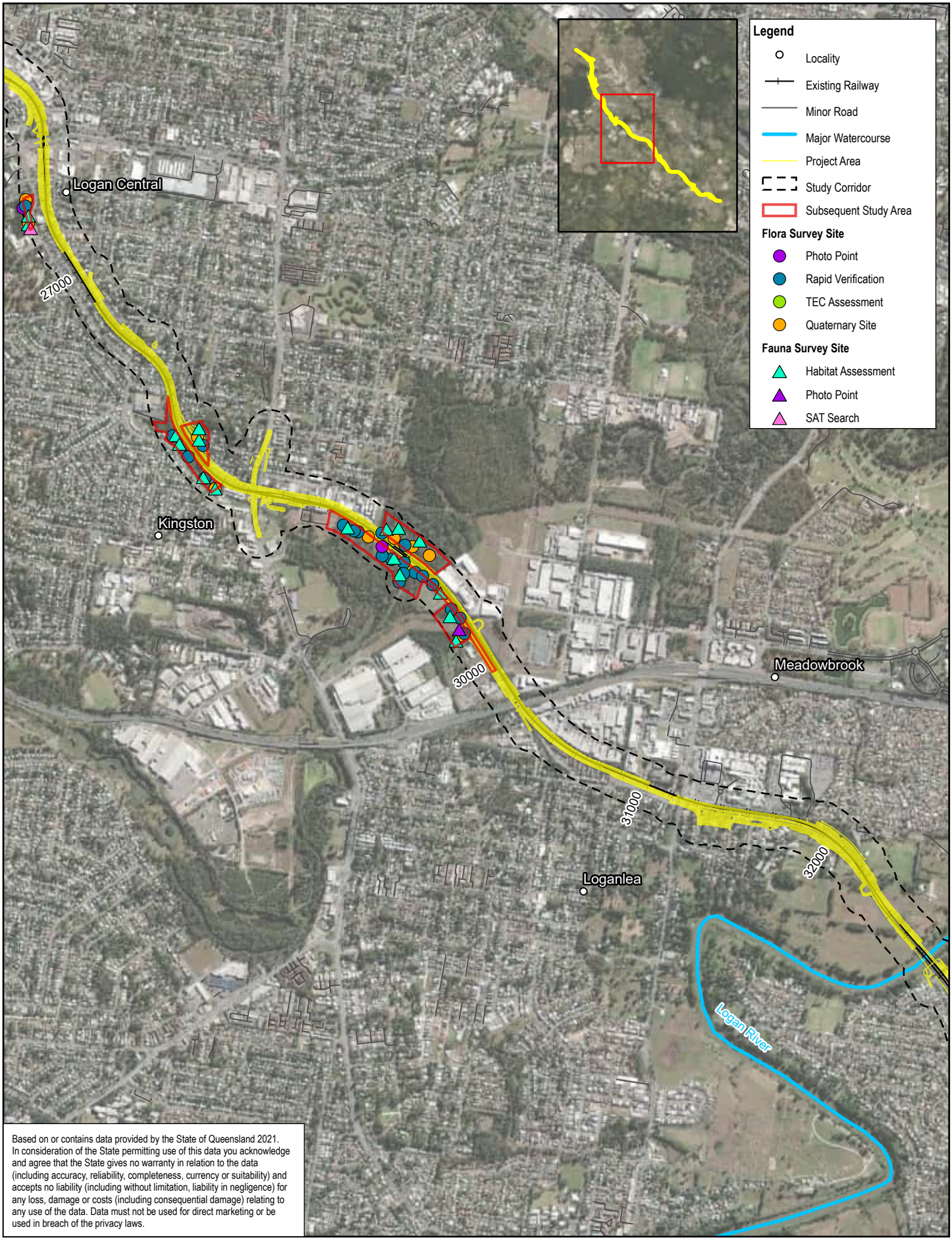

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FIGURE 2-1b

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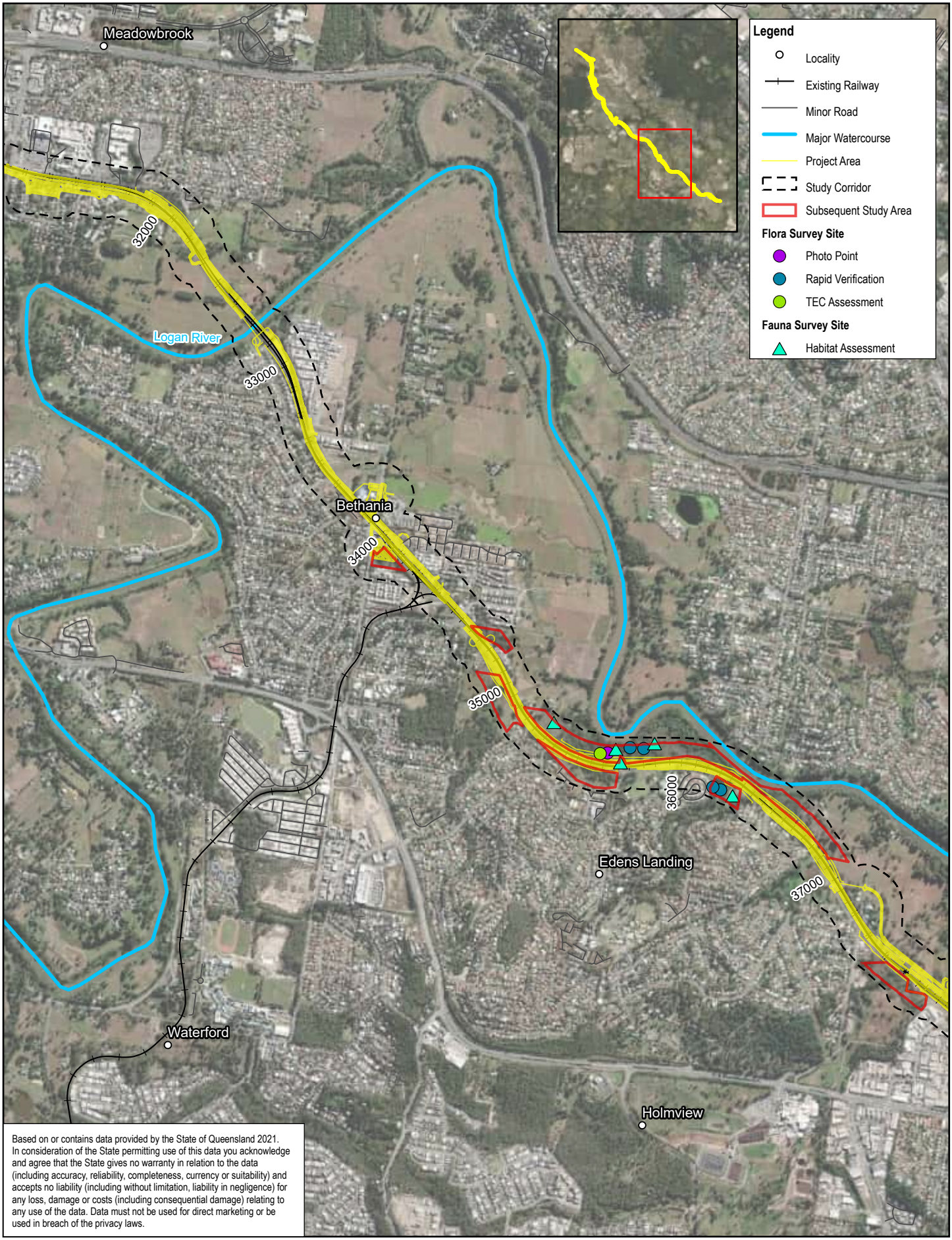

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Subsequent study area and distribution of field survey sites

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FIGURE 2-1c

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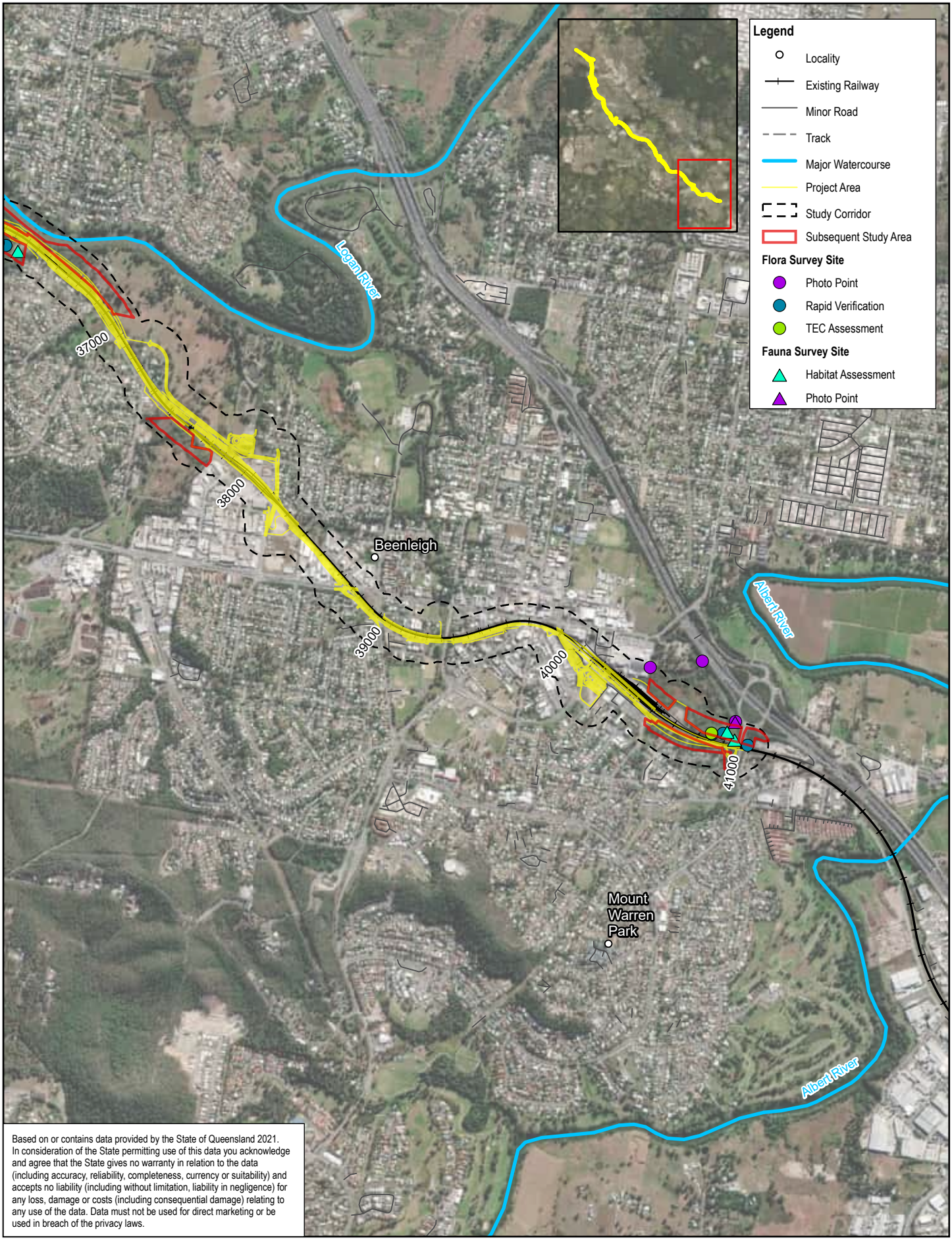

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FIGURE 2-1d

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World Imagery: Maxar. Created by: xlee

2.2.4 Animal ethics and legislative permits

The ecological field surveys were conducted in accordance with the following permits and approvals:

- Department of Employment, Economic Development and Innovation Scientific Users Registration Certificate (Registration Number 132)
- Department of Environment and Heritage Protection Scientific Purposes Permit (permit number WISP15723315)
- Animal Reacher Authority issued by the accredited GHD Animal Ethics Committee.

2.3 Likelihood of occurrence assessment

An assessment was conducted to attribute a 'likelihood of occurrence' to conservation significant species (i.e. species listed under the EPBC Act and/or NC Act) that have been previously recorded or were predicted to occur in the desktop searches (Table 2-3). The likelihood of occurrence assessment was based on a review of species distributions and habitat requirements, historical records for the region, and the results of habitat assessments conducted during the field surveys.

Table 2-3 Likelihood of occurrence assessment criteria

Category	Criteria
Confirmed present	Species recorded during field surveys in the Study corridor.
Likely to occur	Species has been recorded within 1 km of the Project area and suitable habitat is present in the Study corridor. Species determined to be 'likely to occur' are otherwise known to occur within the surrounding landscape.
May occur	Species has not been recorded within 1 km of the Project area although species' distribution incorporates the Study corridor and potentially suitable habitat occurs in the Study corridor (but may not be particularly abundant or optimal habitat).
Unlikely to occur	Species has not been recorded within 1 km of the Project area and/or current known distribution does not encompass the Study corridor and/or suitable habitat is generally lacking from the Study corridor.

3. Results

3.1 Regional environment overview

3.1.1 Bioregion

The Project area is located within the Southeast Queensland bioregion. This bioregion encompasses 62,484.2 km^2 and approximately 3.6 percent of Queensland (DES, 2013a). The Southeast Queensland bioregion is located within the MacPherson-Macleay Overlap, where tropical and temperate zone converge. As such, the bioregion supports a high diversity of flora, fauna and ecological communities (SEQ Catchments, 2016).

3.1.2 Catchment and hydrology

The Project area intersects three riverine catchment areas, namely the Brisbane River, Logan River and Albert River Catchments.

The majority of the Project area is located within the Logan River Catchment, while Ch 21,250 to Ch 23,300 falls within the Lower Brisbane River Catchment and Ch 39,100 to Ch 41,350 falls within the Albert River Catchment.

The Logan River Catchment covers approximately 3,000 m^2. The main waterway within the catchment is the Logan River, with numerous smaller waterways flowing into it. The Logan River joins Albert River and flows to Moreton Bay which is a Ramsar wetland of International importance. The Lower Brisbane River Catchment covers approximately 1,195 m^2. The catchment receives water from the mid Brisbane River and its tributaries, as well as the Bremer River. The Lower Brisbane River Catchment also flows into Moreton Bay. The Albert River Catchment covers approximately 790 m^2. The catchment receives water from the Albert River and its tributaries (DES, 2013b).

3.1.3 Watercourse, waterways and drainage features

In total the Project area intersects 18 waterways including both minor and major waterways (Figure 3-1). Of these 18, four comprise major waterways to which the remaining 14 are minor tributaries of, these four major waterways include Spring Creek, Slacks Creek, Scrubby Creek and the Logan River. Each of the major waterways are further described below:

Spring Creek

The Project intersects Spring Creek at Ch 22,250 m, which is a tributary of Slacks Creek. Spring Creek converges with Slacks Creek at approximately Ch 23,100 m and is part of the Lower Logan River sub-catchment. The sub-catchment is located within urban residential developments and therefore receives runoff from a variety of sources including existing road and rail infrastructure, commercial and industrial sites, medium and high-density residential areas (DES, 2015a).

Slacks Creek

The Project intersects Slacks Creek at Ch 23,300 m (Plate 3-1). Slacks Creek is a major tributary of the Logan River. Slacks Creek joins with Logan River near Tanah Merah approximately 10 km downstream of the Project area. Slacks Creek is part of the Lower Logan River sub-catchment. Most of the sub-catchment is located within urban residential developments, and as with Spring Creek, receives runoff from a similar range of sources (DES, 2015a). Although Slacks Creek is located within a highly urbanised area of the sub-catchment,

the majority of housing and development has been set back from the waterway allowing some riparian connectivity to be maintained (Figure 3-1).

Scrubby Creek

The Project intersects Scrubby Creek at Ch 29, 300 m (Plate 3-1). Scrubby Creek is a major tributary of the Logan River. At the intersection location the waterway runs through two Council managed parklands including Nealdon Park and Battle Park. The waterway converges with the Logan River approximately 7 km downstream of the Project area just south of the Pacific Highway. As with Slacks Creek, majority of development has been set back from the high bank of the waterway allowing some riparian connectivity to occur.

Logan River

The Project intersects the lower reaches of Logan River at Ch 33, 000 m. Ultimately the Logan River flows into southern Moreton Bay which is listed as an Internationally important Ramsar wetland (Section 3.1.4). Moreton Bay is approximately 25 km downstream of the Project area. The Logan River is part of the Lower Logan River Sub catchment. The Project intersects the estuarine region of the lower Logan River, known as the Logan Estuary, which reaches from the river's convergence with the sea up to Stockleigh (DES, 2015a). Most of the catchment is urban residential developments, with activities such as grazing and horticulture occurring higher in the catchment (DES, 2015a).

Plate 3-1 Slacks Creek (left) and Scrubby Creek (right)

3.1.4 Ramsar wetlands

The EPBC PMST identified one Wetland of International Importance, the Moreton Bay Ramsar site, as occurring approximately 10 km downstream of the Project area (Figure 3-1). This wetland was confirmed to be approximately 25 km downstream of the Project. The Project area remains hydrological connected to the Ramsar wetland, with the Logan River catchment discharging directly into Moreton Bay.

No Ramsar wetlands are directly intersected by or in close proximity to the Project area. Given the separation distance and environmental management controls, no impacts to the Ramsar wetland values are anticipated to occur as a result of the proposed Project.

3.1.5 Wetlands of National significance

The Project area does not contain any wetlands of national significance listed under the Directory of Important Wetlands of Australia (DIWA). The nearest DIWA listed wetland is the Karawatha Forest Park wetland, located approximately 2.5 km southwest and upstream of the Project area (Figure 3-1).

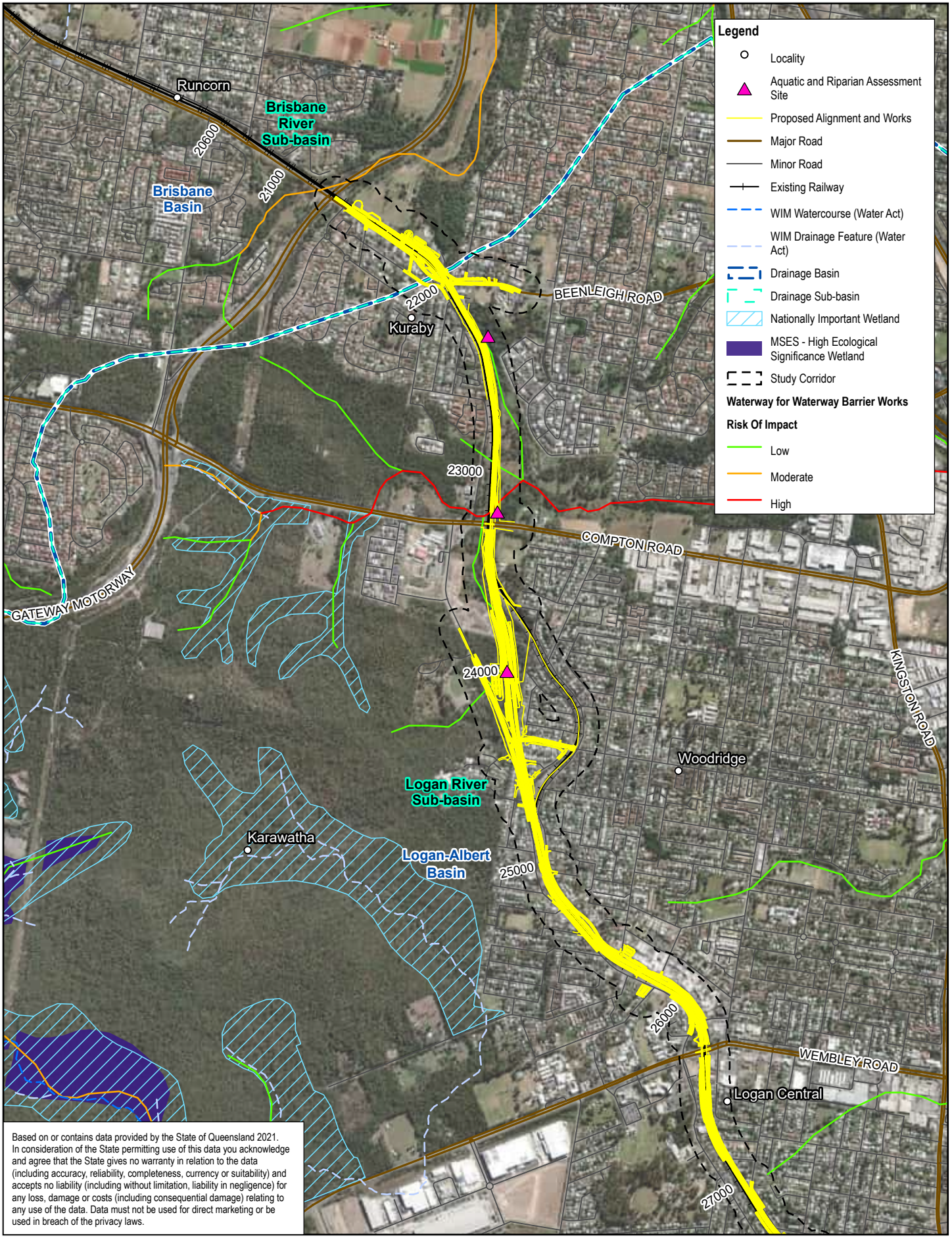
3.1.6 Wetlands of High Ecological Significance (HES)

The alignment intersects wetlands mapped under the Vegetation Management Act 1999 and Matters of State Environmental Significance. Table 3-1 lists where the protected waterbodies traverse the Project area.

Table 3-1 Protected waterbodies with HES wetlands

Protected waterbodies	Chainage
Wetland (HES) associated with Scrubby Creek	Ch 29,500 m
Wetland (HES) adjacent to Logan River	Ch 36,750 m
Wetland (HES) associated with unnamed watercourse or drainage feature	Ch 38,000 m

Key to table: HES = High Ecological Significance.



Paper Size ISO A4

0 200 400 600 800

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Department of Transport and Main Roads
Logan and Gold Coast Faster Rail
(Kuraby to Beenleigh) Project

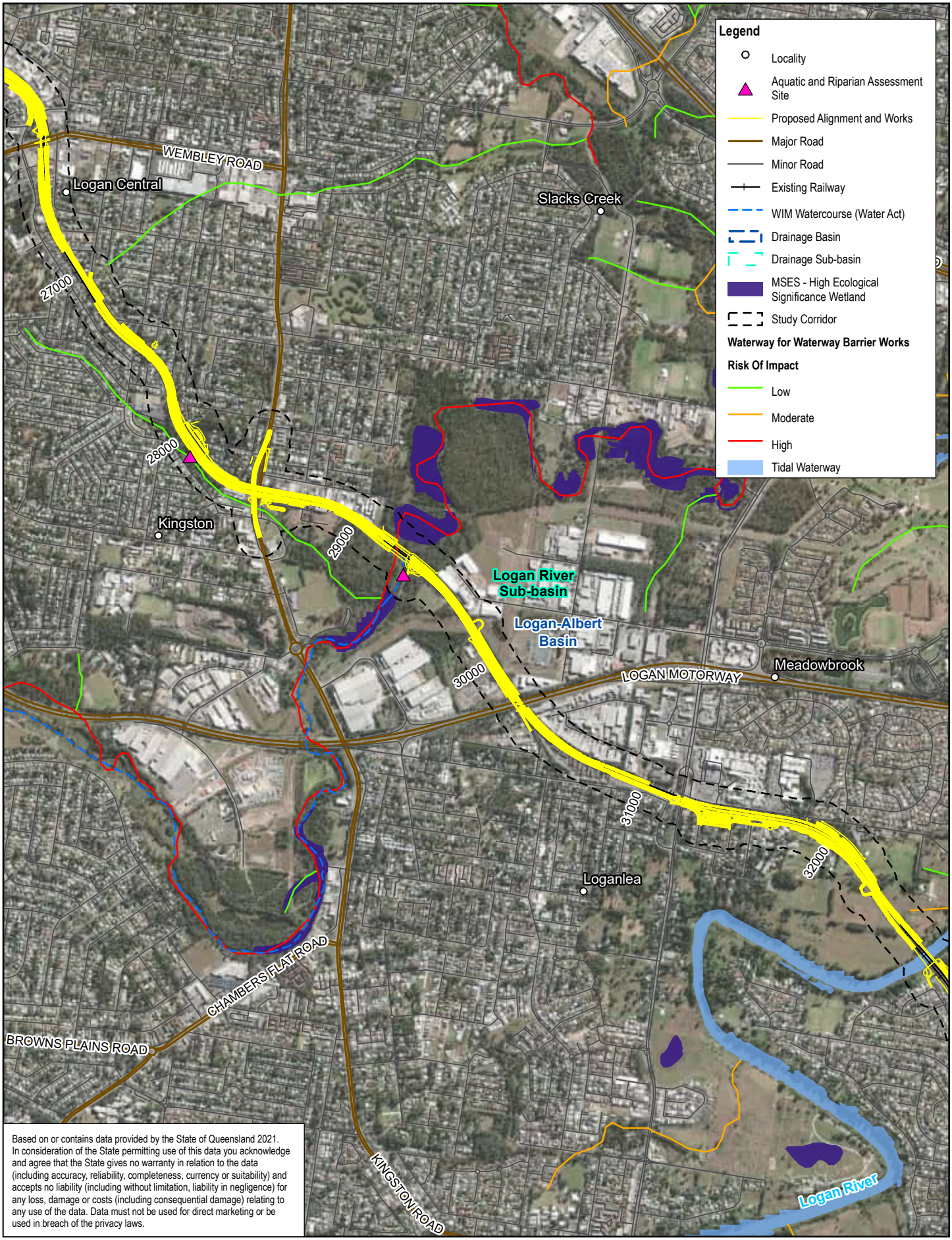
Wetlands and waterways within the study corridor

Project No. **12534697**
Revision No. **2**
Date **18/06/2021**

FIGURE 3-1a

N:\AU\Brisbane\Projects\41\12534697\GIS\Maps\Working\12534697_ESR.aprx\12534697_003_ESR_Waterways
Print date: 09 Aug 2021 - 16:27

Data source: DoR: WIM Watercourse, WIM Drainage Feature, Locality, Roads, Railway, Drainage Basin and Sub-basin, HES Wetland, Watercourse labels (2020); DAF: Waterway Barrier Works (2016); DAWE: Nationally Important Wetland (2008); GHD: Proposed Alignment, Study Area (2021); ESRI World Imagery: Maxar. Created by: xlee



Paper Size ISO A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Department of Transport and Main Roads
Logan and Gold Coast Faster Rail
(Kuraby to Beenleigh) Project

Wetlands and waterways within the study corridor

Project No. **12534697**
Revision No. **2**
Date **18/06/2021**

FIGURE 3-1b

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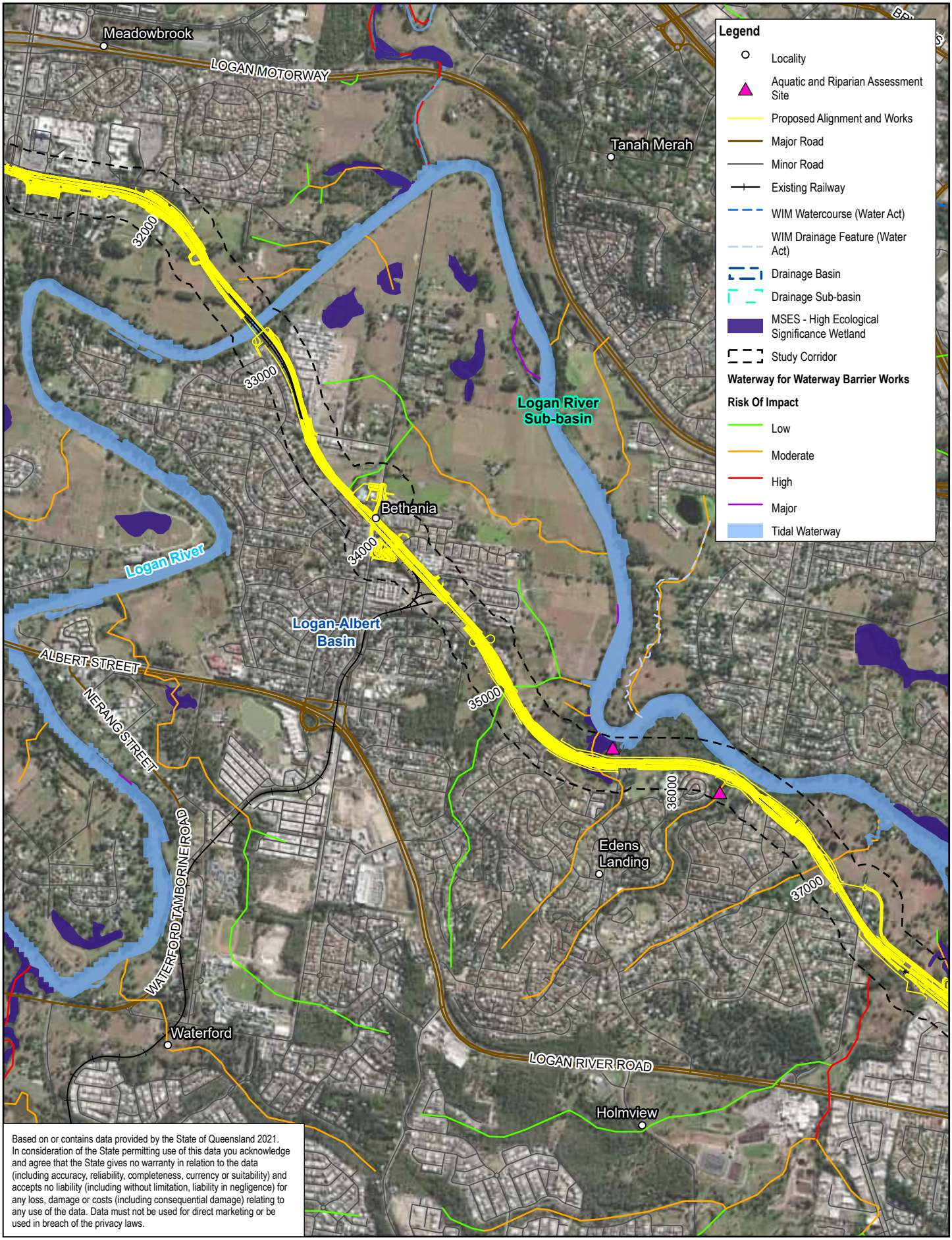
Print date: 09 Aug 2021 - 16:27

Data source: DoR: WIM Watercourse, WIM Drainage Feature, Locality, Roads, Railway, Drainage Basin and Sub-basin, HES Wetland, Watercourse labels (2020); DAF: Waterway Barrier Works (2016); DAWE: Nationally Important Wetland (2008); GHD: Proposed Alignment, Study Area (2021); ESRI World Imagery: Maxar. Created by: xlee



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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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GHD

Department of Transport and Main Roads
Logan and Gold Coast Faster Rail (Kuraby to Beenleigh) Project

Wetlands and waterways within the study corridor

Project No. **12534697**
Revision No. **2**
Date **18/06/2021**

FIGURE 3-1c

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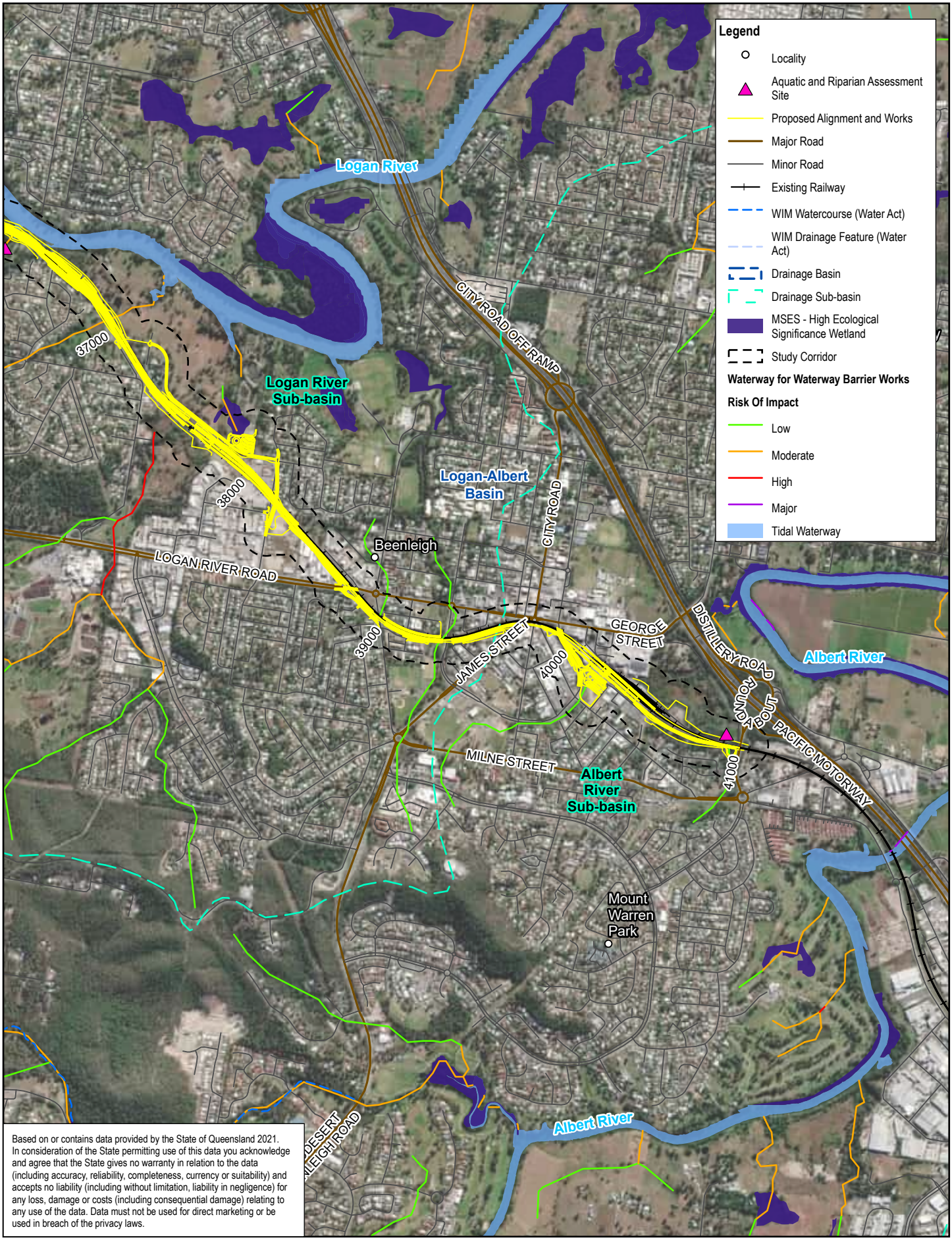
Print date: 09 Aug 2021 - 16:27

Data source: DoR: WIM Watercourse, WIM Drainage Feature, Locality, Roads, Railway, Drainage Basin and Sub-basin, HES Wetland, Watercourse labels (2020); DAF: Waterway Barrier Works (2016); DAWE: Nationally Important Wetland (2008); GHD: Proposed Alignment, Study Area (2021); ESRI World Imagery: Maxar. Created by: xlee



Paper Size ISO A4

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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GHD

Department of Transport and Main Roads
Logan and Gold Coast Faster Rail
(Kuraby to Beenleigh) Project

Wetlands and waterways within the study corridor

Project No. **12534697**
Revision No. **2**
Date **18/06/2021**

FIGURE 3-1d

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Print date: 09 Aug 2021 - 16:27

Data source: DoR: WIM Watercourse, WIM Drainage Feature, Locality, Roads, Railway, Drainage Basin and Sub-basin, HES Wetland, Watercourse labels (2020); DAF: Waterway Barrier Works (2016); DAWE: Nationally Important Wetland (2008); GHD: Proposed Alignment, Study Area (2021); ESRI World Imagery: Maxar. Created by: xlee

3.2 Threatened ecological communities

3.2.1 Desktop assessment

The EPBC Act PMST identified four TECs that have the potential to occur within 1 km of the Project area (Appendix A), namely:

- Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community
- Lowland Rainforest of Subtropical Australia
- Poplar Box Grassy Woodland on Alluvial Plains
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

Table 3-2 outlines the conservation status and the corresponding REs for each of the predicted TECs.

Of the REs identified as potentially corresponding with a TEC, only one was mapped by DoR within the Subsequent study areas. Specifically, RE 12.3.20 is mapped within the Study corridor at Ch 40,600 to 40,900 m and potentially constitutes the *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community*.

Table 3-2 Desktop TEC results with associated REs

TEC name	EPBC Act status	Associated REs
Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community	E	12.1.1 and 12.3.20 (DEE, 2018)
Lowland Rainforest of Subtropical Australia	CE	12.3.1, 12.5.13, 12.8.3, 12.8.4, 12.11.1, 12.11.10, 12.12.1 and 12.12.16 (DSEWPC, 2011)
Poplar Box Grassy Woodland on Alluvial Plains	E	11.3.2, 11.3.17, 11.4.7, 11.4.12 and 12.3.10 (TSSC, 2019)
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	CE	11.8.2a, 11.8.8, 11.9.9a, 13.3.1, 13.11.8, 13.12.8, 13.12.9, 11.3.23#, 12.8.16#, 13.3.4#^, 13.11.3#^ and 13.11.4#^ (TSSC, 2006)

Key to table: C.E = Critically Endangered, E = Endangered.

Can also be a smaller component these regional ecosystems:
^ Only at the far western edge of the bioregion

3.2.2 Field results

Assessment of vegetation communities that potentially constituted any of the EPBC Act listed TECs was undertaken throughout the Subsequent study areas. From these assessments only one TEC was considered to potentially occur, this being the Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community.

Two vegetation communities were identified as potential locations for this TEC, one being Hugh Muntz park (Ch 40,600-40,900 m) at the southern extent of the Project area. However, these

vegetation communities were found to be highly modified and based on the canopy composition of the vegetation and the high percentage of introduced species, vegetation within the Subsequent study areas at this location was not considered to constitute the TEC at the time of the field survey as the condition thresholds for the TEC were not met.

The other area considered to be a potential TEC was located along the Logan River near Edens Landing Station (Ch 35,600 m). This location was recorded as meeting the key diagnostic characteristics of the TEC however, the condition thresholds were not met and therefore this vegetation did not constitute the TEC. Specifically, three disjunct patches were recorded as being too small (less than 0.5 ha) and containing vegetation cover that consisted of a high percentage of transformer species (non-native plant species with the potential to permanently change the character, condition, form or nature of patches of the ecological community) (DoEE, 2018). The two primary transformer species recorded within the communities included *Lantana camara** and *Asparagus plumosus**, both of which are listed as example transformer species within the conservation advice for this TEC (DoEE, 2018).

Plate 3-2 shows an area of vegetation at Edens Landing that is highly impacted by transformer species and therefore does not constitute the TEC.

Plate 3-2 Vegetation discounted as TEC due to extremely high impact from invasive species

3.3 Regional ecosystems

3.3.1 Desktop assessment

DoR's regulated vegetation management map shows that the Subsequent study areas comprised Category B (remnant) regulated vegetation and Category X (non-remnant) vegetation. A total of 14 different homogenous RE types are mapped within the Study corridor, as described in Table 3-3 and shown on Figure 3-2 (DoR, 2021). Due to the highly fragmented nature of the urban area, many of the mapped polygons are slithers or small remaining patches within a largely cleared landscape.

Table 3-3 Mapped regional ecosystem communities within the Study corridor

RE label	REDD short description	VMA status	Regulated Vegetation Category
12.3.3d	*Eucalyptus moluccana* woodland. Other frequently occurring species include *Eucalyptus tereticornis, E. crebra, E. siderophloia, Corymbia citriodora subsp. variegata, Angophora leiocarpa* and *C. intermedia*. Occurs on margins of Quaternary alluvial plains often adjacent sedimentary geologies.	E	B
12.3.6	*Melaleuca quinquenervia +/- Eucalyptus tereticornis, Lophostemon suaveolens, Corymbia intermedia* open forest on coastal alluvial plains.	LC	B
12.3.7	*Eucalyptus tereticornis, Casuarina cunninghamiana subsp. cunninghamiana +/- Melaleuca* spp. fringing woodland.	LC	B
12.3.8	Swamps with *Cyperus* spp., *Schoenoplectus* spp. and *Eleocharis* spp.	OC	B
12.3.11	*Eucalyptus tereticornis +/- Eucalyptus siderophloia, Corymbia intermedia* open forest on alluvial plains usually near coast.	OC	B
12.3.20	*Melaleuca quinquenervia, Casuarina glauca +/- Eucalyptus tereticornis, E. siderophloia* open forest on low coastal alluvial plains.	E	B
12.5.3a	*Eucalyptus racemosa subsp. racemosa* woodland on remnant Tertiary surfaces.	E	B
12.9-10.4	*Eucalyptus racemosa subsp. racemosa* woodland on sedimentary rocks.	LC	B
12.9-10.7a	*Eucalyptus siderophloia, Corymbia intermedia +/- E. tereticornis* and *Lophostemon confertus* open forest. Occurs on Cainozoic and Mesozoic sediments in near coastal areas.	OC	B
12.9-10.12	*Eucalyptus seeana, Corymbia intermedia, Angophora leiocarpa* woodland on sedimentary rocks	E	B
12.9-10.17c	Open forest of *Eucalyptus carnea* and/or *E. tindaliae* and/or *E. helidonica +/- Corymbia citriodora subsp. variegata, Eucalyptus crebra, Eucalyptus major, Corymbia henryi, Angophora woodsiana, C. trachyphloia, E. siderophloia, E. microcorys, E. resinifera and E. propinqua*. *Lophostemon confertus* often present as a sub-canopy or understorey tree. Occurs on Cainozoic and Mesozoic sediments.	LC	B

RE label	REDD short description	VMA status	Regulated Vegetation Category
12.9-10.17c	Open forest of *Eucalyptus carnea* and/or *E. tindaliae* and/or *E. helidonica +/- Corymbia citriodora subsp. variegata, Eucalyptus crebra, Eucalyptus major, Corymbia henryi, Angophora woodsiana, C. trachyphloia, E. siderophloia, E. microcorys, E. resinifera and E. propinqua. Lophostemon confertus* often present as a sub-canopy or understorey tree. Occurs on Cainozoic and Mesozoic sediments.	LC	B
12.9-10.19a	*Corymbia henryi* and/or *Eucalyptus fibrosa subsp. fibrosa* open forest. Other commonly associated species include, *Corymbia citriodora subsp. variegata, E. carnea, E. siderophloia, E. crebra* and *E. major*. Occurs in coastal areas on Cainozoic and Mesozoic sediments.	LC	B
12.11.27	*Eucalyptus racemosa subsp. racemosa* and/or *E. seeana* and *Corymbia intermedia* woodland on metamorphics +/- interbedded volcanics.	E	B

Key to table: REDD = Regional Ecosystem Description Database, VMA = *Vegetation Management Act 1999;* E = Endangered, OC = Of Concern, LC = Least Concern.

3.3.2 Field results

The vegetation communities confirmed present within the Subsequent study areas are described in Table 3-4. A number vegetation communities were found to differ in species composition from that mapped by DoR (DoR, 2021).

Table 3-4 Observed vegetation communities within Subsequent study areas

Community	Description	Photograph	Chainage (m)
Mapped 12.3.3d Field Verified 12.3.3. (Eucalyptus tereticornis woodland on Quaternary alluvium) 12.3.11	**REDD:** *Eucalyptus moluccana* woodland. Other frequently occurring species include *Eucalyptus tereticornis, E. crebra, E. siderophloia, Corymbia citriodora* subsp. *variegata, Angophora leiocarpa* and *C. intermedia*. Occurs on margins of Quaternary alluvial plains often adjacent sedimentary geologies. **Field observation** Located on the alluvial plains of Scrubby creek. Canopy dominated by *Eucalyptus tereticornis* at 30 m with approximately 40 percent cover with district understorey of *Lophostemon suaveolens* at 15 m with approximately 60 percent cover. Sparse to absent shrub layer with young *Glochidion sumatranum* and *Parsonsia straminea*. Dense ground cover of *Paspalum conjugatum, Urochloa mutica* and *Sphagneticola trilobata** on alluvial soil. With a clear dominance of *Eucalyptus tereticornis* the RE is more likely 12.3.3 than 12.3.3d. Aligning with the change in geology the eastern section from approximately Ch 29,400 m the RE was recorded as aligning with 12.3.11. Dominated by a mix of species including *Eucalyptus siderophloia, Angophora leiocarpa, Eucalyptus tereticornis* and *Corymbia intermedia*. The understorey included *Melaleuca sieberi, Lophostemon suaveolens, Acacia disparrima* and *Alphitonia excelsa.* The ground layer included *Imperata cylindrica, Lomandra multiflora, Entolasia stricta* and *Lomandra confertifolia* on silty grey brown alluvial sols.	 	29,200; 29,400

Community	Description	Photograph	Chainage (m)
Mapped 12.3.6 Field Verified 12.3.6	**REDD:** *Melaleuca quinquenervia +/- Eucalyptus tereticornis, Lophostemon suaveolens, Corymbia intermedia* open forest on coastal alluvial plains. **Field observation** Confirmed present with *Melaleuca quinquenervia, Eucalyptus tereticornis, Lophostemon suaveolens* and *Corymbia intermedia* recorded in the canopy layer. The subcanopy was often dominated by *Melaleuca sieberi*. The ground layer was dominated by dense cover of *Paspalum conjugatum, Urochloa mutica* and *Sphagneticola trilobata** on alluvial soil.		29,300
Mapped 12.3.7 Field Verified 12.3.7 with areas of 12.3.20	**REDD:** *Eucalyptus tereticornis*, *Casuarina cunninghamiana subsp. cunninghamiana +/- Melaleuca* spp. fringing woodland. **Field observation** Confirmed, although heavily impacted by introduced species. There was a clear presence of *Eucalyptus tereticornis* and some *Casuarina cunninghamiana*. Other species present included *Eucalyptus siderophloia, Angophora leiocarpa, Casuarina glauca, Corymbia tessellaris, Acacia disparrima* and *Corymbia torelliana*. The understorey was frequently dominated *Lantana camara** and *Asparagus plumosa**.		35,600; 35,800; 36,200

Community	Description	Photograph	Chainage (m)
Mapped 12.3.8 Field Verified 12.3.8 heavily impacted	**REDD:** Swamps with *Cyperus* spp., *Schoenoplectus* spp. and *Eleocharis* spp. **Field observation** Freshwater wetland dominated by *Typha orientalis* and *Phragmites australis*. Mature trees growing along fringe of wetland, including *Casuarina cunninghamiana* and *Melaleuca bracteata*. Ground layer contained *Eleocharis* spp. Local hydrology was recorded as being modified by culvert to the east. No tidal influence and heavily degraded by exotic species to the west of the Project area.		36,300
Mapped 12.3.11 Field Verified 12.3.11 heavily impacted	**REDD:** *Eucalyptus tereticornis +/- Eucalyptus siderophloia, Corymbia intermedia* open forest on alluvial plains usually near coast. **Field observation** Dominant species recorded as *Melaleuca quinquenervia* and with some emergent *Eucalyptus microcorys*. Associate species included *Glochidion sumatranum*, *Acacia disparrima* and *Lophostemon suaveolens*. Soils were alluvial with high percentage of introduced or invasive species including *Ipomoea indica, Megathyrsus maximus* and *Sphagneticola trilobata**		21,800; 23,201^; 23,220^; 23,225^; 24,060

Community	Description	Photograph	Chainage (m)
Mapped 12.3.20 Field Verified 12.3.7 Regrowth	**REDD:** *Melaleuca quinquenervia, Casuarina glauca +/- Eucalyptus tereticornis, E. siderophloia* open forest on low coastal alluvial plains **Field observation** Located at the southern end of Hugh Muntz Park the mapped RE was not able to be confirmed. The dominant species of this RE *Melaleuca quinquenervia* and *Casuarina glauca* were recorded from the wider area however the mapped portion of the RE accessed was dominated by regrowth *Eucalyptus tereticornis* with tall dense *Megathyrsus maximus* subsp. *maximus*. The entire area was heavily impacted by introduced or invasive species. Access was limited by the standing water and rail corridor.		40,900
Mapped 12.5.3a Field Verified 12.5.3a	**REDD:** *Corymbia intermedia, Eucalyptus seeana +/- E. racemosa subsp. racemosa, Angophora leiocarpa, E. siderophloia, E. microcorys, C. citriodora* subsp. *variegata, Lophostemon suaveolens* woodland. *Melaleuca quinquenervia* is often a prominent feature of lower slopes. Occurs on complex of remnant Tertiary surfaces +/- Cainozoic and Mesozoic sediments **Field observation** Dominated by *Eucalyptus microcorys* with some *Eucalyptus racemosa, Corymbia intermedia* and *Acacia disparrima* us subcanopy sparse. The section located within the Study corridor was maintained as a parkland and the understorey was mostly mown grasses, all shrubs were cleared. Recorded as sandy grey brown alluvial soils		21,800

Community	Description	Photograph	Chainage (m)
Mapped 12.9-10.4 Field Verified 12.9-10.4	**REDD:** *Eucalyptus racemosa* subsp. *racemosa* woodland on sedimentary rocks **Field observation** *Eucalyptus exserta* and *Eucalyptus racemosa* sparse canopy to 20 m over dense *Allocasuarina littoralis*. *Lepidosperma laterale* dominating the ground layer		23,250^; 24,000; 24,200
Mapped 12.9-10.7a Field Verified 12.3.5 with some 12.3.11, 12.9-10.7a may occur on upper slopes but too impacted to tell.	**REDD:** *Eucalyptus siderophloia, Corymbia intermedia +/- E. tereticornis* and *Lophostemon confertus* open forest. Occurs on Cainozoic and Mesozoic sediments in near coastal areas. **Field observation** *Melaleuca quinquenervia* to 15 m tall dominating the upper gully line and adjacent areas with approximately 80 percent cover. Associated species included *Glochidion sumatranum*, *Pinus elliottii* and *Syagrus romanzoffiana*. Lower in the gully a dense shrub layer was present including *Ochna serrulata* and *Pteridium esculentum* throughout *Ottochloa* spp. were present in the ground layer although some areas had dense introduced garden plants such as *Impatiens walleriana* dominating the ground layer. Sandy alluvial soils with heavy weed impacts through most areas.		22,200

Community	Description	Photograph	Chainage (m)
Mapped 12.9-10.12 Field Verified 12.9-10.7a	**REDD:** *Eucalyptus seeana, Corymbia intermedia, Angophora leiocarpa* woodland on sedimentary rocks **Field observation** *Eucalyptus siderophloia* and *Corymbia intermedia* dominated. *Eucalyptus racemosa* present uphill but not in this section. Small *Alphitonia excelsa* in the shrub layer and *Lepidosperma laterale* in the ground layer on sandy soils		23,100^; 23,200^; 24,001
Mapped 12.9-10.17c Field Verified 12.9-10.4	**REDD:** Open forest of *Eucalyptus carnea* and/or *E. tindaliae* and/or *E. helidonica +/- Corymbia citriodora* subsp. *variegata, Eucalyptus crebra, Eucalyptus major, Corymbia henryi, Angophora woodsiana, C. trachyphloia, E. siderophloia, E. microcorys, E. resinifera and E. propinqua. Lophostemon confertus* often present as a sub-canopy or understorey tree. Occurs on Cainozoic and Mesozoic sediments. **Field observation** *Eucalyptus racemosa* and *Corymbia intermedia* sparse to 24 m over dense *Allocasuarina littoralis*. *Eucalyptus robusta* also recorded in the lower tree layer. The ground layer species included *Lepidosperma laterale* dominating most dryer areas and included *Lomandra multiflora* and *Entolasia stricta*. Soils were recorded as sandy.		23,900

Community	Description	Photograph	Chainage (m)
Mapped 12.9-10.17d Field Verified 12.9-10.17d	**REDD:** Open forest generally containing *Eucalyptus siderophloia, E. propinqua* or *E major, Corymbia intermedia* on hills and ranges on Cainozoic and Mesozoic sediments. **Field observation** In the western block at Chainage 24,700 m had a mown ground layer for fire protection through most of the relevant area along the edge closer to the houses. The interior to the block conformed with the mapped RE being dominated *Eucalyptus propinqua Corymbia intermedia* and *Eucalyptus siderophloia*. A very sparse shrub layer present primarily *Acacia* spp. and the ground layer included *Lomandra multiflora, Lepidosperma laterale* and *Themeda triandra*.		24,300; 24,700
Mapped 12.9-10.19a Field Verified 12.9-10.17d	**REDD:** *Corymbia henryi* and/or *Eucalyptus fibrosa* subsp. *fibrosa* open forest. Other commonly associated species include, *Corymbia citriodora* subsp. *variegata, E. carnea, E. siderophloia, E. crebra* and *E. major*. Occurs in coastal areas on Cainozoic and Mesozoic sediments. **Field observation** The canopy consisted of *Eucalyptus propinqua* dominant with sub- dominant *Eucalyptus crebra* to 30 m tall and an approximate cover of 60 percent. Shrub and ground cover had Low native species diversity especially further from the road. Native species recorded included *Entolasia stricta, Themeda triandra, Lepidosperma laterale* and *Lomandra confertifolia*. Large amount of garden plants present, with areas dominated by *Bromeliad* sp., *Aloe* sp., *Bryophyllum* sp. and *Epidendrum* sp.		26,600

Community	Description	Photograph	Chainage (m)
Mapped 12.11.27 Field Verified 12.11.14	**REDD:** *Eucalyptus racemosa* subsp. *racemosa* and/or *E. seeana* and *Corymbia intermedia* woodland on metamorphics +/- interbedded volcanics **Field observation** Highly disturbed woodland dominated by *Acacia leiocarpa, Eucalyptus siderophloia, Corymbia citriodora* and *Corymbia torelliana*. Shrub layer contained *Lantana camara**, *Asparagus plumosus*, Alphitonia excelsa* and *Acacia* spp. with associated *Casuarina cunninghamiana* and *Casuarina glauca*. Mixed ground layer often not present under dense *Lantana camara** cover and containing *Imperata cylindrica, Lomandra longifolia, Murdannia graminea* and various introduced grass species where dense shrub layer not present.		35,900; 36,250

^= indicates a slither polygon, *=restricted invasive species

3.4 Marine plants

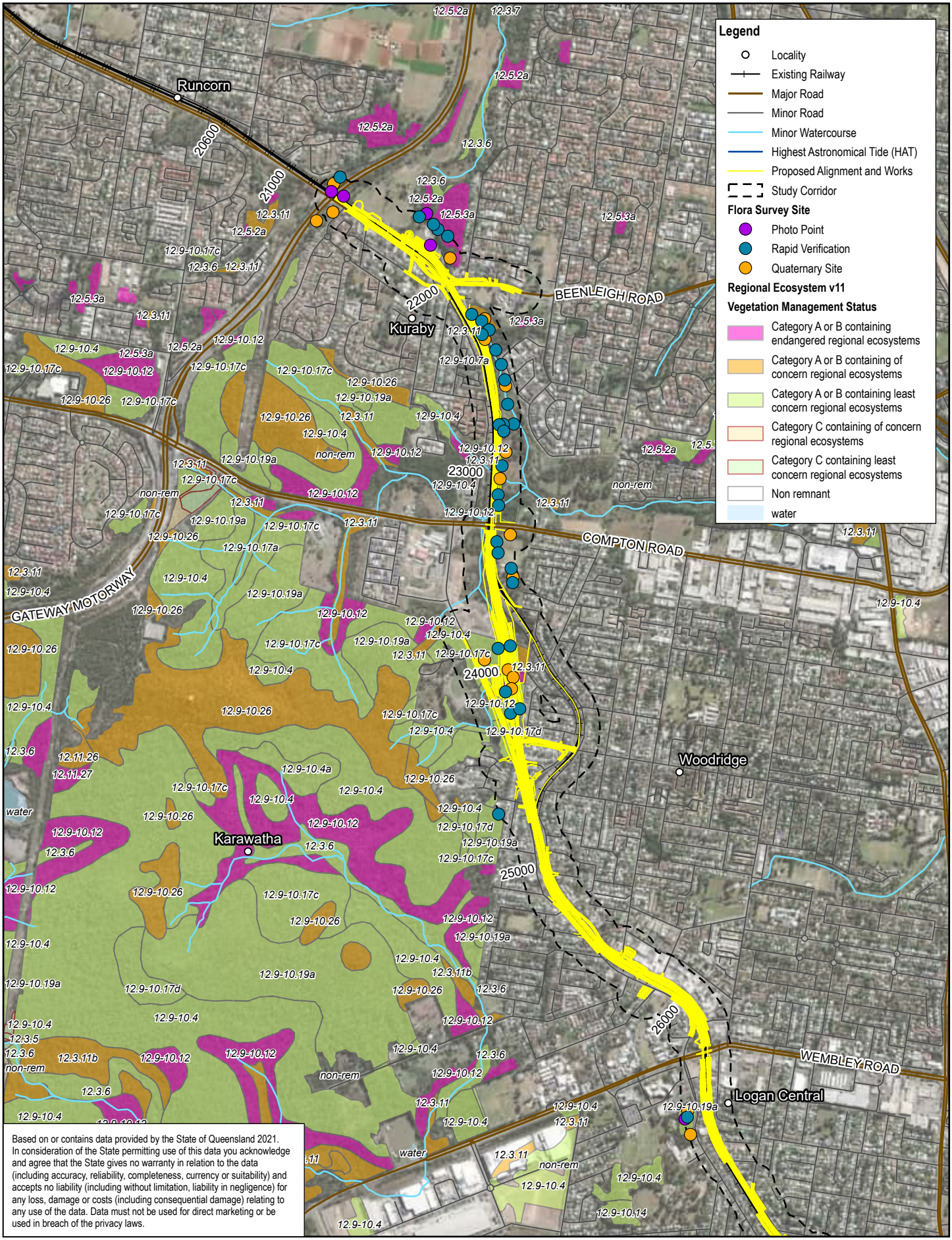
The Project area is partially located within the tidal flats of the Logan River and Albert River, with scattered areas adjacent to the Project mapped as below highest astronomical tide (HAT). The *Fisheries Act 1994* defines marine plants as plants which usually grow on or adjacent to tidal land.

The Fish Habitat Management Operational Policy FHMOP 001 (Fish Habitat Management Policy) stipulates that tidal 'is any land at or below the HAT mark' and therefore, all native vegetation growing below the theoretical level of HAT comprises marine plants. Mapped HAT is recorded at the following locations and shown in Figure 3-2.

- Ch 32, 700 – 32,800 m – the Logan River
- Ch 35,600 m – a minor tributary of the Logan River
- Ch 36,150 – 36,600 m – Logan River floodplain
- Ch 37,500 - 37,700 m – A tributary of the Logan River

Accordingly, vegetation within the Project area at these locations constitutes marine plants as per the *Fisheries Act 1994* definition.

This assessment confirmed that no areas of marine plants additional to the above are present within the Subsequent study areas.



Paper Size ISO A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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(Kuraby to Beenleigh) Project

Vegetation community values within the study corridor

Project No. **12534697**
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FIGURE 3-2a

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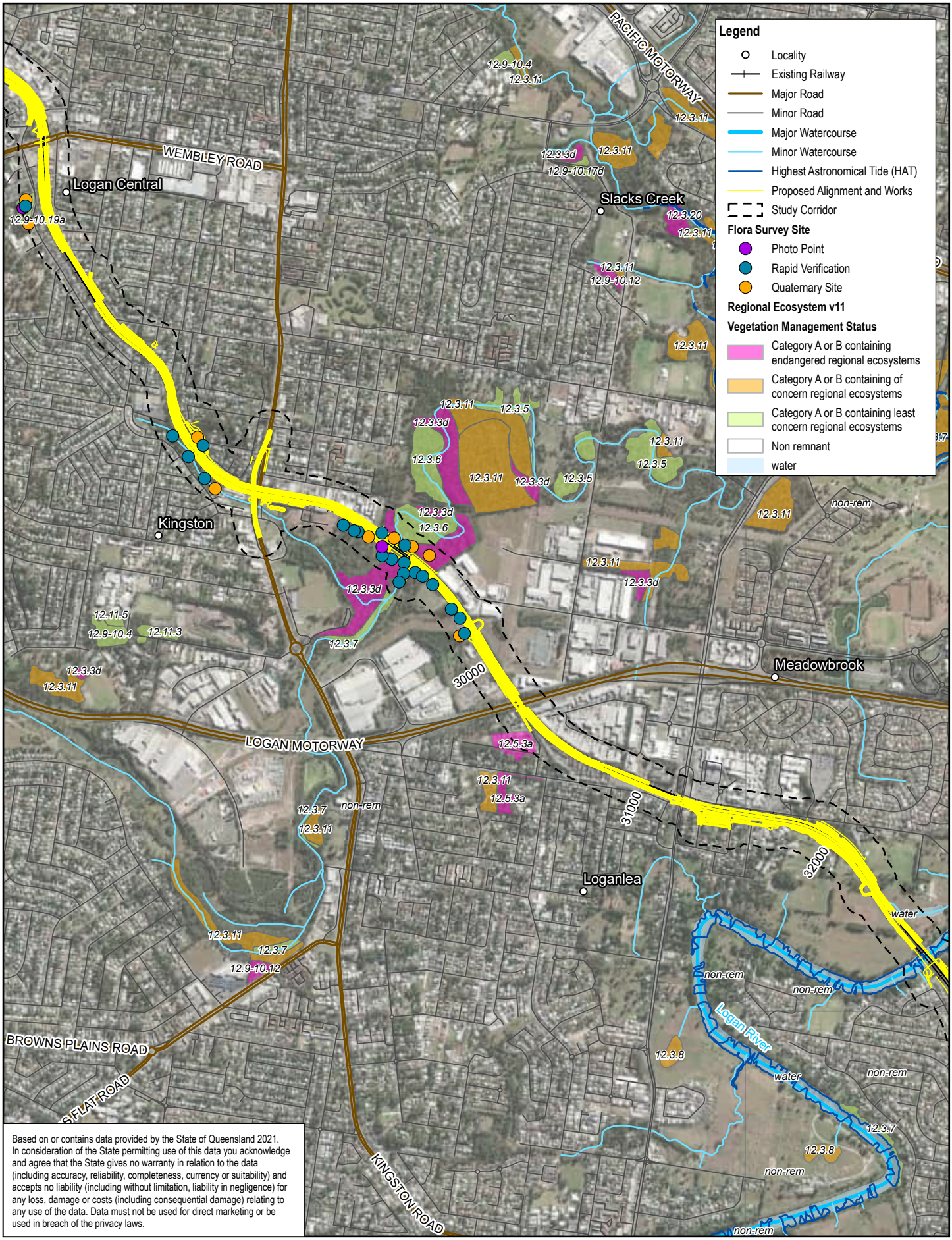
Print date: 09 Aug 2021 - 16:29

Data source: DoR: Locality, Roads, Railway, Watercourses, RE v11 (2020), HAT (2013); GHD: Proposed Alignment, Flora Survey, Study Area (2021); World Imagery: Maxar. Created by: xlee



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Vegetation community values within the study corridor

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Revision No. **2**
Date **18/06/2021**

FIGURE 3-2b

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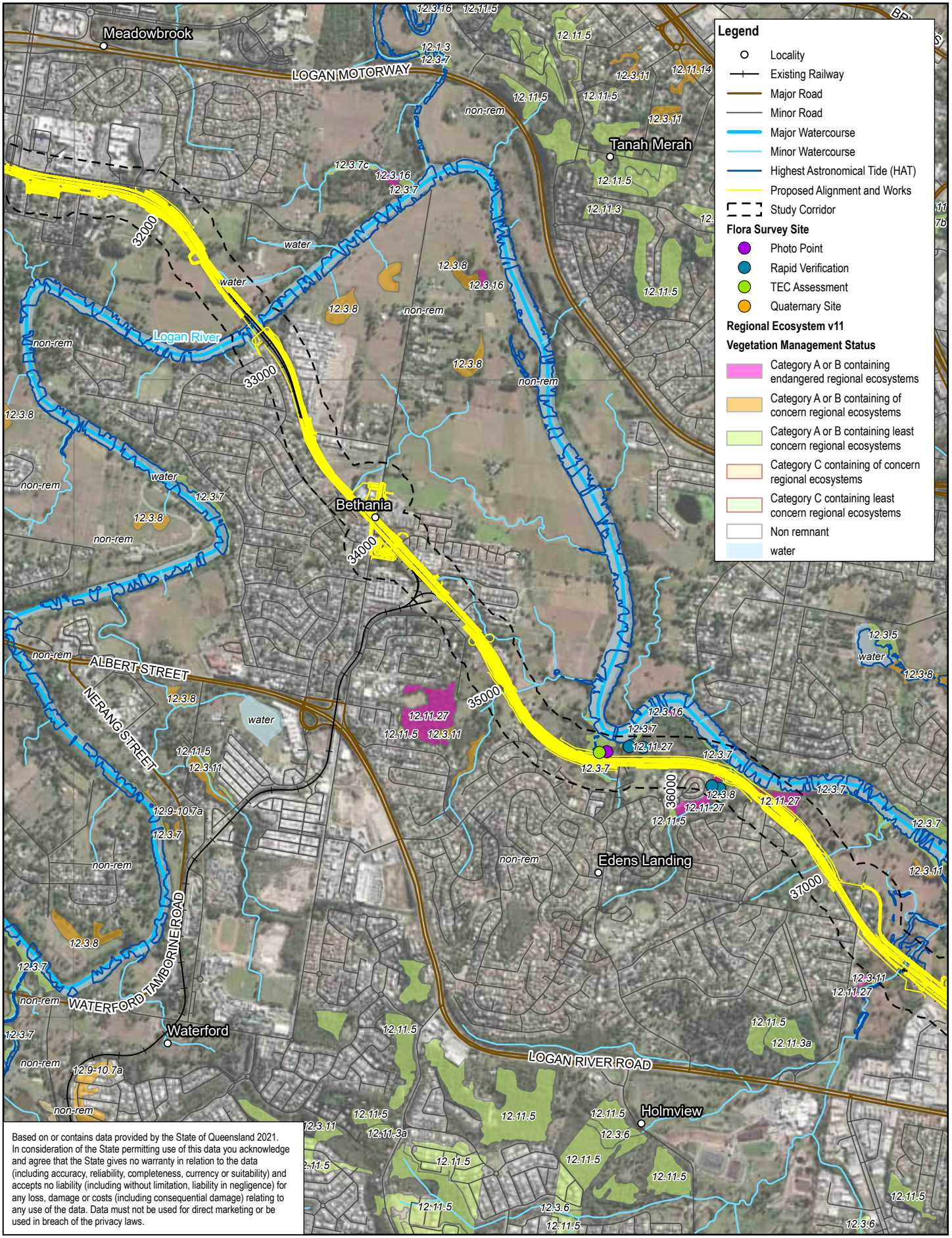
Data source: DoR: Locality, Roads, Railway, Watercourses, RE v11 (2020), HAT (2013); GHD: Proposed Alignment, Flora Survey, Study Area (2021); World Imagery: Maxar. Created by: xlee



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Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 56

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Vegetation community values within the study corridor

Project No. **12534697**
Revision No. **2**
Date **18/06/2021**

FIGURE 3-2c

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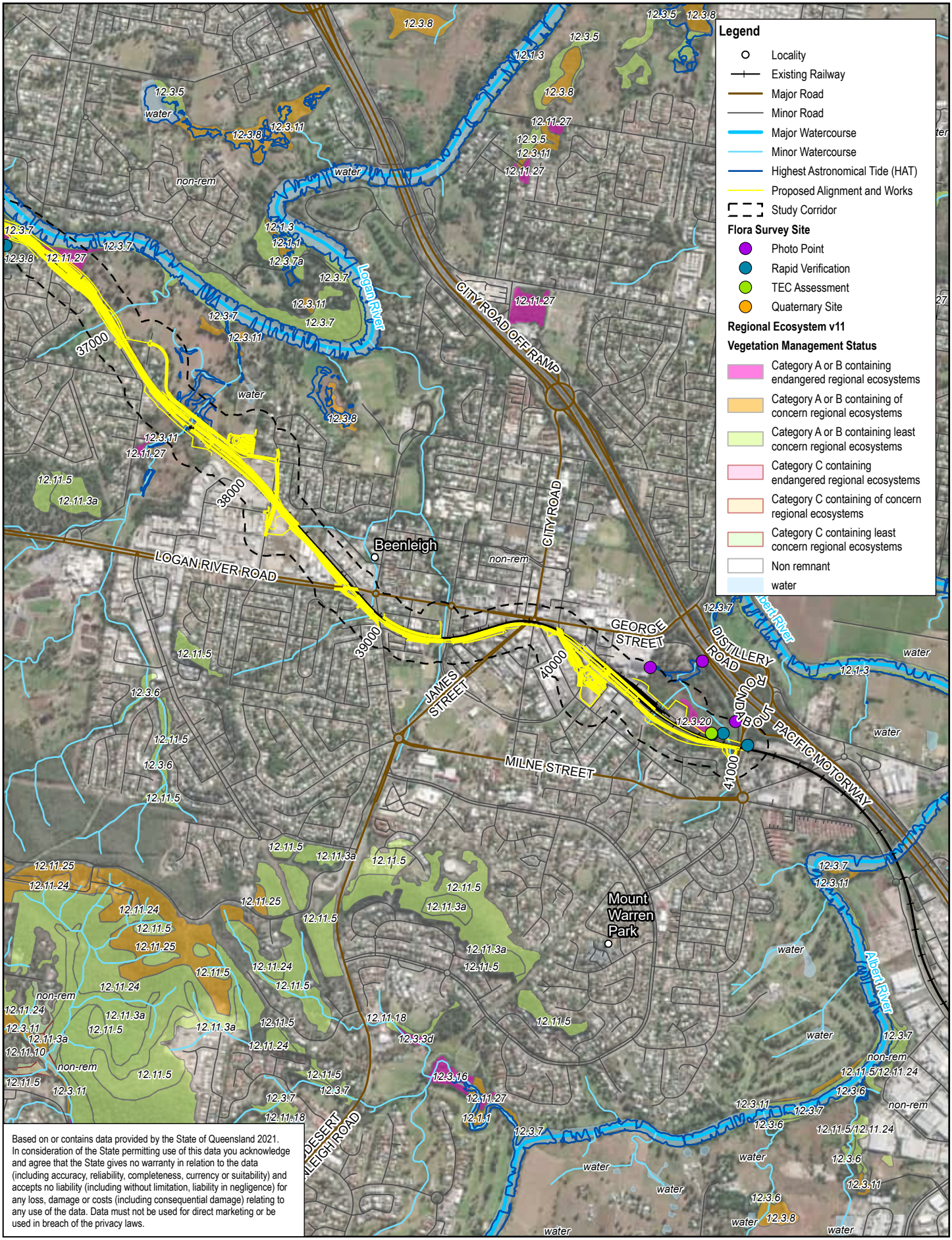
Print date: 09 Aug 2021 - 16:29

Data source: DoR: Locality, Roads, Railway, Watercourses, RE v11 (2020), HAT (2013); GHD: Proposed Alignment, Flora Survey, Study Area (2021); World Imagery: Maxar. Created by: xlee



Paper Size ISO A4

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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(Kuraby to Beenleigh) Project

Vegetation community values within the study corridor

Project No. **12534697**
Revision No. **2**
Date **18/06/2021**

FIGURE 3-2d

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Print date: 09 Aug 2021 - 16:29

Data source: DoR: Locality, Roads, Railway, Watercourses, RE v11 (2020), HAT (2013); GHD: Proposed Alignment, Flora Survey, Study Area (2021); World Imagery: Maxar. Created by: xlee

3.5 Conservation significant flora species

3.5.1 Desktop assessment

High-risk flora trigger areas are frequently present across large areas of the Subsequent study areas, particularly where the Project area intersects Scrubby Creek (Ch 29,100-29,500 m) and along the alluvial flats of the Logan River (Ch 35,600 to 36,700 m) (refer to Figure 3-3 and Appendix A).

A search of DAWE's PMST indicated that 20 threatened flora species listed under the EPBC Act are predicted to occur within 1 km of the Project area (refer to Appendix A). A search of DES's Wildlife Online database indicated that four NC Act listed conservation significant flora species have been historically recorded within 1 km of the Project area (refer to Appendix A), namely:

- *Coleus habrophyllus* – Endangered (EPBC Act and NC Act)
- *Gossia gonoclada* – Endangered (EPBC Act and NC Act)
- *Marsdenia coronata* – Vulnerable (NC Act)
- *Melaleuca irbyana* – Endangered (NC Act)

No conservation significant flora species were recorded within the Study corridor during the 2019 field surveys (WSP, 2019b). The likelihood of occurrence undertaken by WSP rated five species as moderately likely to occur. Two of these species were not recorded in the desktop extent for the current report, namely *Eucalyptus curtisii* (near threatened NC Act) and *Zieria furfuracea* (endangered NC Act). All species recorded within the desktop searches are presented in Table 3-5.

Essential habitat for two conservation significant flora species is mapped within the Study corridor, these being, *Gossia gonoclada* and *Coleus habrophyllus*. Essential habitat for *Gossia gonoclada* is mapped across five interconnected properties along the Logan River. These properties are situated along the eastern side of the Study corridor between Ch 36,400 – 37,600 m, with essential habitat immediately adjacent to the Project between Ch 36,400 – 36,700 m (refer to Table 3-6). Similarly, essential habitat for *Coleus habrophyllus* is mapped within the Study corridor, however outside the Project area. Essential habitat for this species occurs along an unnamed drainage line approximately 100 m southwest of the Project area at Ch 37,600 m. The essential habitat requirements for these species and the intersected property lots are summarised in Table 3-6 and displayed in Figure 3-4.

Table 3-5 Conservation significant flora species predicted occur within the Study corridor

Scientific name	Common name	Conservation status		Source
		EPBC Act	NC Act	
Arthraxon hispidus	Hairy-joint grass	V	V	PMST
Baloghia marmorata	Marbled balogia,	V	V	PMST
Bosistoa transversa	Three-leaved bosistoa	V	LC	PMST
Coleus habrophyllus	-	E	E	WO
Corchorus cunninghamii	Native jute	E	E	PMST
Cryptocarya foetida	Stinking cryptocarya	V	V	PMST
Cryptostylis hunteriana	Leafless tongue-orchid	V	LC	PMST

Scientific name	Common name	Conservation status		Source
		EPBC Act	NC Act	
Cupaniopsis shirleyana	Wedge-leaf tuckeroo	V	V	PMST
Diploglottis campbellii	Small-leaved tamarind	E	E	PMST
Endiandra floydii	Floyd's walnut	E	E	PMST
Eucalyptus curtisii^	Plunket mallee	NL	NT	WSP 2019
Fontainea venosa	-	V	V	PMST
Gossia gonoclada	Angel-stemmed myrtle	E	E	PMST, WO
Lepidium peregrinum	Wandering pepper-cress	E	LC	PMST
Macadamia integrifolia	Queensland nut tree	V	V	PMST
Macadamia tetraphylla	Rough-shelled bush nut	V	V	PMST
Marsdenia coronata	Slender milk vine	-	V	WO
Melaleuca irbyana	Weeping paperbark	NL	E	WO
Notelaea ipsviciensis	Cooneana olive	CE	CR	PMST
Persicaria elatior	Knotweed	V	V	PMST
Phaius australis	Lesser swamp-orchid	E	E	PMST
Samadera bidwillii	Quassia	V	V	PMST
Thesium australe	Austral toadflax	V	V	PMST
Vincetoxicum woollsii	-	E	E	PMST
Zieria furfuracea^	-	NL	E	WSP 2019

Key – CE /CR = Critically Endangered, E = Endangered, V = Vulnerable, NT = Near threatened, NL = Not Listed, LC = Least Concern, WO = Wildlife Online.
^= identified as moderately likely to occur in WSP 2019 report.

3.5.2 Field results

Three conservation significant flora species were recorded during the 2021 field surveys; however two of these species were planted stock outside of suitable habitat within maintained areas, with only one of the species (*Macadamia integrifolia*) considered to be 'in the wild' based on the Operational policy '*When a protected plant in Queensland is taken to be 'in the wild*'' and presence of recruitment.

A precautionary approach was adopted and the likelihood of conservation significant flora was assessed based on habitat suitability (refer to Appendix B). This was undertaken for all conservation significant species identified during the desktop assessment. A summary of the likelihood of occurrence assessment is provided below.

- Four conservation significant flora species were considered likely to occur in the Study corridor
- Nine conservation significant flora species may occur within the Study corridor

- 12 of the 25 conservation significant flora species identified during the desktop assessment were considered ‘unlikely to occur’ due to a lack of suitable habitat and/or a lack of nearby records

The species recorded as confirmed or likely to occur are listed below with a description of habitat within the Subsequent study areas.

Macadamia integrifolia – Confirmed present

Macadamia integrifolia is listed as vulnerable under the EPBC Act and NC Act.

Six *Macadamia integrifolia* individuals were recorded across the Subsequent study area (outside the Project area), with most of them occurring within the parkland area as maintained amenity trees of Lot 2 on RP897149 (Ch 21,300 m) (refer to Figure 3-3). These individuals were recorded as being regularly mown around with herbicide treatment to the ground layer directly surrounding the base (refer to Plate 3-3). One juvenile individual was recorded as planted within the bushland area. This individual had a tree guard on and up until recently appears to have been maintained. These individuals were not considered to be ‘in the wild’ and therefore the provisions of the NC Act do not apply.

One recorded individual however was found to be a natural recruit of the larger planted trees. This naturally recruited individual was located with a stand of *Melaleuca* and *Eucalyptus* spp. with an understorey dominated by *Megathyrsus maximus*. This individual was considered to be ‘in the wild’.

This species is known to occur within a diverse range of landforms and several vegetation communities including complex notophyll mixed forest, extremely tall closed forest, simple notophyll mixed very tall closed forest to simple microphyll-notophyll mixed mid-high closed forest with *Araucaria* and *Argyrodendron* emergents (DAWE, 2021). The vegetation present within the Subsequent study areas does not meet the described habitats for this species with the community present described as open forest with some sections having a closed canopy. However, *Macadamia integrifolia* is also reported to occur on the margins of rainforests (DAWE, 2021) which would have a more open/low structural formation than the preferred habitat. Numerous introduced or invasive species were recorded from this part of the Subsequent study areas. Avoidance of impacts to this species should be achievable as it does not occur within area of predicted works. Indirect impacts will be addressed within an Impact Management Plan required with the submission of a clearing permit application.

Plate 3-3 *Macadamia integrifolia* recorded within the Project area

Marsdenia coronata – Likely to occur

Marsdenia coronata is listed as vulnerable under the NC Act.

A previous record from 2007 exists within a currently highly modified environment including carparks, buildings and roads approximately 200 m east of the Project area (refer to Figure 3-3). However, it was concluded that this record is inaccurately sited, with the location of the record described as '*Found 10 metres from centre of deep gully; metasediment geology, in Logan'* with the location accuracy specified as 2 km.

As this species can occur in a reduced state, with only the underground organ present, optimal survey conditions are required for the best chance of positive identification. The survey conditions during the current survey effort (2021) were optimal as the survey was undertaken during the species' known flowering period (November to March (DES, 2021c)). In addition, significant local rainfall events occurred between November 2020 to January 2021 coupled with hot days (BoM, 2021), which is likely to provide optimal growing conditions. As a result, it is expected that any individuals present would be able to be detected as they would be actively growing and have visible vegetative features. Supportive habitat requirements, in the form of eucalypt open forest, were recorded through various sections of the Subsequent study areas (DES, 2021c) and therefore the species was rated as likely to occur. Should this species be recorded within the project area at a later date, impacts will be managed under an Impact Management Plan required with the submission of a clearing permit application.

Melaleuca irbyana – Likely to occur

Melaleuca irbyana is listed as vulnerable under the NC Act.

Two *Melaleuca irbyana* individuals were recorded from Lot 2 on RP897149 and were also planted (refer to Figure 3-3 and Plate 3-4). Both individuals were planted in a small rise of the parkland with one recorded as having a tree guard present. Although this species is known from

the surrounding area, the location of these two individuals within the landscape does not met the described habitat for these species. The species profile description describes the habitat as flat areas that are periodically waterlogged, in eucalypt forest, mixed forest and *Melaleuca* woodland with a sparse and grassy understorey on poorly draining, heavy clay soils (DES, 2021c). The landform on site is highly modified and sloping towards the nearby residential street. It is very unlikely that this site would be periodically waterlogged. Based on this there is a low chance of the individuals onsite naturally germinating and forming a viable population.

The third point of the policy statement (Operational policy 'When a protected plant in Queensland is taken to be 'in the wild'') states:

Is the ecological situation in which the plant is found considered natural?

> *The plant should be found in a relatively natural ecological situation (e.g. in bushland) to be considered 'in the wild'. Generally speaking, planted vegetation is not considered 'in the wild' (see 1 for an exception), unless it has matured and is part of a relatively natural ecological community.*

Based on the lack of suitable habitat for this species and the low likelihood of becoming part of a self-sustaining *'relatively natural ecological community',* these individuals are not likely to be considered 'in the wild'.

Plate 3-4 *Melaleuca irbyana* individuals recorded within the Project area

Although the chosen site for these planted individuals does not meet the habitat requirements for this species, suitable habitat for this species was recorded further south in the Subsequent study areas and therefore this species was rated as likely to occur. The largest area of suitable habitat is located on the alluvial flats around Scrubby Creek, including Nealdon Park, Battle Park and adjacent areas (Ch 29,300 m) (Figure 3-3 and Plate 3-5). Historical records are located both north and south outside of the Study corridor at this location (Figure 3-3).

Plate 3-5 Suitable habitat for *Melaleuca irbyana* within the Project area

Rhodamnia rubescens – Confirmed not 'in the wild'

Rhodamnia rubescens is listed as critically endangered under the NC Act.

One *Rhodamnia rubescens* individual was also recorded from the same planted area of (Ch 21,300 m) Lot 2 on RP897149 (refer to Figure 3-3). Similar to *Melaleuca irbyana,* this species has been planted outside of its natural habitat. The likelihood of occurrence assessment considered this 'may occur' within the Study corridor due to the absence of nearby previous records and only marginally suitable habitat present around Scrubby Creek.

The individual recorded within the Subsequent study area was juvenile within a tree guard and in very poor health (refer to Plate 3-6). The species is very susceptible to *Austropuccinia psidii* (Myrtle rust) with the impact evident on this individual with only a few leaves remaining. Habitat for this species is recorded littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils (NSW OEH, 2021). Based on this, habitat within the Subsequent study areas is limited to riparian zones on alluvial soils. This species is unlikely to become part of a self-sustaining 'relatively natural ecological community' Although not evident at the time the younger planted species within the lot may still be under periodic maintenance (i.e. weed control) based on the type of reserve as a public amenity.

Plate 3-6 *Rhodamnia rubescens* individual recorded within the Project area

Gossia gonoclada – Likely to occur

Gossia gonoclada is listed as endangered under the EPBC Act and NC Act.

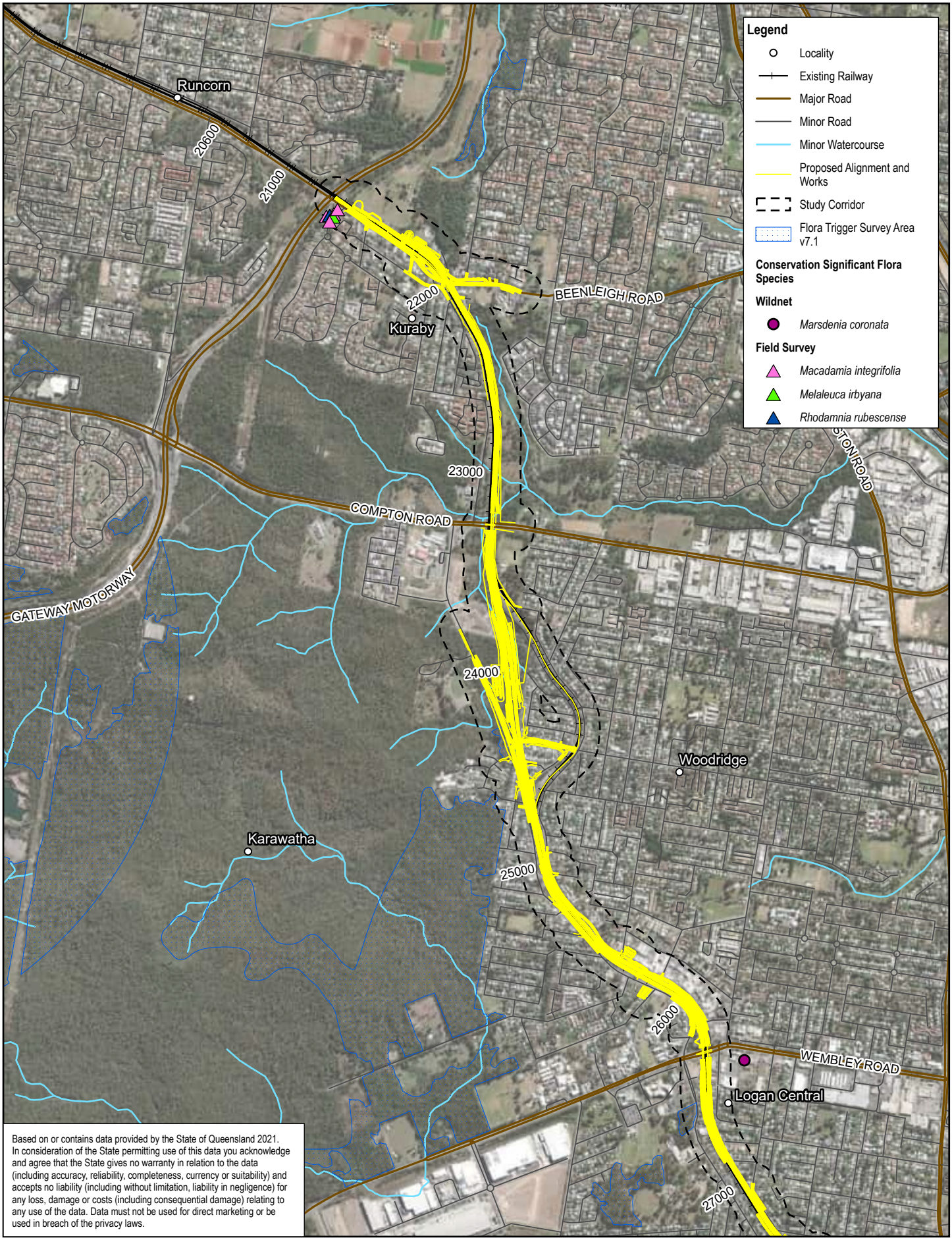
Gossia gonoclada was considered likely to occur within the Study corridor based on nearby historical records and the presence of suitable habitat. This species is recorded as occurring along permanent watercourses subject to tidal influence in lowland riparian rainforest and notophyll vine forest. Usually found between 5-50 m below the peak flood level, on steep slopes. It occurs on moderately well drained clay soils, sandy loams and alluvial soils (DES, 2021c). No *Gossia gonoclada* individuals were recorded from the Project area however marginally suitable habitat for this species was recorded present along waterways within the Project area. The nearest historical record of *Gossia gonoclada* is recorded from RE 12.3.7a located on the edge of the Logan river. One vegetation community within the Study corridor also along the Logan River is mapped as similar RE 12.3.7 and was assessed for suitability. The RE was, in part, confirmed as RE 12.3.7 however due to a very high presence of invasive species the habitat was considered to be very degraded and less likely to contain *Gossia gonoclada*. An additional area located along Scrubby Creek was considered to be marginally suitable habitat for this species, however evidence of a recent fire in part would exclude some of these areas.

Coleus habrophyllus – Likely to occur

Coleus habrophyllus is listed as endangered under the EPBC Act and NC Act.

Coleus habrophyllus was considered likely to occur within the Project area based on nearby historical records and the presence of suitable habitat. No *Coleus habrophyllus* individuals were recorded from the Study corridor however marginally suitable habitat for this species was recorded present from a restricted area of the Subsequent study area. This species is recorded as growing on chert or sandstone outcrops, in open woodlands often in shaded situations near vine forest, as stated in the Species Profile (DAWE, 2021). Although no associated vine forest was recorded, one area noted as potential habitat was recorded at Ch 23,450 (refer to Plate 3-7). The remainder of the Subsequent study areas were located on low lying areas with no rocky outcrops.

Plate 3-7 Potential habitat for *Coleus habrophyllus*



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Grid: GDA 1994 MGA Zone 56

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(Kuraby to Beenleigh) Project

Conservation significant flora values within the study corridor

Project No. **12534697**
Revision No. **2**
Date **9/08/2021**

FIGURE 3-3a

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Print date: 09 Aug 2021 - 16:40

Data source: DoR: Locality, Roads, Railway, Watercourse (2020); DES: Flora Trigger Area v7.1 (2020), Wildnet Records (2021); GHD: Proposed Alignment, Study Area, CSS Flora Field Records (2021); ESRI World Imagery: Maxar. Created by: xlee

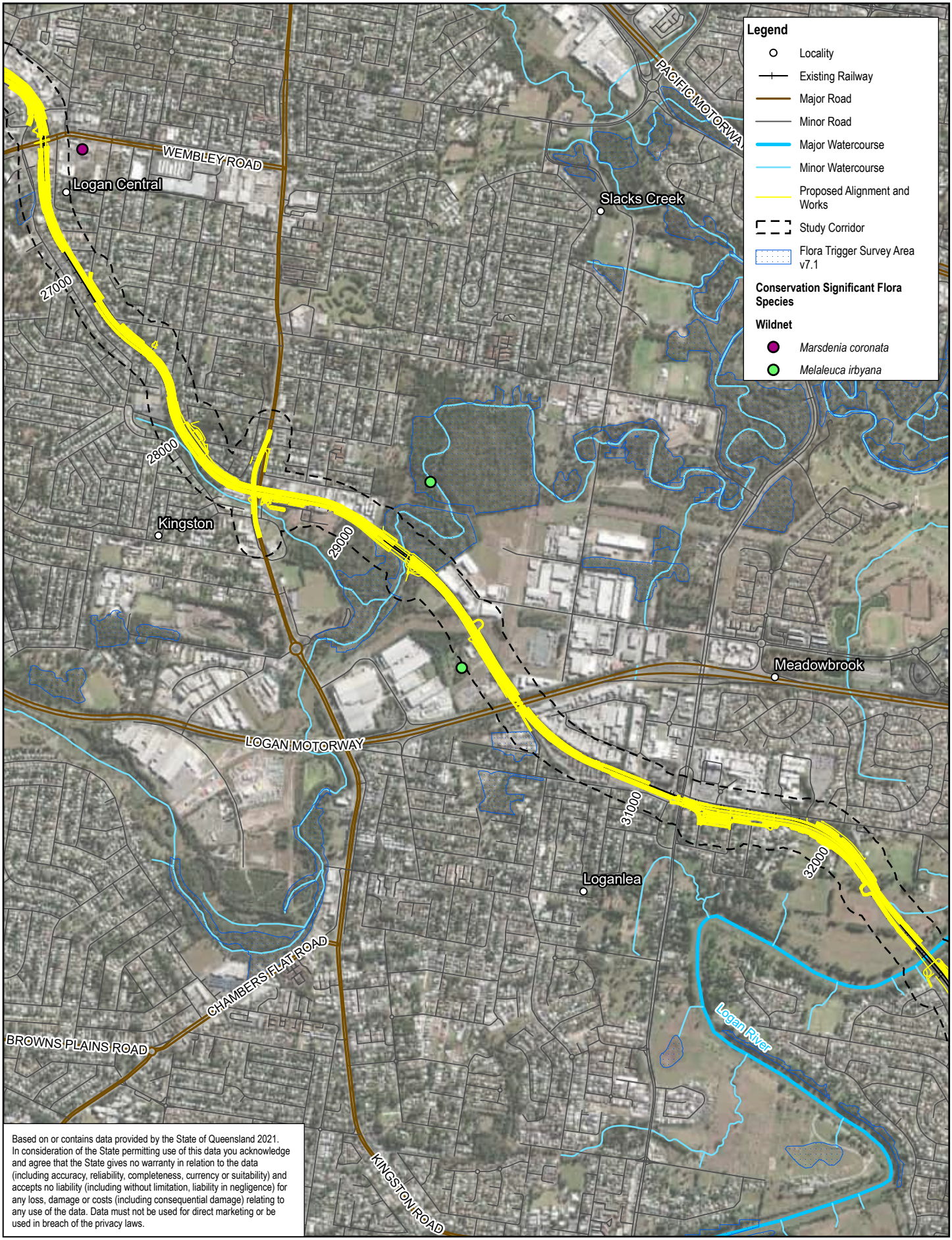

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FIGURE 3-3b

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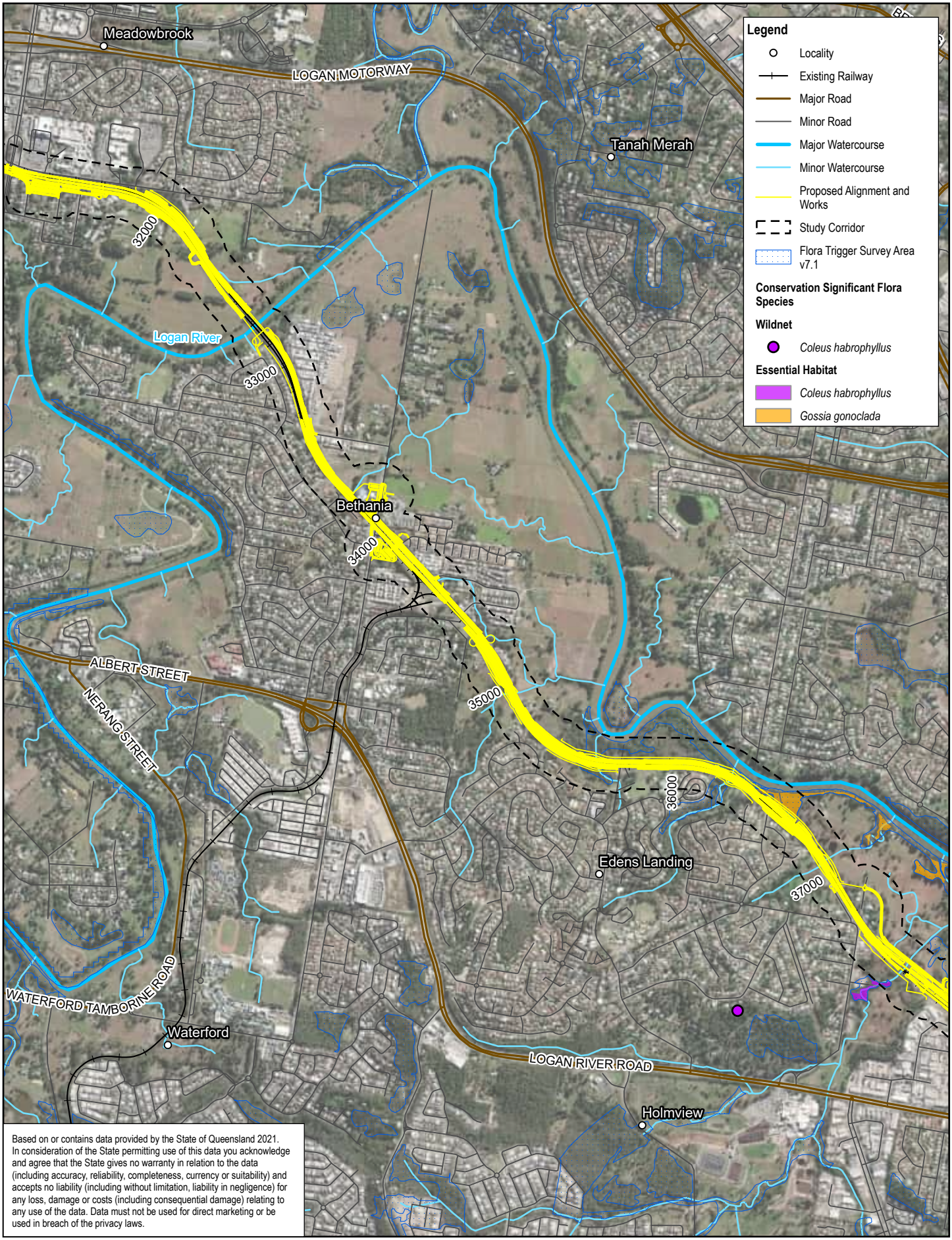

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Map Projection: Transverse Mercator
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Conservation significant flora values within the study corridor

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FIGURE 3-3c

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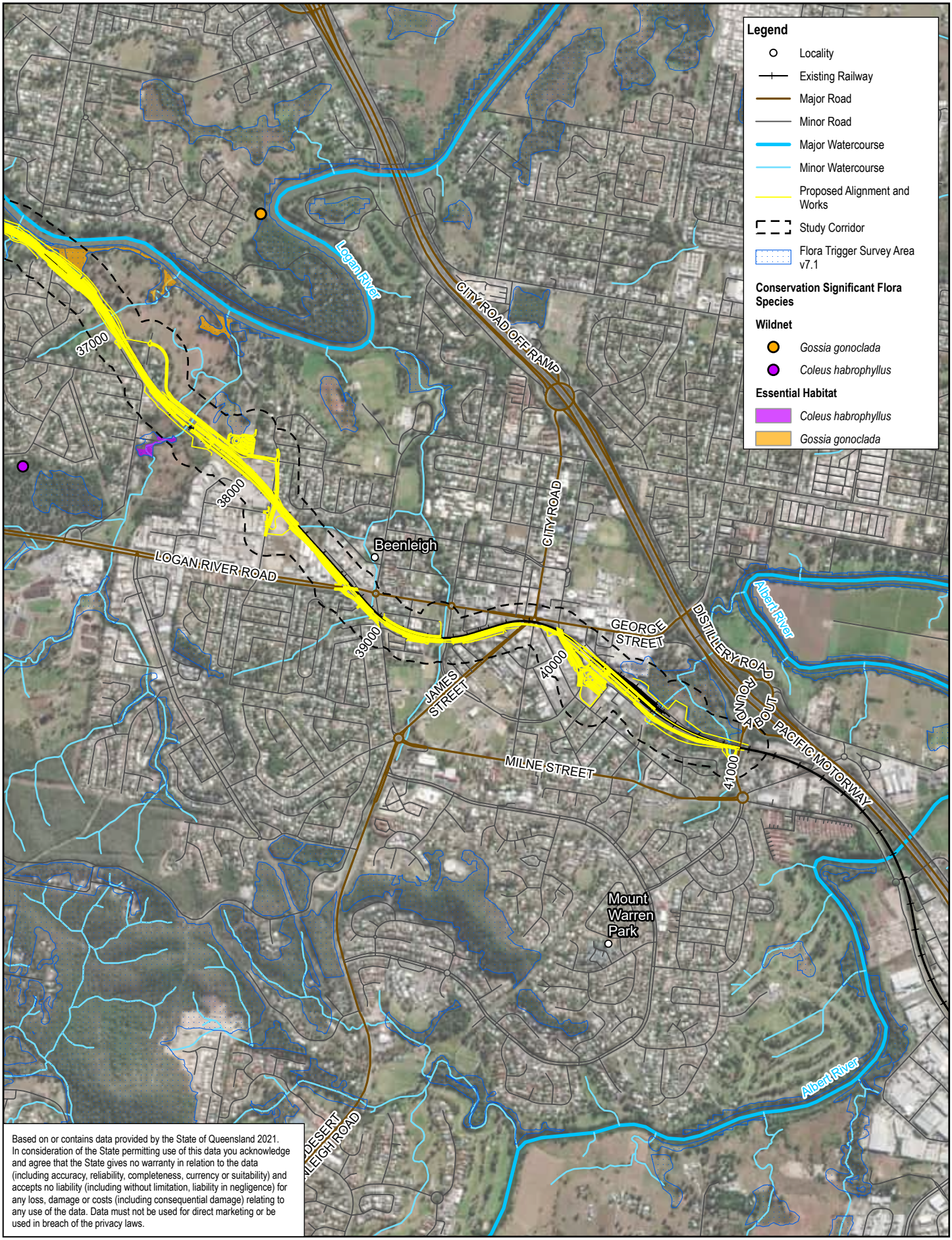

Paper Size ISO A4

0 200 400 600 800

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
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FIGURE 3-3d

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Data source: DoR: Locality, Roads, Railway, Watercourse (2020); DES: Flora Trigger Area v7.1 (2020), Wildnet Records (2021); GHD: Proposed Alignment, Study Area, CSS Flora Field Records (2021); ESRI World Imagery: Maxar. Created by: xlee

3.6 Fauna and fauna habitats

3.6.1 Essential habitat

Seven conservation significant fauna species have essential habitat mapped within or adjacent to the Study corridor, as shown on DoR's regulated vegetation management mapping (Figure 3-4).

Essential habitat for the koala (*Phascolarctos cinereus*) widely occurs across the Subsequent study areas and is mapped on 46 properties (Table 3-6 and Figure 3-4). These areas exist as remnants patches of mixed eucalypt woodland and provide essential habitat for other arboreal mammal species such as the greater glider (*Petauroides volans*). Essential habitat for both species is contained within Karawatha Forest Park, Acacia Forest Park and along Scrubby Creek, which contained remnant woodlands of high ecological value. The woodlands along Scrubby Creek also contain essential habitat for the powerful owl (*Ninox strenua*) and the swift parrot (*Lathamus discolor*). Essential habitat for the glossy black-cockatoo (*Calyptorhynchus lathami*) was also mapped in eucalypt woodlands which supported a dense stratum of *Allocasuarina*, particularly within Karawatha Forest Park and Acacia Forest Park. Several waterways and drainage lines also occur within the Subsequent study areas that have the potential to support conservation significant amphibians, with essential habitat for the wallum froglet (*Crinia tinnula*) and tusked frog (*Adelotus brevis*) present within the Study corridor. Essential habitat for the tusked frog is mapped along the banks of the Logan River, near the existing Edens Landing station. Similarly, essential habitat for the wallum froglet is mapped with Karawatha Forest Park, Slacks Creek, Scrubby Creek, Wally Tate Park and Hugh Muntz Gardens in Beenleigh.

These species, their essential habitat requirements and the intersect property lots are summarised below in Table 3-6 and displayed in Figure 3-4.

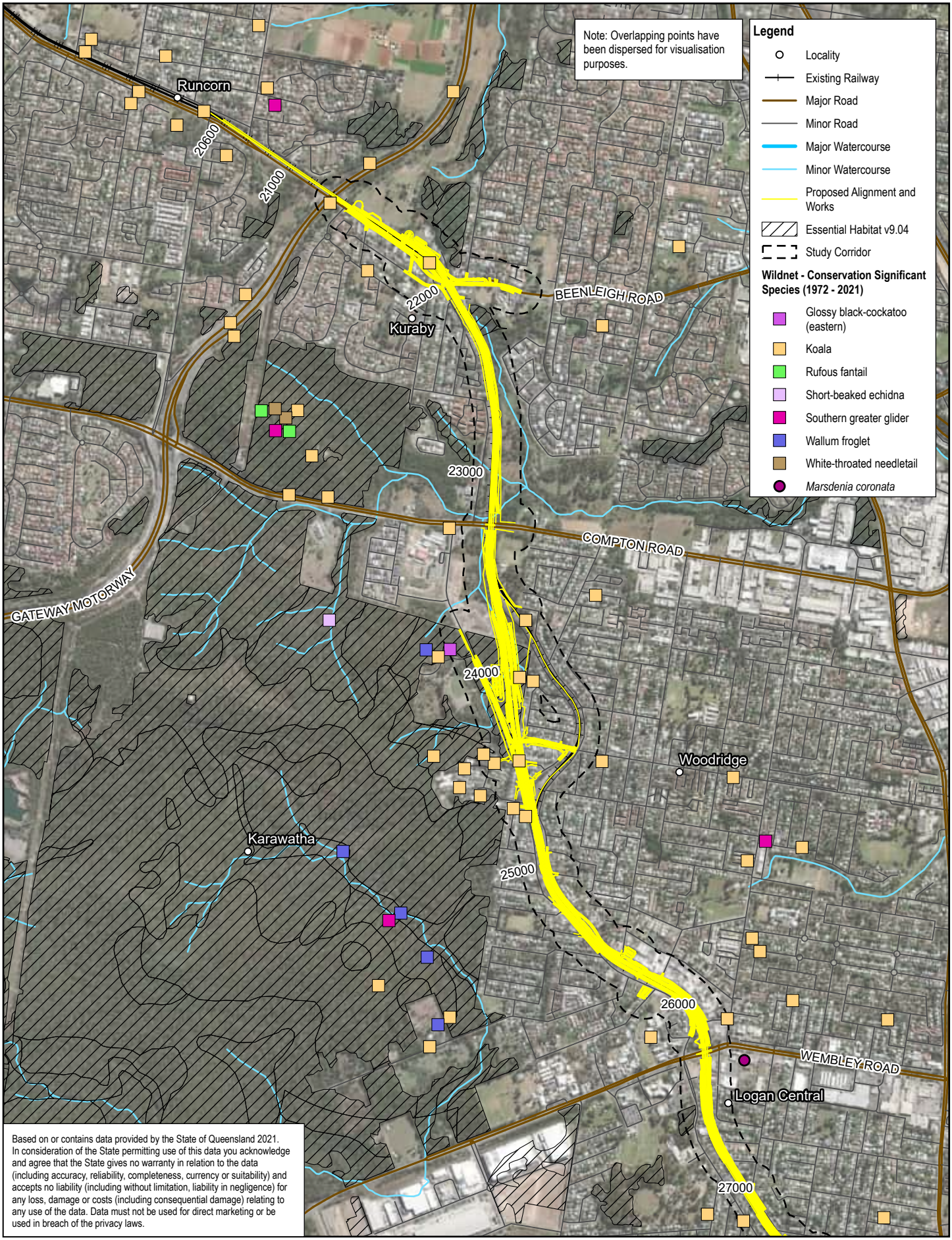
Table 3-6 Essential habitat within the Study corridor

Species	Conservation status		Essential habitat within the Project area	Habitat requirements
	EPBC Act	NC Act		
Fauna				
Glossy black-cockatoo *Calyptorhynchus lathami*	NL	V	2RP54123, 2RP173106, 3RP852745.	Lowland and highland eucalypt forest and woodland, including riparian, and brigalow scrub areas, with *Casuarina* (*C. glauca, C. cristata*)/*Allocasuarina* spp. (*A. torulosa, A. littoralis*). Nest in large vertical hollow up to 28 m above ground in tall slightly isolated tree usually near principal food source (*Allocasuarina/Casuarina*).
Greater glider *Petauroides volans*	V	V	2RP54123, 2RP173106, 2RP220135, 3RP852745, 72SP123137.	Tall mature open wet and dry eucalypt forest (*Eucalyptus* and/or *Corymbia* spp.) to low open eucalypt woodland; presence of hollow-bearing trees. Sea level to 1300 m. Usually on soils of relatively high fertility.

Species	Conservation status		Essential habitat within the Project area	Habitat requirements
	EPBC Act	NC Act		
Koala *Phascolarctos cinereus*	V	V	1RP8071, 1RP8072, 1RP80326, 1RP115298, 1RP157296, 1RP856096, 1SP307207, 2RP54123, 2RP168714, 2RP173106, 2RP220135, 2SP145849, 3RP203428, 3RP852745, 4RP203428, 7SP145849, 8RP219577, 8RP234019, 12SP106873, 13SP106873, 14RP209342, 14SP106873, 15SP114587, 16SP114587, 17SP100590, 21SP122200, 38SP190117, 42SP154633, 70SP109404, 72SP109405, 72SP123137, 135CP827105, 144RP37390, 145RP37390, 146RP37390, 147RP37390, 148RP37390, 149RP37390, 150RP37390, 151RP37390, 152RP99345, 154RP99345, 752SP222159, 941RP849310, 949RP849309, 950RP849297.	Open eucalypt forest and woodland that has: a) multiple strata layers containing *Eucalyptus, Corymbia, Angophora, Lophostemon* or *Melaleuca* trees that-at 1.3 metres above the ground-have a diameter both greater and less than 30 centimetres; and b) at least 1 of the following species: *Eucalyptus tereticornis, E. fibrosa, E. propinqua; E. umbra, E. grandis, E. microcorys, E. tindaliae, E. resinifera, E. populnea, E. robusta, E. nigra, E. racemosa, E. crebra, E. exserta, E. seeana, Lophostemon confertus, L. suaveolens, Melaleuca quinquenervia*
Powerful owl *Ninox strenua*	NL	V	2RP54123.	Occurs in gullies with wet and dry tall open eucalypt forest, including mountain forest gullies/gorges; forests aged 60+ years (large and old) on fertile soils with suitable hollows; roosting in dense foliage of closed forest (occasionally caves) and foraging in open forest and woodland including areas adjacent to urban/rural development. Nest in large hollows above ground, in large (>100 cm dbh) old eucalypts on the side or at the head of heavily wooded gully.

Species	Conservation status		Essential habitat within the Project area	Habitat requirements
	EPBC Act	NC Act		
Swift parrot *Lathamus discolor*	CE	E	1RP174366, 1RP856096, 2RP220135, 5SP291890, 6SP291890, 7SP291890, 14RP209342, 135CP827105.	Inhabits box-ironbark dry open eucalypt forest and woodland, including *Eucalyptus sideroxylon, E. microcarpa* and *E. albens, E. melliodora*, with profuse flowering; especially those on high fertility soils (generally large trees); in coastal areas visits *E. robusta, E. tereticornis* and *Corymbia citriodora/maculata*. Does not breed in Queensland.
Tusked frog *Adelotus brevis*	NL	V	1RP8071, 1RP8072, 1RP115298, 1RP157296, 7SP145849, 8RP219577, 15SP114587, 17SP100590.	Species occurs on cavities, under debris (logs, stones) in subtropical vine forest, tall open moist forest, heaths and *Melaleuca* swamp from sea level to 1000 m AHD.
Wallum froglet *Crinia tinnula*	NL	V	2RP54123, 2RP220135, 3RP852745, 8RP234019, 12SP106873, 13SP106873, 14SP106873, 38SP190117,	Vegetation community is a mandatory essential habitat factor for this species. Permanent to ephemeral acidic (pH 4.3 – 5.2), soft freshwater in *Melaleuca* (e.g. *M. quinquenervia*) swamps, sedgeland, wet and dry heathland and wallum (*Banksia aemula* shrubland/woodland) areas coastal lowlands on sand or sandstone, occasionally in adjacent open forest/woodland (e.g. *Eucalyptus racemosa, Corymbia citriodora*) with heathy understorey; known to persist in small remnants (<10 ha); may be found well away from water.

Key to table: CE = Critically Endangered, E = Endangered, V = Vulnerable, NL = Not Listed.



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Essential habitat and Wildnet records

FIGURE 3-4a

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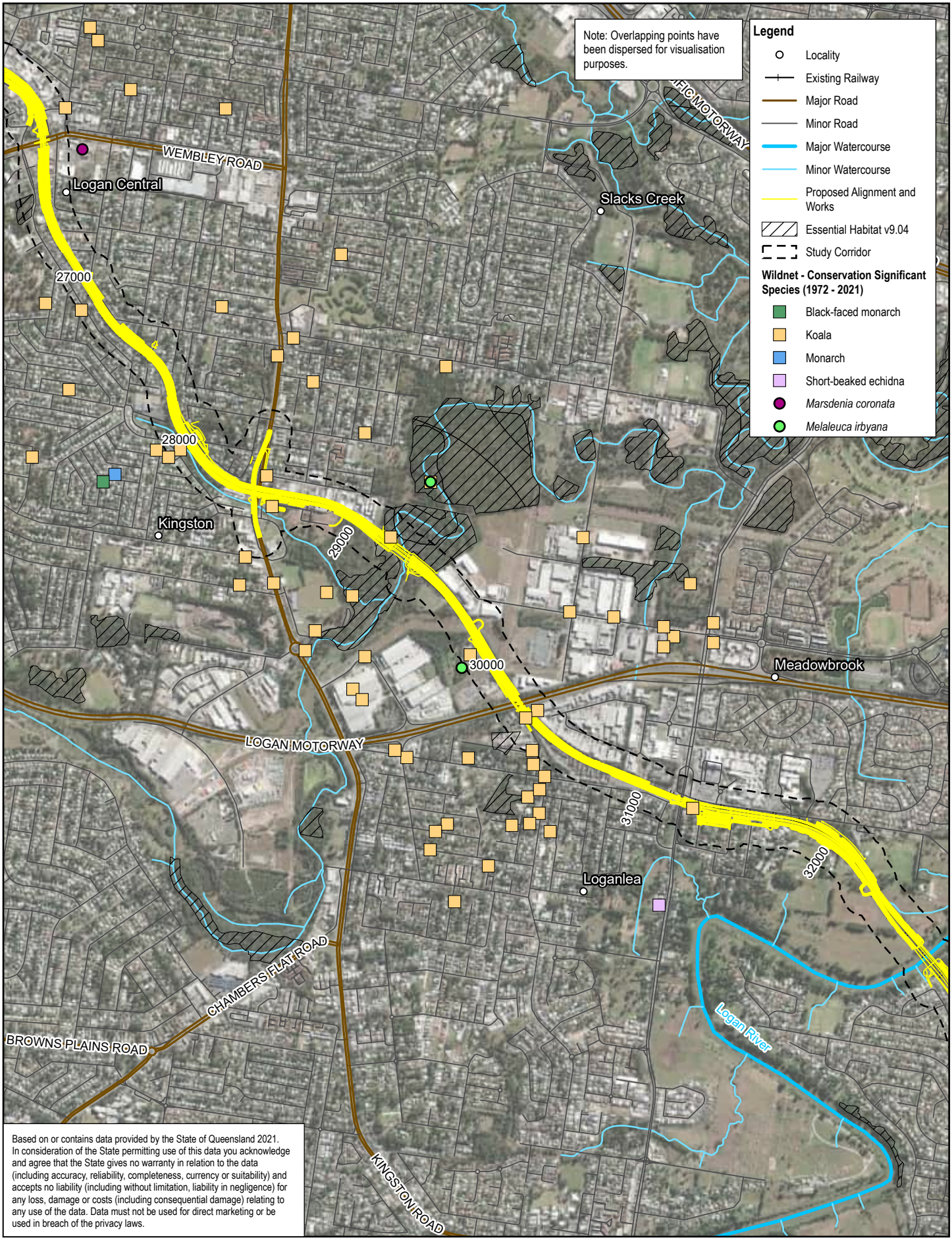
Print date: 09 Aug 2021 - 16:15

Data source: DoR: Locality, Roads, Railway, Essential Habitat v9.04, Watercourses (2020); DES: Wildnet Records (2021); GHD: Proposed Alignment, Study Area (2021); ESRI World Imagery: Maxar. Created by: xlee



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Essential habitat and Wildnet records

FIGURE 3-4b

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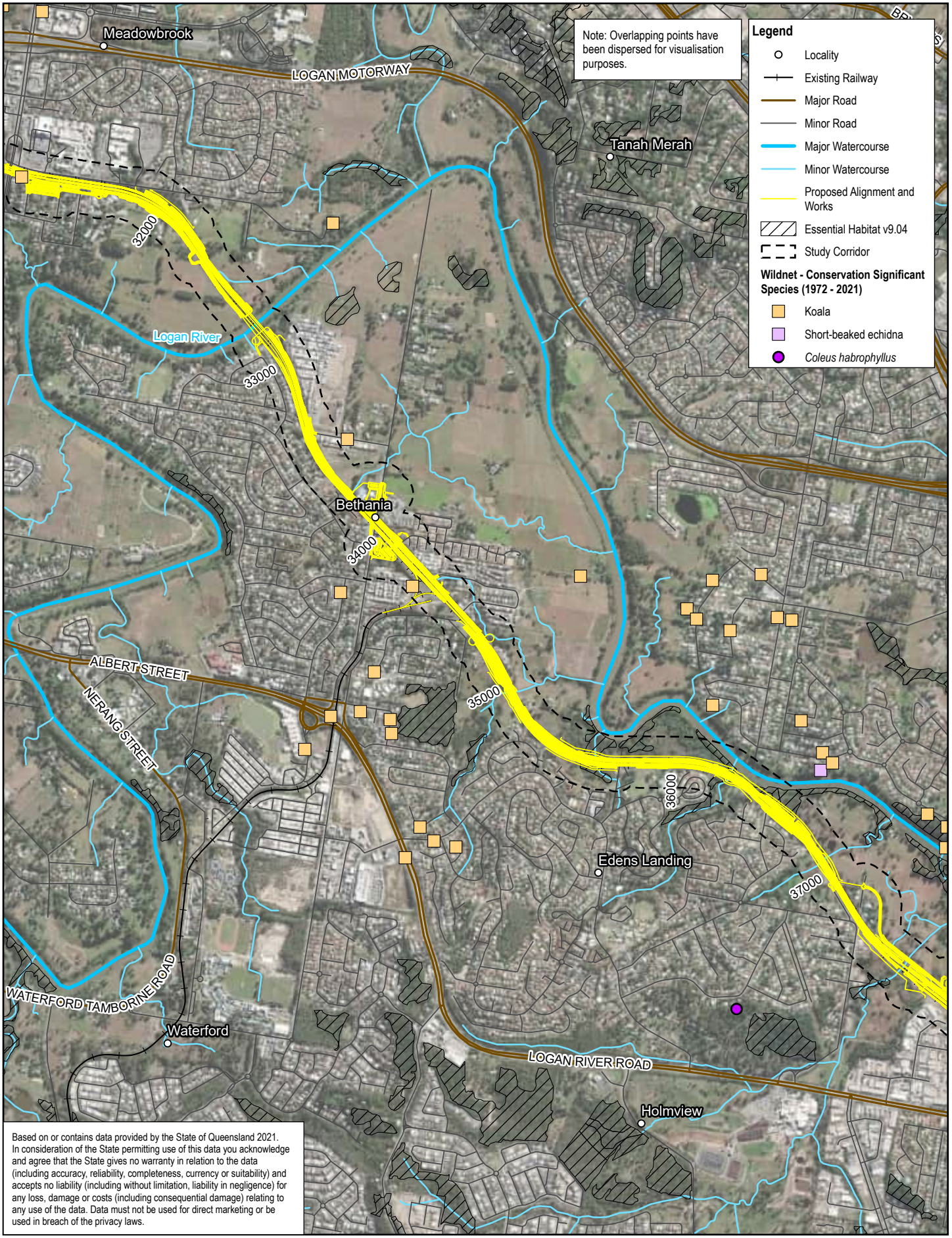
Data source: DoR: Locality, Roads, Railway, Essential Habitat v9.04, Watercourses (2020); DES: Wildnet Records (2021); GHD: Proposed Alignment, Study Area (2021); ESRI World Imagery: Maxar. Created by: xlee



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Essential habitat and Wildnet records

FIGURE 3-4c

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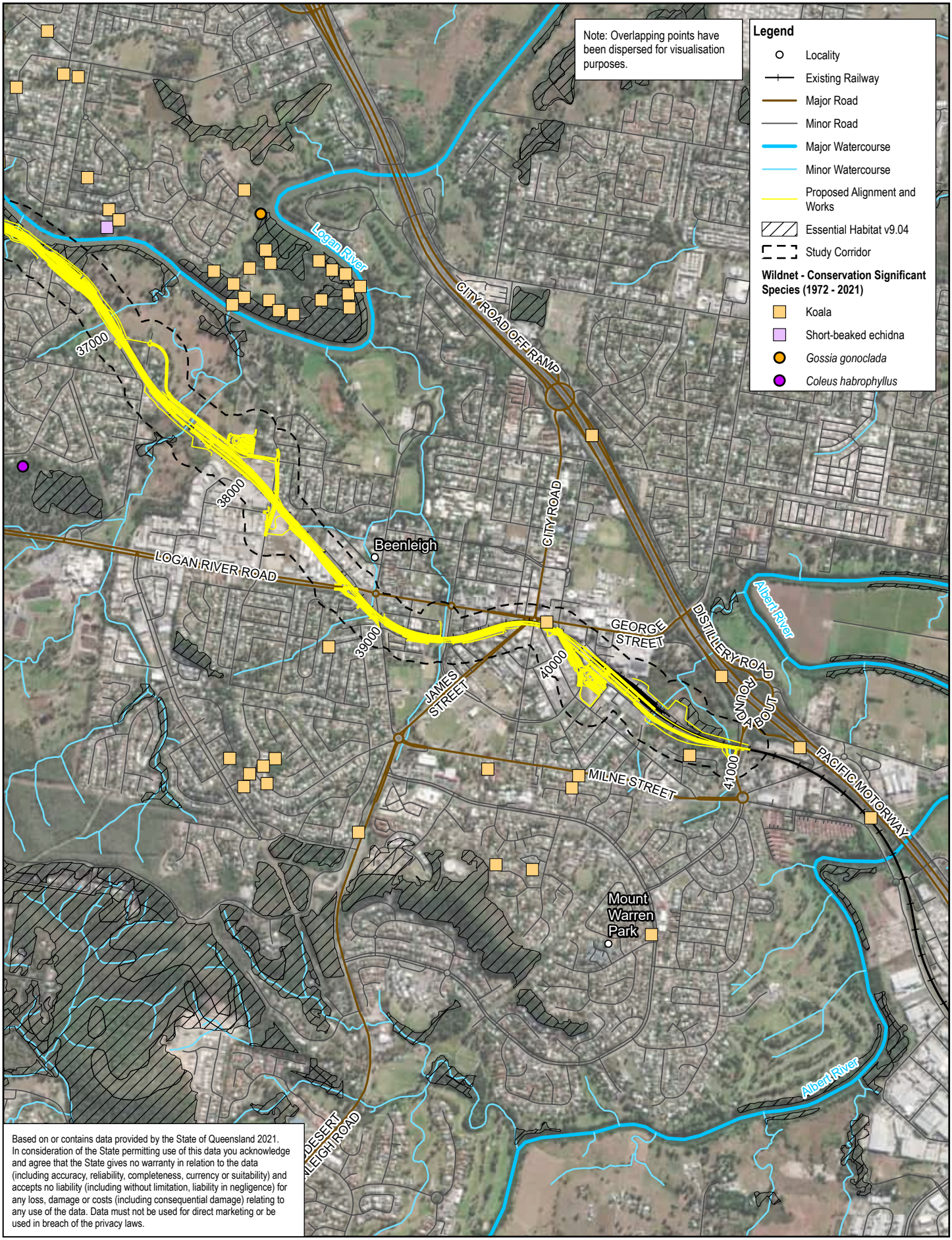
Data source: DoR: Locality, Roads, Railway, Essential Habitat v9.04, Watercourses (2020); DES: Wildnet Records (2021); GHD: Proposed Alignment, Study Area (2021); ESRI World Imagery: Maxar. Created by: xlee



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Essential habitat and Wildnet records

FIGURE 3-4d

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3.6.2 Fauna habitats

The Subsequent study areas support a diverse range of habitats, ranging from highly urbanised parklands to remnant eucalypt woodlands and wet *Melaleuca* forests (Table 3-7).

Despite the ever-increasing urbanisation and development occurring within the region, mature patches of eucalypt woodlands remained in several of the Subsequent study areas. These areas, particularly Acacia Forest Park, Nealdon Park and Wally Tate Park supported remnant eucalypt woodlands that reflect vegetation communities that were once widespread within the south east Queensland region. Where the Study corridor extends along small order streams and ephemeral waterbodies, the fringing vegetation transitions from dry eucalypt woodlands into wet *Melaleuca* forests that dominated the temporarily inundated ecosystems. This habitat type was particularly dominant along Spring Creek and Scrubby Creek, and contained occasional patches of sedge, reeds and rushes. In areas of lower moisture content, *Allocasuarina* occupied the lower canopy layer and occasionally formed dense monocultures of *Allocasuarina* woodlands. Whilst these vegetation communities were also identified along road edges and in narrow corridors between residential areas, such areas were often impacted by anthropogenic pressures and we highly degraded. Regardless, these areas still had the potential to provide linking habitat for native fauna and facilitate fauna movement throughout the Study corridor. In total, ten habitat types were observed within the Subsequent study areas, including:

- Permanent watercourses with fringing riparian vegetation
- Mixed eucalypt woodlands
- Eucalyptus woodland with dense *Allocasuarina* understorey
- Densely vegetated wetland
- Small order streams and ephemeral waterbodies
- Routinely managed parklands and open spaces
- Wet eucalypt woodland and *Melaleuca* woodland
- *Allocasuarina* woodland
- Degraded forest remnants
- Introduced grassland patches.

A summary and representative photograph of the fauna habitats recorded within the Subsequent study areas is presented in Table 3-7 and illustrated in Figure 3-5.

Table 3-7 Fauna habitat types observed within the Subsequent study areas

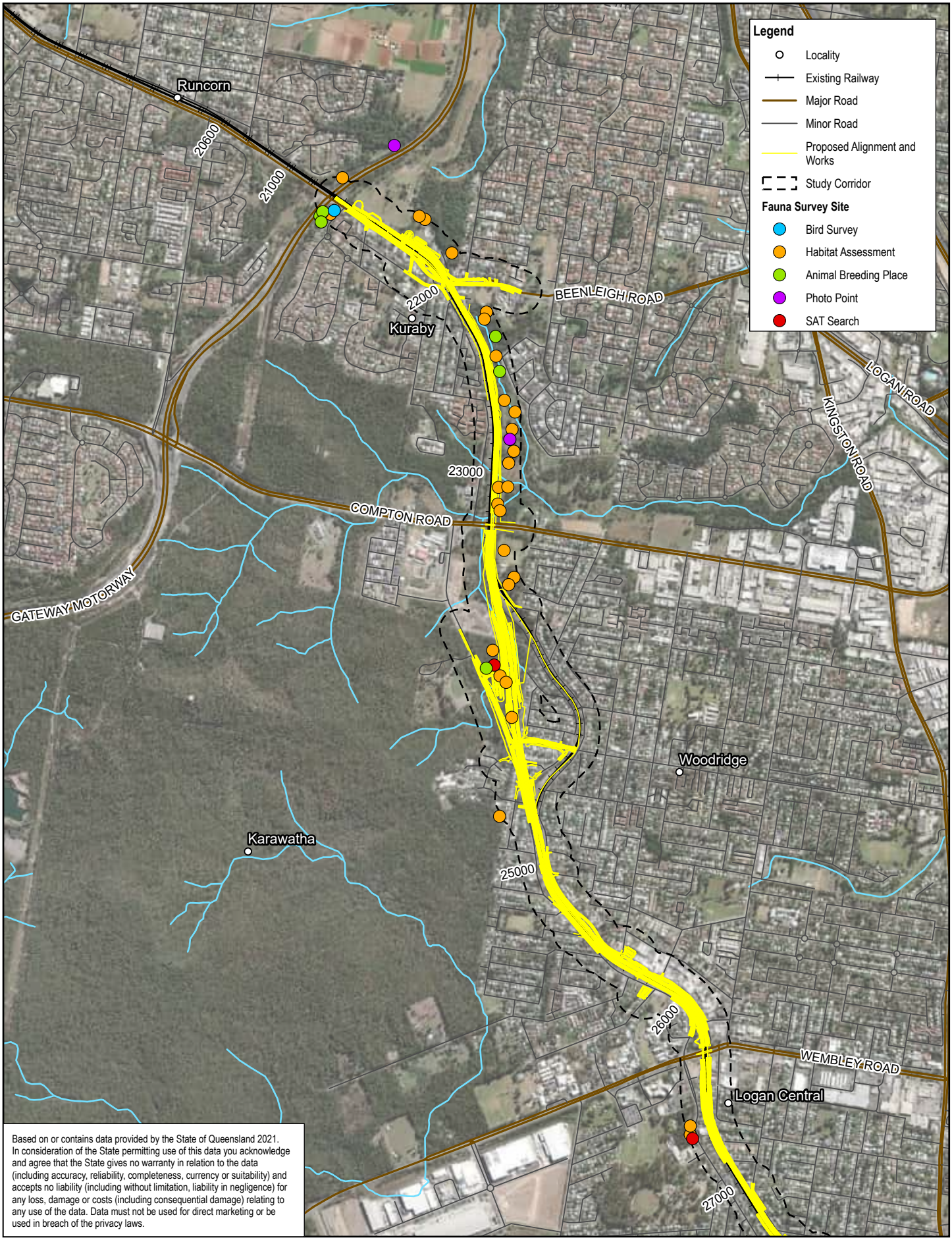
Habitat type	Habitat characteristics	Ecological value
Permanent watercourses with fringing riparian vegetation		
	• Riparian vegetation supported remnant woodlands. • Contained a variety of aquatic habitats (e.g. deeper pools, riffles). • Soft sandy substrate suitable for burrowing. • Supported dense clusters of aquatic surface plants. • Hollows occasionally present in fringing vegetation. • Important for urban storm / flood mitigation.	• Suitable foraging and breeding habitat for amphibians. • Drinking sites for birds and mammals. • Provided habitat for aquatic reptiles and frog-eating snakes. • Providing habitat continuity and continued fauna movement/dispersal pathways. • Foraging and roosting habitat and potential flyways for microbats. • Conservation significant species – wallum froglet and migratory bird species.
Mixed eucalypt woodlands		
	• Canopy layer mostly dominated by mixed eucalypt species. • Dense stratum of *Allocasuarina* beneath canopy. • Logs, woody debris and other complex ground-level microhabitats present in high densities. • Canopy layer representing the dominant vegetative strata.	• Provides important habitat connectivity for woodland species. • Suitable nesting habitat for a diversity of woodland birds. • Complex ground level microhabitats. • Nesting and foraging habitat for canopy-dwelling birds. • Refuges and basking areas for snakes, dragons, skinks and geckos. • Conservation significant species – koala and glossy black-cockatoo.

Habitat type	Habitat characteristics	Ecological value
Eucalyptus woodland with dense *Allocasuarina* understorey		
	• Canopy layer mostly dominated by mixed Eucalypt species. • Dense stratum of *Allocasuarina* beneath canopy. • Logs, woody debris and other complex ground-level microhabitats present in high densities. • Canopy layer representing the dominant vegetative strata. • Occasional hollows present.	• Provides important habitat connectivity for woodland species. • Suitable nesting habitat for a diversity of woodland birds and obligate-hollow nesters. • Complex ground level microhabitats. • Nesting and foraging habitat for canopy-dwelling birds. • Refuges and basking areas for snakes, dragons, skinks and geckos. • Conservation significant species – koala and glossy black-cockatoo.
Densely vegetated wetlands		
	• Contained dense populations of cumbungi (*Typha orientalis*) • Holds permanent still or slow-moving bodies of fresh or brackish water with impeded water flow. • Canopy layer absent. • Soft sandy and muddy substrate. • Often situated between eucalypt woodlands and residential developments.	• Suitable foraging and breeding habitat for amphibians. • Drinking sites for birds and mammals. • Suitable breeding and foraging habitat for wetland and aquatic bird species. • Suitable foraging habitat for frog-eating snakes. • Conservation significant species –migratory birds.

Habitat type	Habitat characteristics	Ecological value
Small order streams and ephemeral waterbodies		
	• Situated within low-land depressions and creek overflow areas. • Supports a dense ground and shrub layer. • Contains aquatic and semi-aquatic plants that are absent from the surrounding ecosystems. • Located at lowest point of the landscape and receives surface water runoff from adjacent urban areas. • Frequently encountered between the wetland system and eucalypt woodland patches.	• Drinking sites for birds and mammals. • Suitable foraging and breeding habitat for amphibians. • Suitable breeding and foraging habitat for wetland and aquatic bird species. • Suitable foraging habitat for frog-eating snakes. • Fringing vegetation provide habitat connectivity and dispersal pathways for fauna. • Conservation significant species – wallum froglet and migratory bird species.
Routinely managed parklands and open spaces		
	• Ground-level habitats cleared and lacking structural complexity. • Presence of occasional larger canopy trees. • Ground layer dominated by exotic pasture grasses. • Routinely mowed and/or slashed. • Hollows absent. • Vegetation consisted of common urban planting species (e.g. *Jacaranda* spp.). • Regularly utilised by residents for dog walking and recreational activities.	• Potential movement corridors for birds, reptiles and mammals within urban areas. • Foraging habitat for raptors and birds adapted to open landscapes. • Grasses provide food resources for granivorous birds and herbivorous mammals. • Ground-level habitats lacking structural complexity. • Conservation significant species – none.

Habitat type	Habitat characteristics	Ecological value
Wet eucalypt and *Melaleuca* woodland		
	• Contained a diverse range of rainforest flora species. • Situated along sandy semi-permanently inundated soils. • Occurred along drainage lines and watercourses. • Soft sandy and muddy substrate. • High rates of deposition from flaking melaleuca bark. • Contained a dense ground layer of ferns and bracken.	• Contained a dense, multi-layer canopy • Provided suitable nesting habitat for woodland birds. • Provide habitat connectivity and dispersal pathways for urban fauna. • Potential movement corridors for birds, reptiles and mammals within urban areas. • Potential drinking sites for fauna and place for drought refuge. • Conservation significant species – wallum froglet and koala.
***Allocasuarina* woodlands**		
	• Vegetation community dominated by *Allocasuarina littoralis* (black she-oak) or *A. glauca* (coastal she-oak). • Occasional eucalypt species present • Simple ground-level habitats due to high deposition of Allocasuarina spines. • Often contained a monoculture due to *Allocasuarina* spines suppressing recruitment from other species. • Hollows largely absent.	• Provides important habitat connectivity for woodland species. • Provided foraging resource for dietary specialists (e.g. the glossy black-cockatoo). • Suitable nesting habitat for a diversity of woodland birds. • Conservation significant species – glossy black-cockatoo.

Habitat type	Habitat characteristics	Ecological value
Degraded forest patches		
	• Often situated adjacent to linear infrastructure or within residential areas. • Exposed to increased noise levels • Heavy weed encroachment and degradation. • Increased predation pressure due to domestic dogs and cats. • Accumulation of fallen wooden debris where vegetation has been trimmed / fell. • Occasional patches of open grasslands amongst woodlands.	• Provide habitat connectivity and dispersal pathways for urban fauna. • Grasses provide food resources for granivorous birds and herbivorous mammals. • Sub-optimal nesting habitat for a diversity of woodland birds. • Complex ground-level habitats around fallen woody debris. • Potential refuge habitat for urban fauna. • Potential conservation significant species – none.
Introduced grassland patches		
	- Larger, open space mostly devoid of trees and shrubs. - Provide foraging habitat for birds and small herbivorous mammals. - Heavily degraded by exotic grasses and introduced flora. • Situated in isolated patches surrounded by eucalypt woodlands or degraded forest remnants. • Likely to have formed following clearing or previous earthworks / development.	• Foraging habitat for raptors and birds adapted to open landscapes. • Grasses provide food resources for granivorous birds and herbivorous mammals. • Potential conservation significant species – none.



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Distribution of fauna habitats

FIGURE 3-5a

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Print date: 09 Aug 2021 - 16:31

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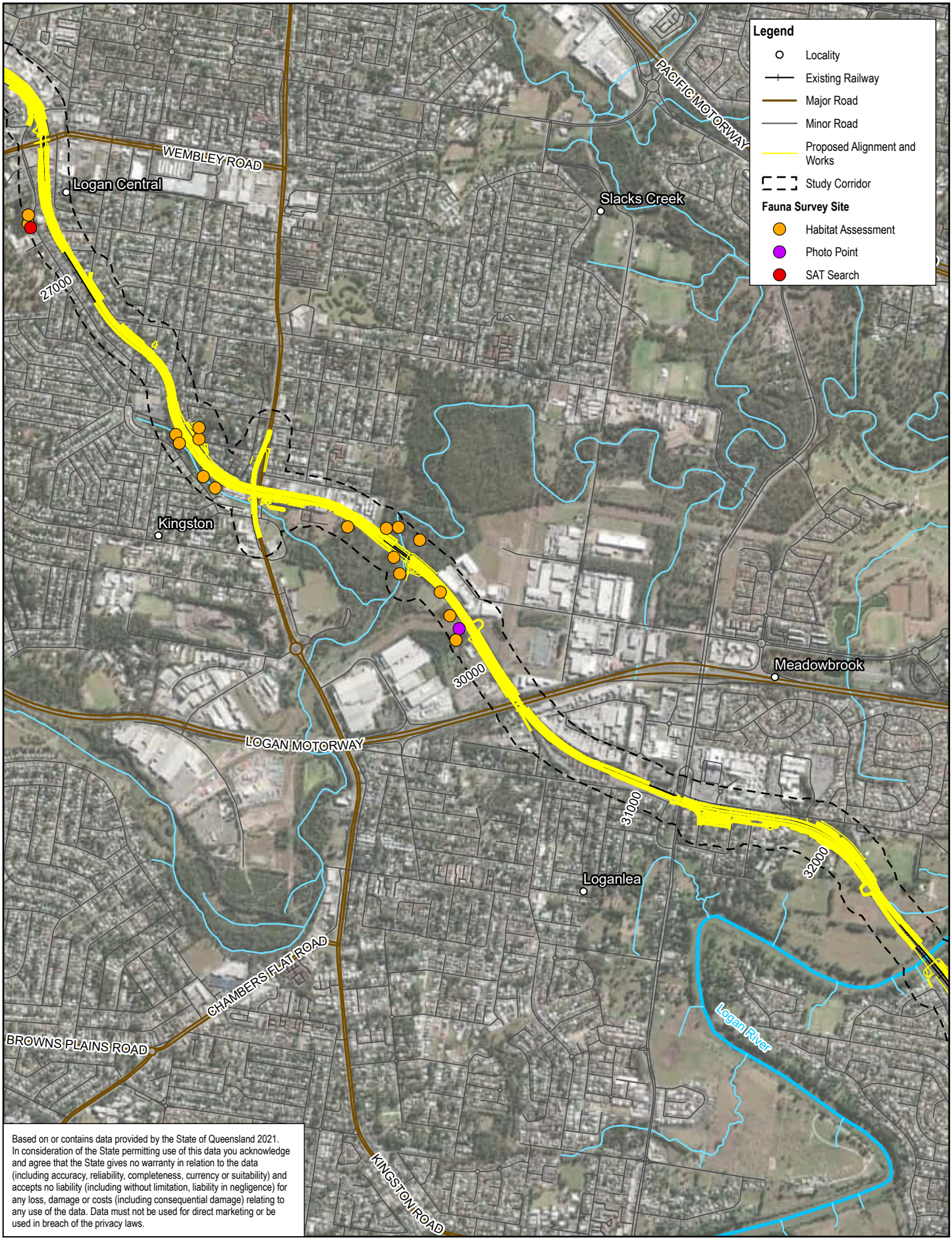

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Distribution of fauna habitats

FIGURE 3-5b

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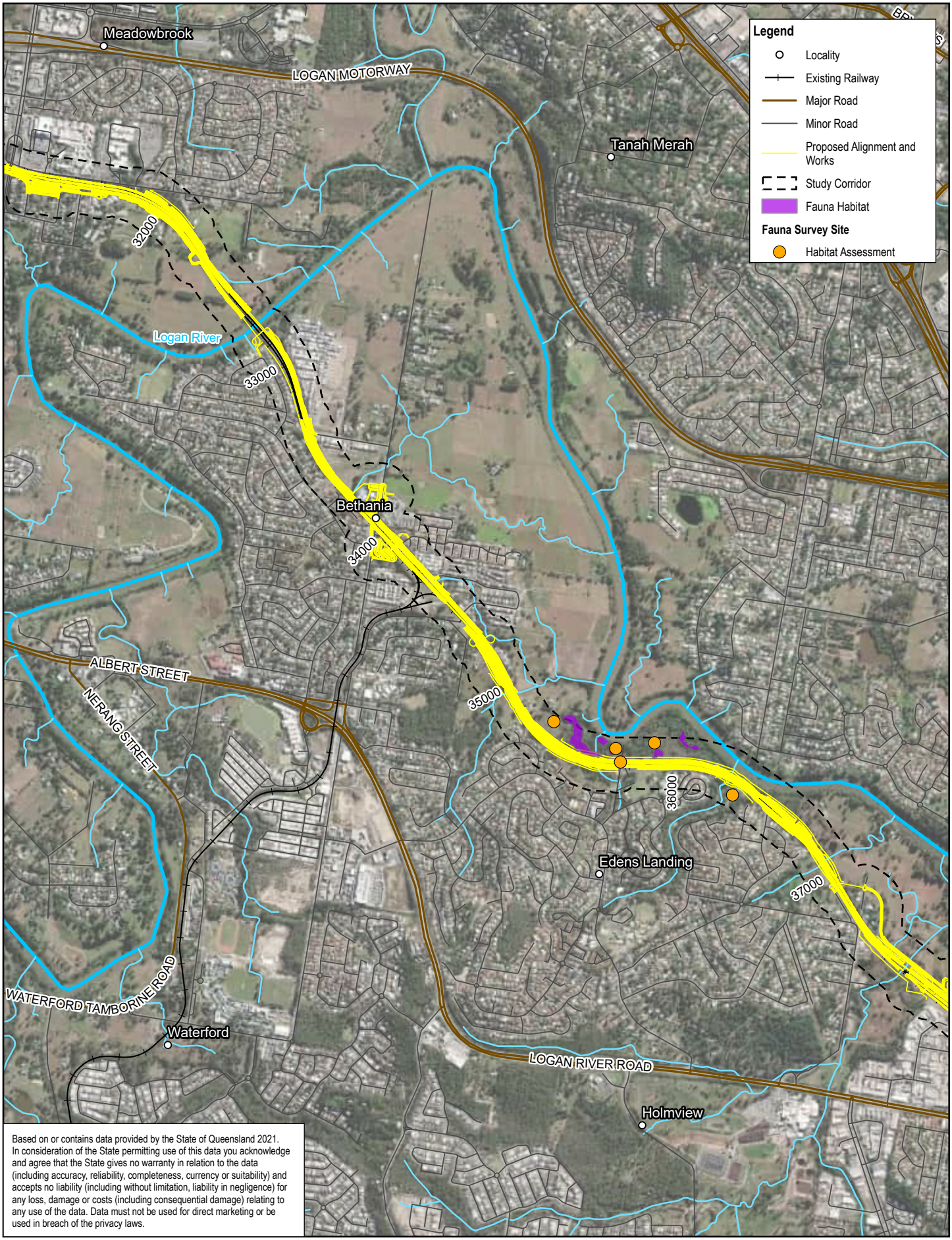

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Distribution of fauna habitats

FIGURE 3-5c

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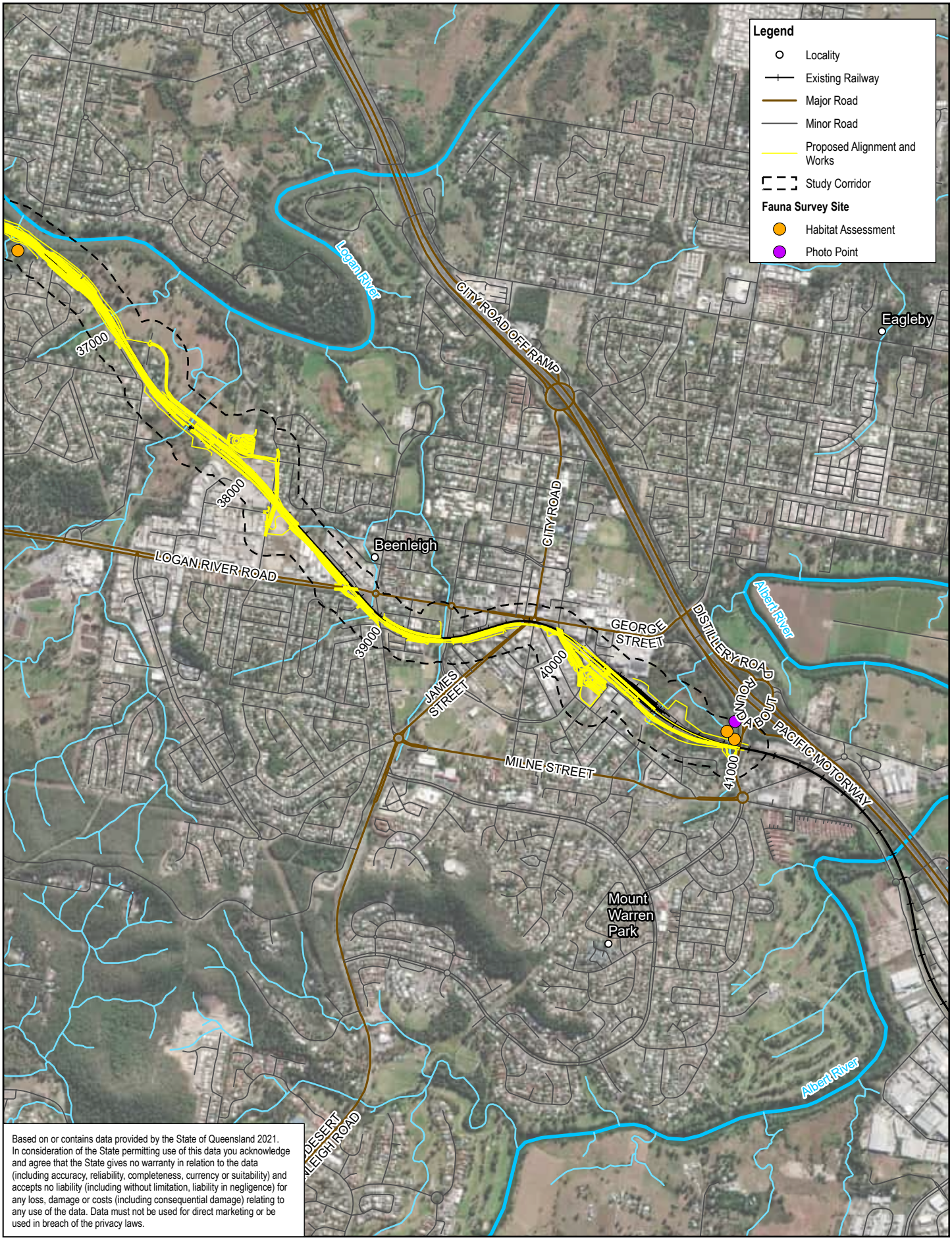

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Distribution of fauna habitats

FIGURE 3-5d

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3.6.3 Fauna communities

Birds

One conservation significant bird species was recorded during field surveys, this being, the glossy black-cockatoo (*Calyptorhynchus lathami*). The glossy black-cockatoo is listed as Vulnerable under the NC Act. No additional conservation significant bird species were assessed as likely to occur based on the presence of suitable habitats or historical records (Appendix C).

Remnant woodlands within the Subsequent study areas supported a diversity of woodland birds that inhabit multiple different vegetation strata. Frequently encountered species included the rainbow lorikeet (*Trichoglossus moluccanus*), sulphur crested cockatoos (*Cacatua galerita*), Lewin's honeyeater (*Meliphaga lewinii*), torresian crow (*Corvus orru*), spangled drongo (*Dicrurus bracteatus*) and black-faced cuckoo-shrike (*Coracina novaehollandiae*). Woodland patches with a complex shrub layer supported a high diversity of finches and wrens, particularly variegated fairy wrens (*Malurus lamberti*), red-backed fairy-wren (*Malurus melanocephalus*), superb fairy wren (*Malurus cyaneus*) and red-browed finches (*Neochmia temporalis*) (Plate 3-8). Watercourses, drainage lines and wetland areas provided both ephemeral and permanent sources of water, and therefore, supported a variety of aquatic and wetland avifauna, including cormorants (*Phalacrocorax* spp.), Australian wood ducks (*Chenonetta jubata*) (Plate 3-8), purple swamphens (*Porphyrio porphyrio*), collared kingfishers (*Todiramphus chloris*) and pied cormorants (*Phalacrocorax varius*). Overall, the most frequently encountered bird species were those considered highly adapted to the urban areas and characteristic species for the urban and bushland interphase.

Plate 3-8 Birds observed within the Subsequent study areas – clockwise from top left: Australian wood duck, red- browed finch **Lewin's honeyeater** and laughing kookaburra

Reptiles

No conservation significant reptiles were recorded during field surveys or assessed as likely to occur in the likelihood of occurrence assessment due to a lack of suitable habitat (Appendix C).

Five species of reptile were recorded during field surveys, with most species encountered within eucalypt woodlands and along riparian corridors. Within woodland habitats, complex groundcover provided refuge for a variety of small reptilian species, with the open-litter rainbow skink (*Morethia boulengeri*), elegant snake-eyed skink (*Cryptoblepharus pulche*r) and eastern brown snake (*Pseudonaja textilis*) being encountered during field surveys. Within the riparian corridors of Slacks Creek and Scrubby Creek, eastern water dragons (*Intellagama lesueurii*) were regularly witness foraging amongst the groundcover, whilst a Brisbane River turtle (*Emydura macquarii*) and observed basking at one location (Plate 3-9).

Plate 3-9 Elegant snake-eyed skink (left) and Brisbane River turtle observed within the Subsequent study areas

Amphibians

No conservation significant amphibians were recorded during field surveys, however one species, the wallum froglet (*Crinia tinnula*), was assessed as likely occur in the likelihood of occurrence assessment due to the presence of suitable habitat and mapped essential habitat (Appendix C).

Nocturnal surveys were not included in the current Project scope, and therefore, the detectability of amphibians was significantly reduced. However suitable habitat was identified within the Study corridor. Larger creek systems, e.g. Slack's Creek and Scrubby Creek, and their associated tributaries provide suitable habitat for amphibian species. Furthermore, these areas often supported fringing communities of wet eucalypt and *Melalueca* woodlands which contained ephemeral depressions of sedge, reeds and rushes. These areas also supported essential habitat for conservation significant amphibians (Section 3.6.1 and Figure 3-4).

Mammals

No conservation significant amphibians were recorded during field surveys, however two species, the koala (*Phascolarctos cinereus*) and grey-headed flying-fox (*Pteropus poliocephalus*) were assessed as likely to occur due to the presence of suitable habitat, essential habitat and historical records within the Subsequent study areas (Appendix C).

Only two mammal species were observed during field studies, these being the eastern grey kangaroo (*Macropus giganteus*) and the swamp wallaby (*Wallabia bicolor*). Mammalian activity within the Subsequent study areas was largely focussed around areas of remnant woodlands with a dense, grassy understorey. Mature vegetation within these areas provided suitable foraging habitat for arboreal mammals, including the koala (*Phascolarctos cinereus*), brush tail

possum (*Trichosurus vulpecula*) and ring-tailed possum (*Pseudocheirus peregrinus*), with potential scratches identified in multiple places within the Subsequent study area (Plate 3-10).

Plate 3-10 Macropod scat (left) and arboreal mammal scratches on mature eucalypt

3.7 Conservation significant fauna

3.7.1 Desktop assessment

The EPBC Act PMST identified 29 conservation significant fauna species that are predicted to occur within 1 km of the Study corridor (Appendix A). This included:

- 33 birds
- Nine mammals
- Nine reptiles
- Two fish
- One amphibian

Of these, four species have been historically recorded within 1 km of the Study corridor (DES, 2021a). The Wildlife Online database also reported the occurrence of five additional species listed at a State level only (Appendix A).

Table 3-8 contains a summary of the conservation significant fauna species predicted to occur within the Study corridor based on the results of the desktop assessment.

Table 3-8 Conservation significant fauna species predicted occur within the Study corridor

Scientific name	Common name	Conservation status		Source
		EPBC Act	NC Act	
Birds				
Anthochaera phrygia	Regents honeyeater	CE	CE	PMST
Botaurus poiciloptilus	Australian bittern	E	E	PMST
Calidris ferruginea	Curlew sandpiper	CE	CE	PMST
Calyptorhynchus lathami	Glossy black-cockatoo	NL	SL	WO
Diomedea antipodensis	Antipodean albatross	V	NL	PMST

Scientific name	Common name	Conservation status		Source
		EPBC Act	NC Act	
Diomedea antipodensis gibsoni	Gibson's albatross	V	V	PMST
Diomedea exulans	Wandering albatross	V	V	PMST
Erythrotriorchis radiatus	Red goshawk	V	E	PMST
Falco hypoleucos	Grey falcon	V	V	PMST
Geophaps scripta scripta	Squatter pigeon (southern)	V	V	PMST
Grantiella picta	Painted honeyeater	V	V	PMST
Hirundapus caudacutus	White-throated needletail	V	V	PMST, WO
Lathamus discolor	Swift parrot	CE	E	PMST
Limosa lapponica baueri	Bar-tailed godwit	V	V	PMST
Limosa lapponica menzbieri	Northern Siberian bar-tailed Godwit	CE	E	PMST
Macronectes giganteus	Southern giant-petrel	E	E	PMST
Macronectes halli	Northern giant petrel	V	V	PMST
Menura alberti	Albert's lyrebird	NL	NT	WO
Numenius madagascariensis	Eastern curlew	CE	CE	PMST
Pachyptila turtur subantarctica	Fairy prion (southern)	V	LC	PMST
Rostratula australis	Australian painted snipe	E	E	PMST
Sternula nereis nereis	Australian fairy tern	V	NL	PMST
Thalassarche cauta	Shy albatross	E	NL	PMST
Thalassarche eremita	Chatham albatross	E	NL	PMST
Thalassarche impavida	Campbell albatross	V	SL	PMST
Thalassarche melanophris	Black-browed albatross	V	NL	PMST
Thalassarche salvini	Salvin's albatross	V	SL	PMST
Thalassarche steadi	White-capped albatross	V	V	PMST
Thinornis cucullatus cucullatus	Hooded plover (eastern)	V	LC	PMST
Turnix melanogaster	Black-breasted button-quail	V	V	PMST
Fish				
Epinephelus daemelii	Black rockcod	V	NL	PMST
Maccullochella mariensis	Mary River cod	E	NL	PMST

Scientific name	Common name	Conservation status		Source
		EPBC Act	NC Act	
Amphibians				
Adelotus brevis	Tusked frog	NL	V	WO
Crinia tinnula	Wallum froglet	NL	V	WO
Mixophyes fleayi	Fleay's frog	E	E	PMST
Mammals				
Chalinolobus dwyeri	Large-eared pied bat	V	V	PMST
Dasyurus maculatus	Spotted-tail quoll	E	V	PMST
Petauroides volans	Greater glider	V	V	PMST, WO
Phascolarctos cinereus	Koala	V	V	PMST, WO
Potorous tridactylus tridactylus	Long-nosed potaroo	V	V	PMST
Pseudomys novaehollandiae	New Holland mouse	V	V	PMST
Pteropus poliocephalus	Grey-headed flying-fox	V	V	PMST, WO
Tachyglossus aculeatus	Short-beaked echidna	NL	SL	WO
Xeromys myoides	Water mouse	V	V	PMST
Reptiles				
Caretta caretta	Loggerhead turtle	E, Mar, Mig	E	PMST
Chelonia mydas	Green turtle	V, Mar, Mig	V	PMST
Coeranoscincus reticulatus	Three-toed snake-tooth skink	V	LC	PMST
Delma torquata	Collared delma	V	V	PMST
Dermochelys coriacea	Leatherback turtle	E, Mar, Mig	E	PMST
Eretmochelys imbricata	Hawksbill turtle	V, Mar, Mig	E	PMST
Furina dunmalli	Dunmall's snake	V	V	PMST
Lepidochelys olivacea	Olive Ridley turtle	E, Mar, Mig	E	PMST
Natator depressus	Flatback turtle	V, Mar, Mig	V	PMST

Key to table – CE = Critically endangered, E = Endangered, V = Vulnerable, Mig = Migratory, Mar = Marine, NT = Near threatened, NL = Not listed, LC = Least concern, WO = Wildlife Online .

Migratory species

The EPBC Act Protected Matters Search Tool reported 39 migratory species predicted to occur within 1 km of the Study corridor (Appendix A), comprising:

- Thirteen migratory marine bird species
- Ten migratory marine species
- Six migratory terrestrial species
- Six migratory wetland species

Of these, 14 species have been previously presented as conservation significant species and are not discussed further within this section. Similarly, as the Project is located outside the marine environment, migratory marine species were excluded from the assessment.

Of the 39 species predicted to occur, five species have been historically recorded within 1 km of the Study corridor (DES, 2021a). The Wildlife Online database (Appendix A) also reported to occurrence of three additional migratory wetland species not listed in the PMST report. These being,

- Glossy ibis (*Plegadis falcinellus*)
- Whimbrel (*Numenius phaeopus*)
- Marsh sandpiper (*Tringa stagnatilis*)

The glossy ibis was also confirmed present during previous ecological surveys of the Study corridor (WSP, 2019b).

Table 3-9 contains a summary of the conservation significant fauna species predicted to occur within the Study corridor based on the results of the desktop assessment.

Table 3-9 Migratory species predicted to occur within the Study corridor

Scientific name	Common name	Conservation status		Source
		EPBC Act	NC Act	
Migratory marine birds				
Apus pacificus	Fork-tailed swift	Mig, Mar	SL	PMST
Ardenna grisea	Sooty shearwater	Mig, Mar	SL	PMST
Calonectris leucomelas	Streaked shearwater	Mig, Mar	SL	PMST
Migratory terrestrial species				
Cuculus optatus	Oriental cuckoo	Mig	SL	PMST
Monarcha melanopsis	Black-faced monarch	Mig	SL	PMST, WO
Myiagra cyanoleuca	Satin flycatcher	Mig	SL	PMST
Rhipidura rufifrons	Rufous fantail	Mig	SL	PMST, WO
Symposiachrus trivirgatus	Spectacled monarch	Mig	SL	PMST
Migratory wetland species				
Actitis hypoleucos	Common sandpiper	Mig	SL	PMST

Scientific name	Common name	Conservation status		Source
		EPBC Act	NC Act	
Calidris acuminata	Sharp-tailed sandpiper	Mig	SL	PMST, WO
Calidris melanotos	Pectoral sandpiper	Mig	SL	PMST
Gallinago hardwickii	Latham's snipe	Mig	SL	PMST, WO
Numenius phaeopus	Whimbrel	Mig	SL	WO
Pandion haliaetus	Osprey	Mig	SL	PMST, WO
Plegadis falcinellus	Glossy ibis	Mig	SL	WO, WSP
Tringa nebularia	Common greenshank	Mig	SL	PMST
Tringa stagnatilis	Marsh sandpiper	Mig	SL	WO

Key to table – Mig – migratory, Mar – marine, SL = Special least concern, WO = Wildlife Online

3.7.2 Field assessment

One conservation significant fauna species was confirmed present during field surveys, this being the glossy black-cockatoo (*Calyptorhynchus lathami*). Three additional species, the koala (*Phascolarctos cinereus*), grey-headed flying-fox (*Pteropus poliocephalus*) and wallum froglet (*Crinia tinnula*) were assessed as likely to occur due to the presence of suitable habitat and historical records within the 1 km of the Subsequent study areas. Further discussion on the confirmed and likely to occur species is provided below.

Glossy black-cockatoo – confirmed present

The glossy black-cockatoo is listed as vulnerable under the NC Act.

The glossy black-cockatoo is distributed throughout eastern and southern Australia, from Mackay in the north, to Kangaroo Island in the south (Forshaw, 2006; Joseph, 1982; Pizzey and Knight, 1999). Within its range, the species predominantly occurs within coastal and subcoastal regions, though is also known to extend inland from southern central Queensland to north-eastern Victoria (Pizzey and Knight, 1999). As a dietary specialist, the glossy black-cockatoo feeds almost exclusively on the seed cones of *Allocasuarina* (Clout, 1989), and is heavily restricted by the availability of their required foraging resource. Therefore, preferred habitats for the species represent woodland areas dominated by she-oak (*Allocasuarina*), or open sclerophyll forests with a dominant stratum of *Allocasuarina* (Glossy Black Conservancy, 2010). Nine species of *Allocasuarina* are known to be utilised by the species, however only one or two are generally utilised within their range (Clout, 1989; Pepper et al., 2000; Chapman, 2007). Within southeast Queensland, preferred feed trees for the glossy black-cockatoo are *Allocasuarina torulosa* (forest she-oak) and *A. littoralis* (black she-oak) (Glossy Black Conservancy, 2010). As an obligate hollow-nesting species, the glossy black-cockatoo is further restricted in its distribution by requirement of old eucalypt forest as suitable nesting habitat (Cameron, 2006; Hourigan et al., 2012).

Within the Subsequent study area, characteristic orts (or chewings) were recorded within a patch of mixed eucalypt woodland at Kingston, within the centre of the Study corridor (Plate 3-11). This area supported a dominant stratum of *A. littoralis* and orts were found under three

threes within this location. Due to the species' sparse distribution and secretive nature, the presence of orts is a regularly utilised method for determining species occurrence for the glossy black-cockatoo (Cameron and Cunningham, 2006; Clout, 1989). Suitable foraging habitat for the species was also identified within Acacia Forest Park (Plate 3-11) and the species has been historically recorded within the neighbouring Karawatha Forest Park (DES, 2021a). No nesting habitat was identified within the Subsequent study areas due to the low abundance of hollows within woodland patches.

The location of field sightings and the distribution of suitable foraging habitat for the glossy black-cockatoo within the Subsequent study areas is displayed in Figure 3-6.

Plate 3-11 Suitable habitat and foraging evidence of the glossy black-cockatoo within the Subsequent study areas

Koala – likely to occur

The koala is listed as vulnerable under the EPBC Act and NC Act.

Koalas have a broad but patchy distribution, restricted to the eucalypt forests and woodlands of eastern Australia (Melzer et al., 2000). The species is a habitat specialist, feeding almost exclusively on the leaves of trees from the *Eucalyptus, Corymbia, Lophostemon, Angophora* and *Melaleuca* genus (Martin and Handasyde, 1999). The distribution and density of koalas is influenced by numerous factors, including habitat connectivity, habitat quality, population dynamics and the presence of threats (Rhodes et al., 2015). Key threats include habitat loss and fragmentation, dog attacks, vehicle strikes, disease and drought (DAWE, 2021).

The koala was not recorded during field surveys; however the species was assessed as likely to occur due to the presence of suitable habitat within the northern and central sections of the Study corridor. Furthermore, there are 189 historical records of the species within 2 km of the Study corridor (DES, 2021a). Suitable habitat was identified within Nealdon Park (Plate 3-12), along Scrubby Creek and within Karawatha State Forest, where the species has also been the focus of targeted studies (Lollback et al.,, 2017). These areas supported diverse eucalypt communities and maintained adequate connectivity for the species and potential koala scratches were recorded on the trunks of multiple trees (Plate 3-12). Whilst eucalypt communities were encountered at several additional locations within the Subsequent study areas, the presence of multiple threats (e.g. domestic dogs, busy roads), small patch sizes and low connectivity had reduced the quality of habitats available for the species.

The distribution of suitable habitat for the koala within the Subsequent study areas is displayed in Figure 3-6.

Plate 3-12 Suitable koala habitat and potential scratches observed within the Subsequent study areas

Grey headed flying fox – likely to occur

The grey-headed flying-fox is listed as vulnerable under the EPBC Act.

The species is Australia's only endemic flying-fox and is distributed along the east coast from Rockhampton, Queensland to Melbourne, Victoria (DAWE, 2021). The species is a canopy feeding frugivore that selectively forages in a wide range of vegetation communities including rainforests, open forests, closed and open woodlands, *Melaleuca* swamps and *Banksia* woodlands (DAWE, 2021). Primarily, the species forages on blossoms from the Eucalypt genera, but it also known to infrequently utilize a wide range of rainforest fruits (Eby, 1998). However, as none of the vegetation communities utilized by the grey-headed flying fox produces foraging resources year-round, the species has adopted complex migration traits in response to seasonal resource availability (Spencer et al., 1991; Eby, 1998). At a regional level, the species movements are strongly linked to the flowering of *Eucalyptus, Melaleucas* and *Banksias*, with roosting sites often found near water bodies such as lakes, rivers or the coast (DAWE, 2021). Therefore, the species actually occupies relatively restricted and continuously changing habitats within their distribution (DAWE, 2021).

Suitable foraging habitat for the grey-headed flying fox was widely identified within the Subsequent study areas, particularly within Acacia Forest Park, Nealdon Park and along the Logan River. Additionally, two historical records of the species are located within 1 km of the Study corridor. Known mixed species flying fox colonies are also located in the southeast corner of Karawatha Forest Park (1.2 km west of Ch 24,900) and at Regents Park (7.5 km southwest of Ch 27,500). As the grey-headed flying fox is known to disperse up to 20 km an evening to forage (NSW OEH, 2021), the Subsequent study areas are considered to represent likely foraging habitat for the species.

The distribution of suitable foraging habitat for the grey-headed flying fox within the Subsequent study areas is displayed in Figure 3-6.

Wallum froglet – likely to occur

The wallum froglet is listed as vulnerable under the NC Act.

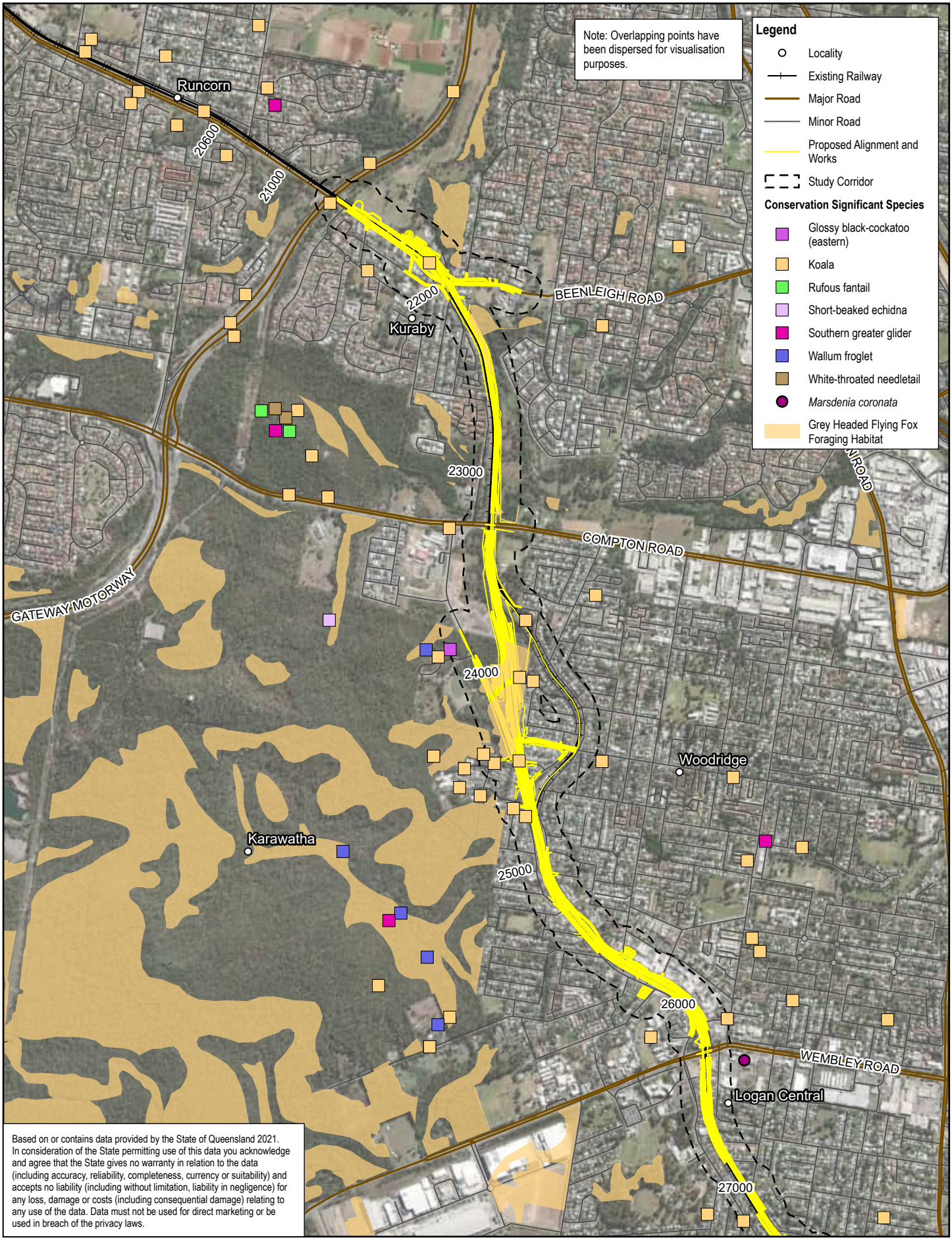
The wallum froglet is confined to the coastal lowlands and sand islands of south-east Queensland and New South Wales, particularly, Fraser, Bribie, Moreton and North Stradbroke Islands – as well as adjacent mainland areas (Meyer et al., 2004; Meyer et al., 2006).The preferred habitat of the wallum froglet is largely coastal environment (< 100 m ASL) associated with wet heath, sedgeland, woodland on nutrient-poor sandy soils and acid paperbark (melaleuca) swamps within a pH ranging between 4.3 - 5.2 (Meyer et al., 2004; Rowland et al., 2012). The swamps and lakes in which the wallum froglet breeds are typically oligotrophic (i.e.

nutrient poor), tannin-stained and acidic (pH < 6.0) and the species is thought to distributed into woodlands following breeding (Meyer et al., 2006). Due to their coastal distribution, niche habitat requirements and sensitivity to disturbances, it is important to minimise any disturbance to remaining populations. Since European settlement much of the remaining wallum has been cleared, modified, and substantially fragmented. As such, continued pressure for coastal development is the greatest threat to wallum frogs (Meyer et al., 2006).

Suitable habitat for the wallum froglet was identified in temporarily inundated patches of sedges, rushes and reeds adjacent to Scrubby Creek (Plate 3-13). This area was situated in a relatively undisturbed wet, eucalypt woodland which provided multiple micro-habitats for the species. This area also supports essential habitat for the species (Figure 3-4). Additionally, the species has the potential to occur within the wet eucalypt and *Melaleuca* communities along Slacks Creek. This area is located approximately 900 m northeast (downstream) of the Karawatha wetland, which contains six historical records for the species (DES, 2021a; Biomaps, 2021).

The distribution of suitable foraging habitat for the wallum froglet within the Subsequent study areas is displayed in Figure 3-6.

Plate 3-13 Suitable habitat for the wallum froglet within the Subsequent study areas



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Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 56

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Logan and Gold Coast Faster Rail
(Kuraby to Beenleigh) Project

Location of field sightings and suitable habitat for conservation significant species within the study corridor

Project No. **12534697**
Revision No. **2**
Date **18/06/2021**

FIGURE 3-6a

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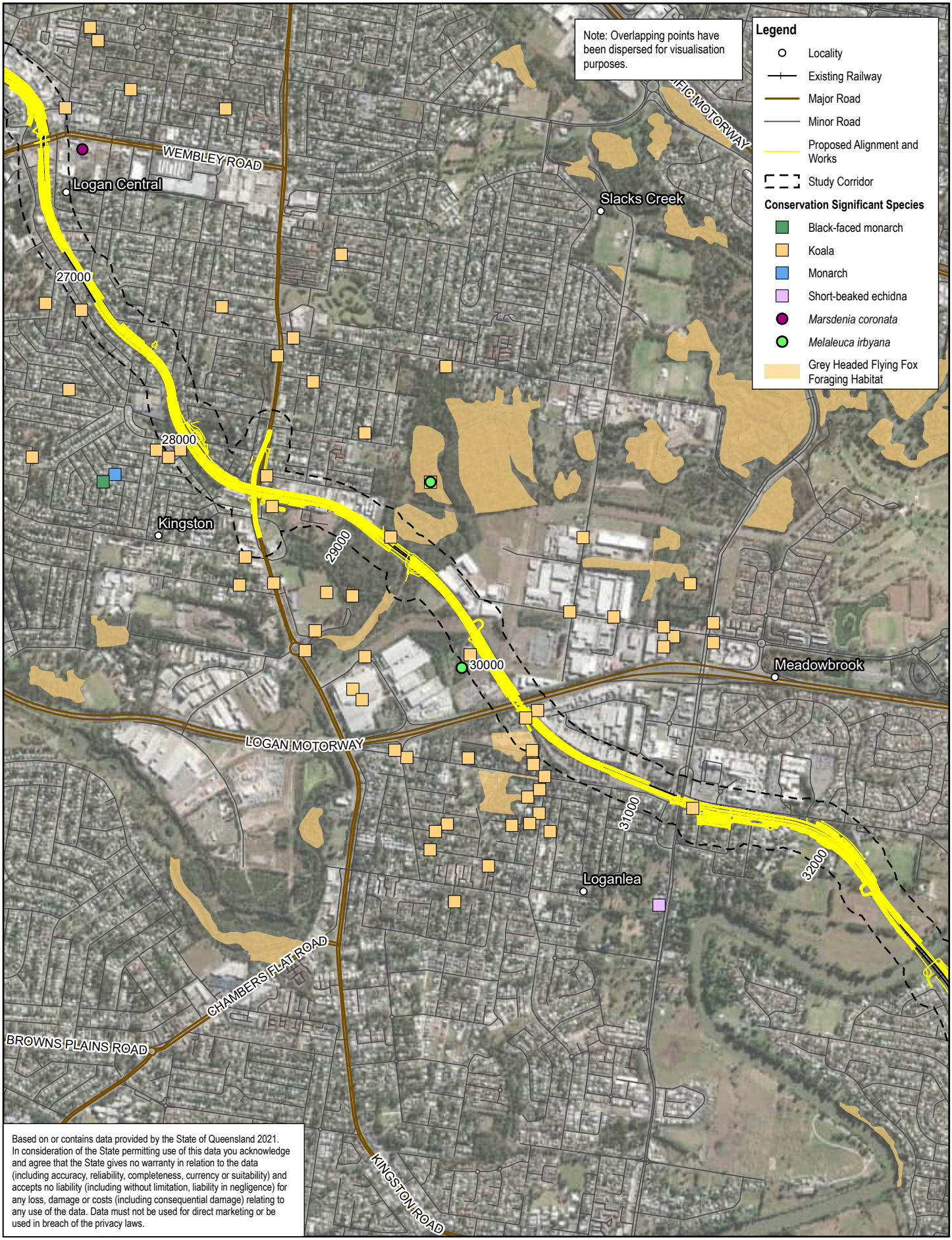
Print date: 09 Aug 2021 - 16:19

Data source: DoR: Locality, Roads, Railway (2020); DES: Wildnet Records (2021); WSP: Field Record (2019); GHD: Proposed Alignment, Study Area (2021); ESRI World Imagery: Maxar. Created by: xlee



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(Kuraby to Beenleigh) Project

Location of field sightings and suitable habitat for conservation significant species within the study corridor

Project No. 12534697
Revision No. 2
Date 18/06/2021

FIGURE 3-6b

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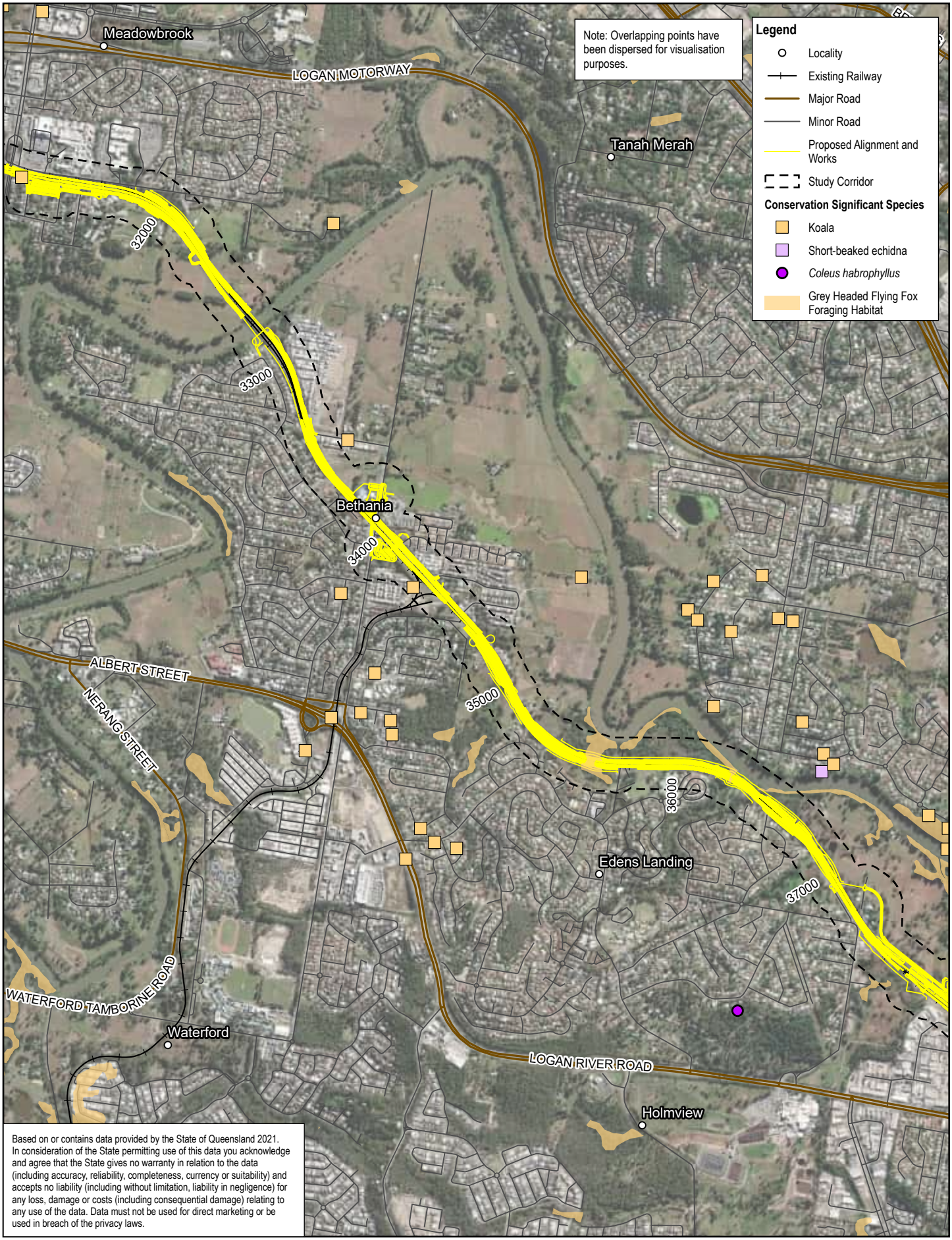
Data source: DoR: Locality, Roads, Railway (2020); DES: Wildnet Records (2021); WSP: Field Record (2019); GHD: Proposed Alignment, Study Area (2021); ESRI World Imagery: Maxar. Created by: xlee



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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Location of field sightings and suitable habitat for conservation significant species within the study corridor

Project No. **12534697**
Revision No. **2**
Date **18/06/2021**

FIGURE 3-6c

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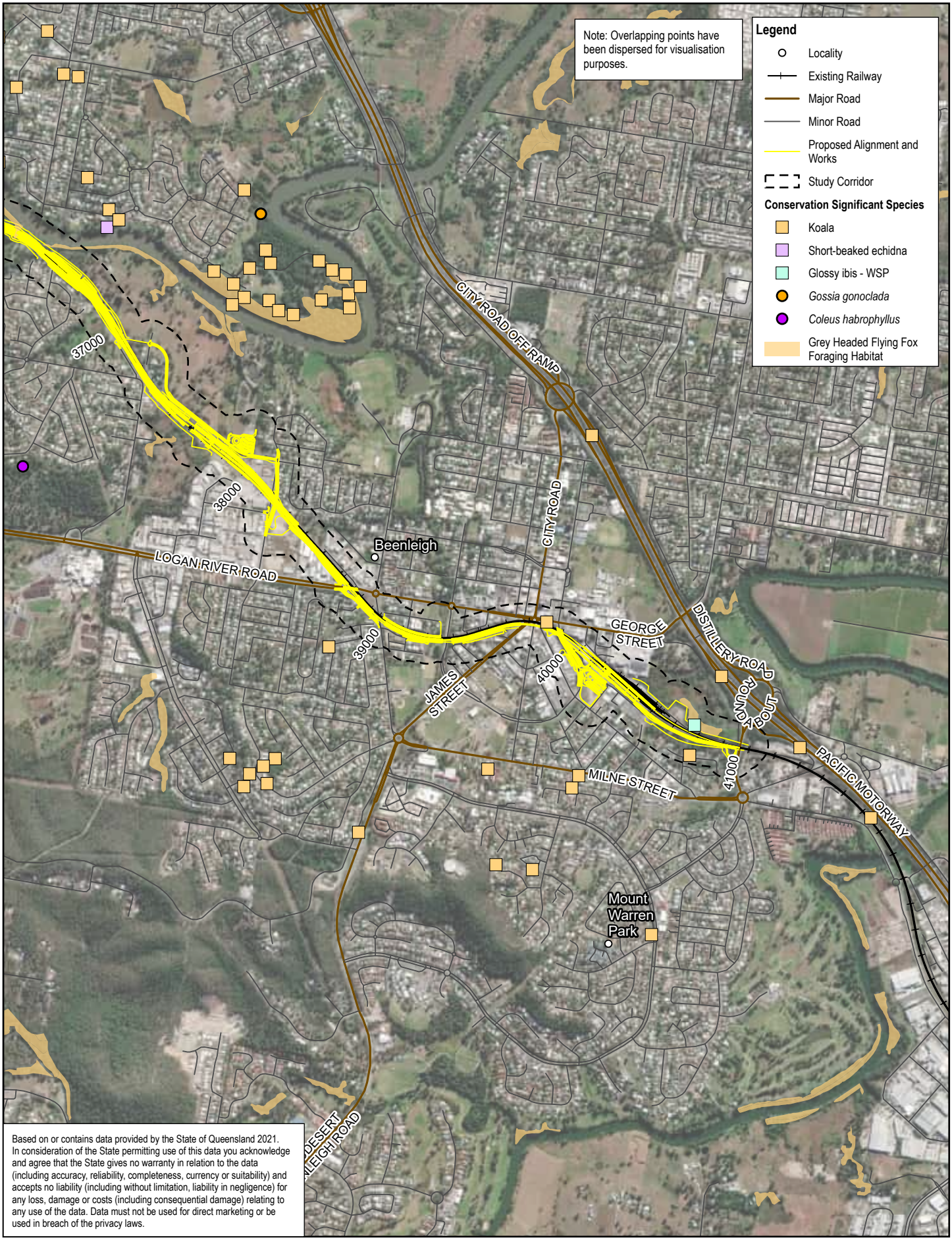
Data source: DoR: Locality, Roads, Railway (2020); DES: Wildnet Records (2021); WSP: Field Record (2019); GHD: Proposed Alignment, Study Area (2021); ESRI World Imagery: Maxar. Created by: xlee



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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Department of Transport and Main Roads
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Location of field sightings and suitable habitat for conservation significant species within the study corridor

Project No. **12534697**
Revision No. **2**
Date **18/06/2021**

FIGURE 3-6d

N:\AU\Brisbane\Projects\41\12534697\GIS\Maps\Working\12534697_ESR.aprx\12534697_008_ESR_CSS_Species
Print date: 09 Aug 2021 - 16:19

Data source: DoR: Locality, Roads, Railway (2020); DES: Wildnet Records (2021); WSP: Field Record (2019); GHD: Proposed Alignment, Study Area (2021); ESRI World Imagery: Maxar. Created by: xlee

3.8 Koala habitat

Under the *Nature Conservation (Koala) Conservation Plan* 2017, the Study corridor is located within koala district A within the south-east Queensland Koala Protection Area. Furthermore, the *South East Queensland Koala Conservation Strategy 2020-2025* (DES, 2020b) koala habitat mapping indicates the Subsequent study areas contain koala priority areas, core koala habitat areas, locally refine koala habitat areas and koala habitat restoration areas.

An area of remnant vegetation associated with the Karawatha State Forest is mapped as a Koala Priority Area (KPA) and adjacent to the Project at Ch 23,700 m (Figure 3-7). This KPA extends south and runs adjacent the western boundary of the Study corridor. This KPA also supports a mosaic of core koala habitat areas, locally refined koala habitat area and koala habitat restoration areas. Additional areas of core koala habitat are located within Nealdon Park (Ch 29,300 m), Hugh Muntz Gardens (Ch 40,800 m) and in scattered areas along the Logan River (Ch 35,600 m). Koala habitat restoration areas are widely mapped across much of the remaining Study corridor, particularly within Noffke Park (Ch 33,800 m), Gould Adams Park (Ch 29,200 m) and Battle Park (Ch 29,500 m).

Koala mapping layers were viewed on Queensland Globe.

The distribution of koala habitat mapping is displayed Figure 3-7 whilst a description of the koala habitat categories is presented in Table 3-10.

Table 3-10 Koala habitat mapping criteria

Mapping category	Description of mapping category
Koala priority areas	Large, connected areas that focus habitat protection, habitat restoration and threat mitigation to areas that have the highest likelihood of safeguarding koala populations in SEQ. Clearing of core and locally refined koala habitat areas within koala priority areas is prohibited, subject to certain exemptions.
Core koala habitat areas	The best quality koala habitat areas, based on modelling of biophysical measures including climate, suitable vegetation for both food and shelter, and koala sighting records.
Locally refined koala habitat area	Areas of mature vegetation that might not meet the Queensland Government's criteria for core koala habitat areas (see Spatial modelling for koalas in SEQ). However, these areas may contain locally important vegetation for koalas, including some areas previously protected under local government planning schemes.
Koala habitat restoration areas	land that could be restored and established as koala habitat areas. These areas feature low threats or constraints, and high conservation opportunities.

3.8.1 State Planning Policy Koala Habitat Mapping

TMR signed a memorandum of agreement (MOA) with the former Department of Environment and Resource Management (DERM, now DES) on 15 June 2010. The MOA serves as a formal mechanism responding to the *State Government Supported Infrastructure - Koala Conservation Policy* (DEHP, 2017) and outlines additional criteria to be used by TMR to guide road infrastructure Projects and determine if a particular Project proposed within the SEQ Koala

Protection Area must be assessed for compliance with the now superseded Koala Conservation State Planning Regulatory Provisions (SPRP). Under the MOA, TMR must assist in reducing adverse impacts to koalas and koala populations by complying with the SPRP where required (to the greatest extent practicable). TMR are required to self-assess Projects against the SPRP when:

- A Project intersects a koala habitat area mapped under the (now superseded) State Planning Policy (SPP)
- The Project does not meet the criteria for exemption from assessment against the SPRP

Furthermore, in accordance with Section 7.2 of the MOA, TMR are required to maintain records of government supported transport infrastructure Projects that intersect koala habitat areas. The register is required to identify:

- The name of the infrastructure Project
- Whether the transport Project was assessable against the Koala Conservation SPRP and if not, details of the exemption
- If the Project was assessable against the Koala Conservation SPRP a brief description of how the Koala Conservation SPRP was compiled with. The description could include any of the following:
  - Details of the koala sensitive design measures included in the design
  - Details of the amount of koala habitat impacted by the development (in the form of the number of individual trees or hectares impacted)
  - Details of any actions taken to mitigate these impacts, for example, revegetation, the provision of an environmental offset or financial contribution provided to DERM (now DES).

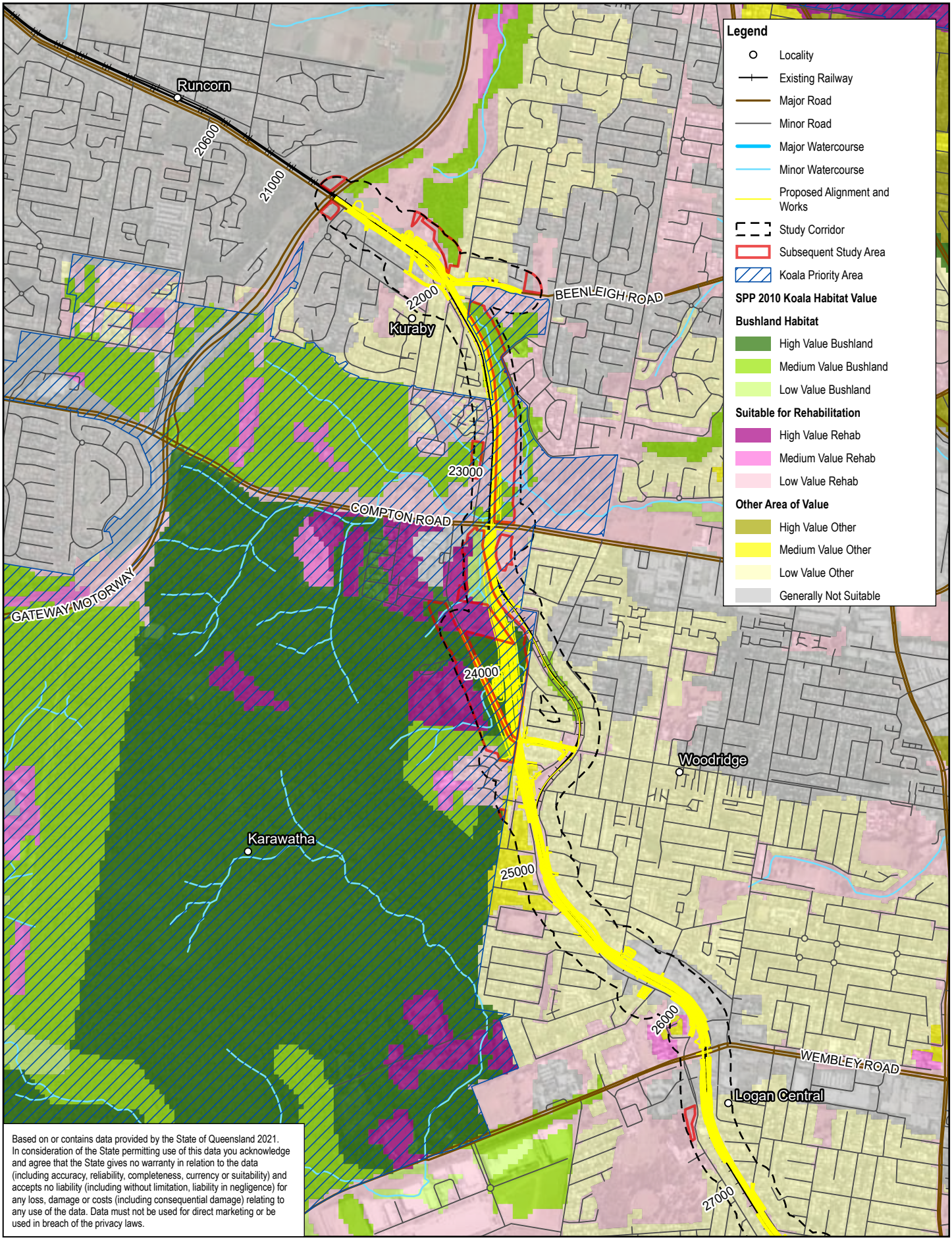
The signed MOA requires the use of the now superseded SPP koala habitat mapping to be utilised. The SPP koala habitat mapping has been superseded by the Koala Habitat Mapping 2020 (discussed in the following Section). The SPP mapping indicates that the Project area intersects the following mapped values as per the SPP koala habitat values:

- High value bushland
- Medium value bushland
- Low value bushland
- High value rehabilitation
- Medium value rehabilitation
- Low value bushland
- Medium value other
- Low value other
- Non-habitat

The total areas of SPP koala habitat mapped within the Project area is shown in Figure 3-7 and quantified in Table 3-11. Of note, the SPP koala habitat mapping is very coarse and currently includes habitat values mapped over existing infrastructure and hard stand areas such as the existing rail infrastructure. As a result, refinement of these areas was undertaken through GIS to remove hard stand areas or areas currently under active maintenance such as mowed batters. Further delineation of the impacted areas will be required during Detailed Design to inform TMR's offsetting obligations under their MOA.

Table 3-11 SPP koala habitat mapping

SSP Koala Habitat category	Extent within the Project area
High value bushland	7.10 ha
Medium value bushland	6.22 ha
Low value bushland	5.96 ha
High value rehabilitation	1.02 ha
Medium value rehabilitation	0.07 ha
Low value rehabilitation	43.28 ha
Medium value other	1.60 ha
Low value other	12.90 ha
Non-habitat	77.66 ha



Paper Size ISO A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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(Kuraby to Beenleigh) Project

Distribution of koala habitat mapping within the subsequent study areas

Project No. **12534697**
Revision No. **2**
Date **18/06/2021**

FIGURE 3-7a

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Print date: 09 Aug 2021 - 16:18

Data source: DoR: Locality, Roads, Railway, Watercourse (2020); DES: Koala SPP Habitat Value (2010); Koala Priority Area (2020); GHD: Proposed Alignment, Study Area (2021); ESRI World Imagery: Maxar. Created by: xlee