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Olive Downs Coking Coal Project

Additional Information to the Environmental Impact Statement

Section 7

Matters of National Environmental Significance – Listed Threatened Species

7 MNES – LISTED THREATENED SPECIES

1. Clarify the extent of nesting, roosting, denning, sheltering, foraging or dispersal habitat for EPBC species (relevant threatened and migratory species) known or likely to be impacted by the project, including the provision of revised mapping where appropriate. Ensure that these habitat definitions are based on the information contained in the Department's Species Profile and Threats (SPRAT) database, including any statutory documents (e.g. listing advices, conservation advices, draft referral guidelines, recovery plans, etc), published research and any other relevant material.

a) Alternatively, provide a detailed justification for the treatment of the habitat of a threatened species as a homogenous unit with overlapping habitat attributes. Justify any areas excluded based on site specific information (i.e. based field surveys, published research and other relevant sources).

DPM Enviros ciences (pers. comm.) has provided additional detail of the habitat mapped within the Project area by mapping the extent of breeding (i.e. nesting, roosting, denning and sheltering habitat), foraging and dispersal habitat of each relevant MNES as requested by DEE.

These habitat definitions are based on the information contained in the DEE's Species Profiles and Treats (SPRAT) database, including the relevant statutory documents (listing advices, conservation advices, draft referral guidelines, recovery plans) and published research. Where a species habitat has been treated as a homogenous unit with overlapping habitat attributes, justification has been provided based on site specific information and published research.

This habitat breakdown and revised mapping, along with supporting justification is provided below.

In summary, the habitat mapping identifies the following for each relevant MNES:

- Squatter Pigeon – the potential habitat within the Project area comprises areas of breeding, foraging and dispersal habitat as outlined on the species' SPRAT profile (DEE, 2019);
- Ornamental Snake – all habitat within the Project area meets the definition of 'Important Habitat' as outlined in the *Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles* (DSEWPC, 2011);
- Australian Painted Snipe – all habitat within the Project area meets the definition of potential breeding habitat as outlined on the species' SPRAT profile (DEE, 2019);
- Koala – all habitat within the Project area meets the definition of 'Critical Habitat' as outlined in the *EPBC Act Referral Guidelines for the Vulnerable Koala* (DotE, 2014); and
- Greater Glider – all habitat within the Project area meets the definition of 'Known Habitat' as outlined on the species' SPRAT profile (DEE, 2019).

Squatter Pigeon (Southern)

The Squatter Pigeon (southern) has a large distribution extending from the Burdekin-Lynd divide in Central Queensland, west to Charleville and Longreach, east to the coastline between Proserpine and Port Curtis (near Gladstone) and south to a number of scattered sites throughout south-eastern Queensland (DEE, 2019). All of the relatively small isolated and sparsely distributed sub-populations occurring south of the Carnarvon Ranges in Central Queensland are considered to be important subpopulations of the subspecies (DEE, 2019).

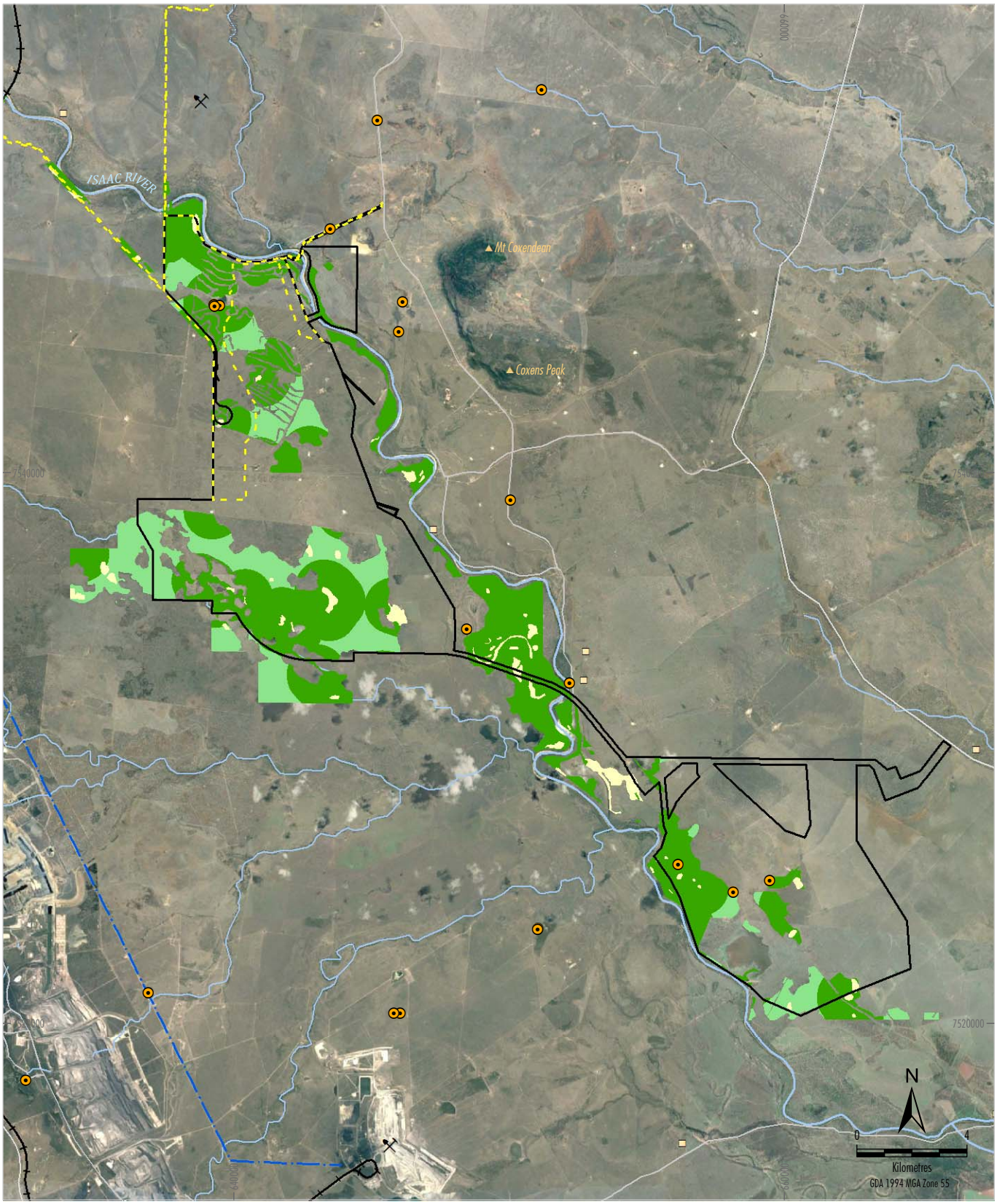
The Squatter Pigeon (southern) was identified on ten occasions within Eucalypt dry woodlands on inland depositional plains in the Project area (Figure 7-1). The Squatter Pigeon (southern) occurs mainly in grassy woodlands and open forests that are dominated by eucalypts (DEE, 2019). Within the Project Area all areas of eucalypt dry woodlands on inland depositional plains and eucalypt open forests to woodlands on floodplains are considered potential habitat for this species. Potential habitat mapping for the Squatter Pigeon (southern) within the Project area is presented as Figure 7-1.

Other broad habitat types (i.e. rainforests and scrubs, wetlands, acacia forests and agricultural grasslands) were not considered potential habitat because they do not support the grassy understorey with a high density of native grasses necessary to provide food resources for this species and the canopy shelter and microhabitat.

Table 7-1 provides a breakdown of the habitat types available within the Project Area for the Squatter Pigeon (Southern).

Table 7-1
Squatter Pigeon (Southern) Habitat Breakdown

Habitat Type	Habitat Descriptions (as per DEEs SPRAT Profile)	Project Area
Breeding habitat	• **Land Zones 5 & 7 and 3, 4 & 10)** – Remnant or regrowth open-forest to sparse, open-woodland or low-woodland dominated by *Eucalyptus*, *Corymbia*, *Acacia* or *Callitris* species within one kilometre of a suitable, permanent or seasonal waterbody. It is distinguished by ground-layer vegetation that: o consists of patchy, native, perennial tussock grasses, or a mix of perennial tussock grasses and low shrubs or forbs; and o does not cover more than 33% of the ground. – These preferred ground-layer vegetation conditions tend to occur on well-draining, sandy or gravelly soils low, gently sloping, flat to undulating plains and foothills, lateritic (duplex) soils on low 'jump-ups' and escarpments.	Within the Project Area, it was determined that RE's and the areas of more advanced regrowth vegetation (i.e. lower abundance of native species in the early stages of development) on land zones 3, 4, 5, 7 and 10 (where within 1 km of a suitable, permanent or seasonal waterbody) provide potential breeding habitat for the Squatter Pigeon (southern). Those RE's (both remnant and regrowth) that were excluded are: • REs 11.9.5. The occurrence of this RE within the Project area was recorded as having a dense vine thicket understorey which limited the availability of native, perennial tussock grasses required by this species. • REs 11.3.27 and 11.5.17. The occurrence of these REs within the Project area have wetted groundcover and do not possess well-draining, sandy or gravelly soils. • REs 11.3.1, 11.4.8, 11.4.9 and 11.9.2. The occurrences of these REs within the Project area contain cracking clay soils (i.e. not sandy or gravelly soils low, gently sloping, flat to undulating plains and foothills, lateritic (duplex) soils) A total of 3,628 ha of breeding habitat for the Squatter Pigeon (southern) would be cleared by the Project (Figure 7-1).



LEGEND

- Olive Downs Project Mine Site and Access Road (EPBC 2017/7867)
- Indicitive Stage 1 Disturbance Extent
- Approved/Operating Coal Mine
- Eungella Pipeline Network
- Railway
- Peaks
- Dwelling
- Squatter Pigeon
- Dispersal Habitat for Squatter Pigeon
- Foraging Habitat for Squatter Pigeon
- Breeding Habitat for Squatter Pigeon

Source: DPM (2018), Pembroke (2018), Queensland Department of Natural Resources, Mines and Energy (2017)
Orthophoto: Google Image (2016)

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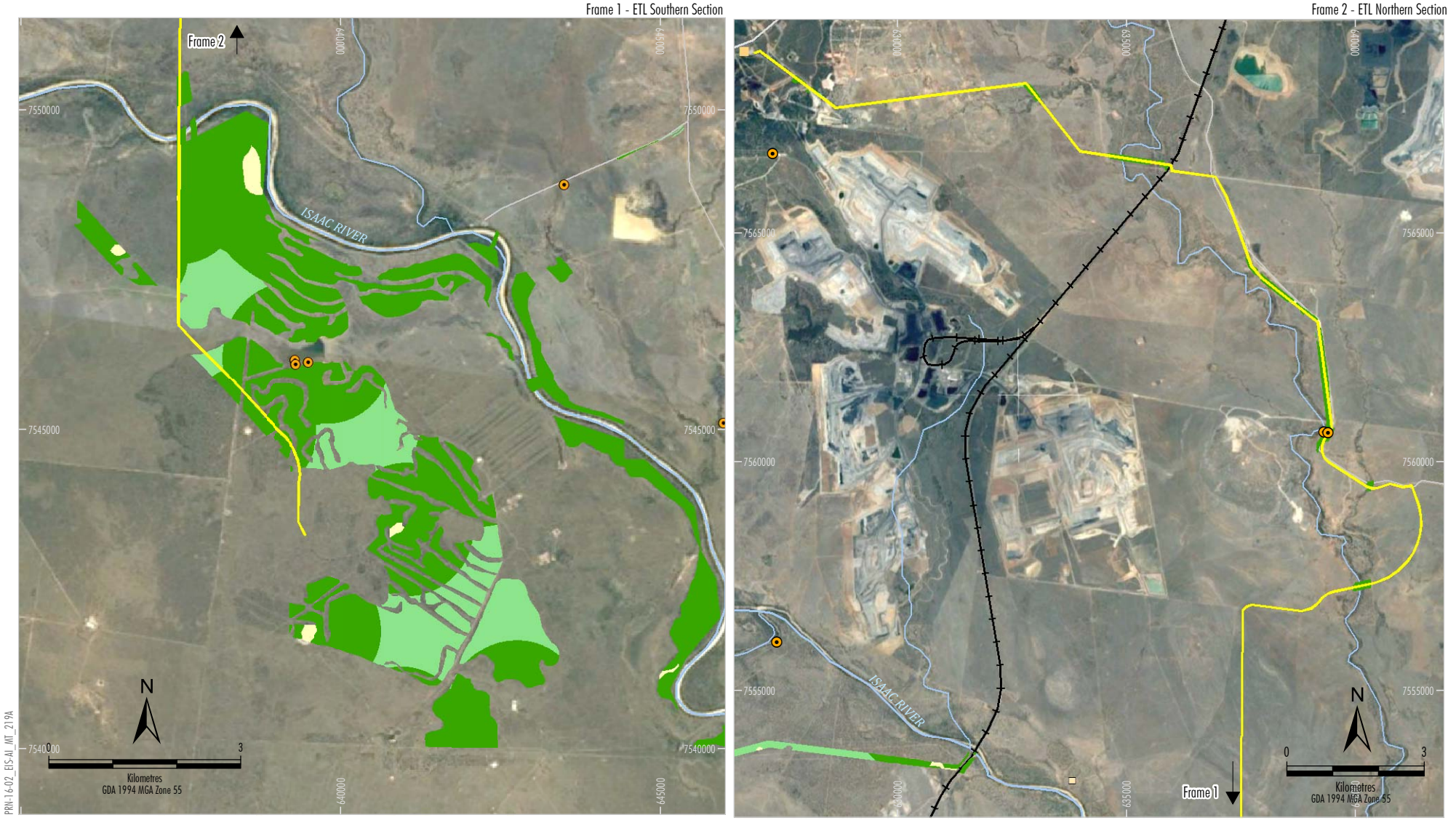
Threatened Species Habitat Mapping
Squatter Pigeon -
Mine Site

Figure 7-1a



LEGEND

- Olive Downs Project Electricity Transmission Line (EPBC 2017/7869)
- Dwelling
- Railway
- Squatter Pigeon
- Dispersal Habitat for Squatter Pigeon
- Foraging Habitat for Squatter Pigeon
- Breeding Habitat for Squatter Pigeon

Source: DPM (2018), Pembroke (2018), Queensland Department of Natural Resources, Mines and Energy (2017)
Orthophoto: Google Image (2016)
(Enirety of the Olive Downs Project Electricity Transmission Line (EPBC 2017/7869) is included in Stage 1 of the Project

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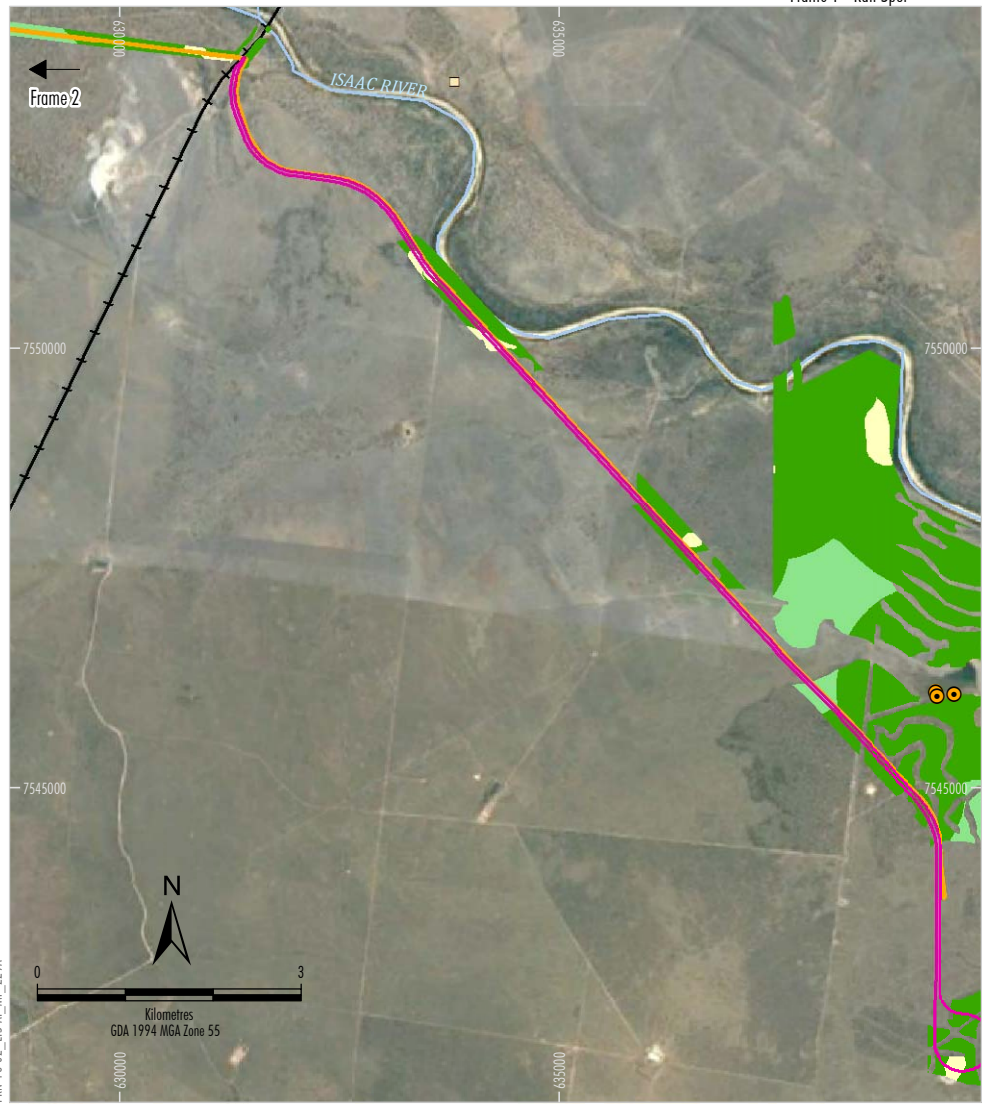
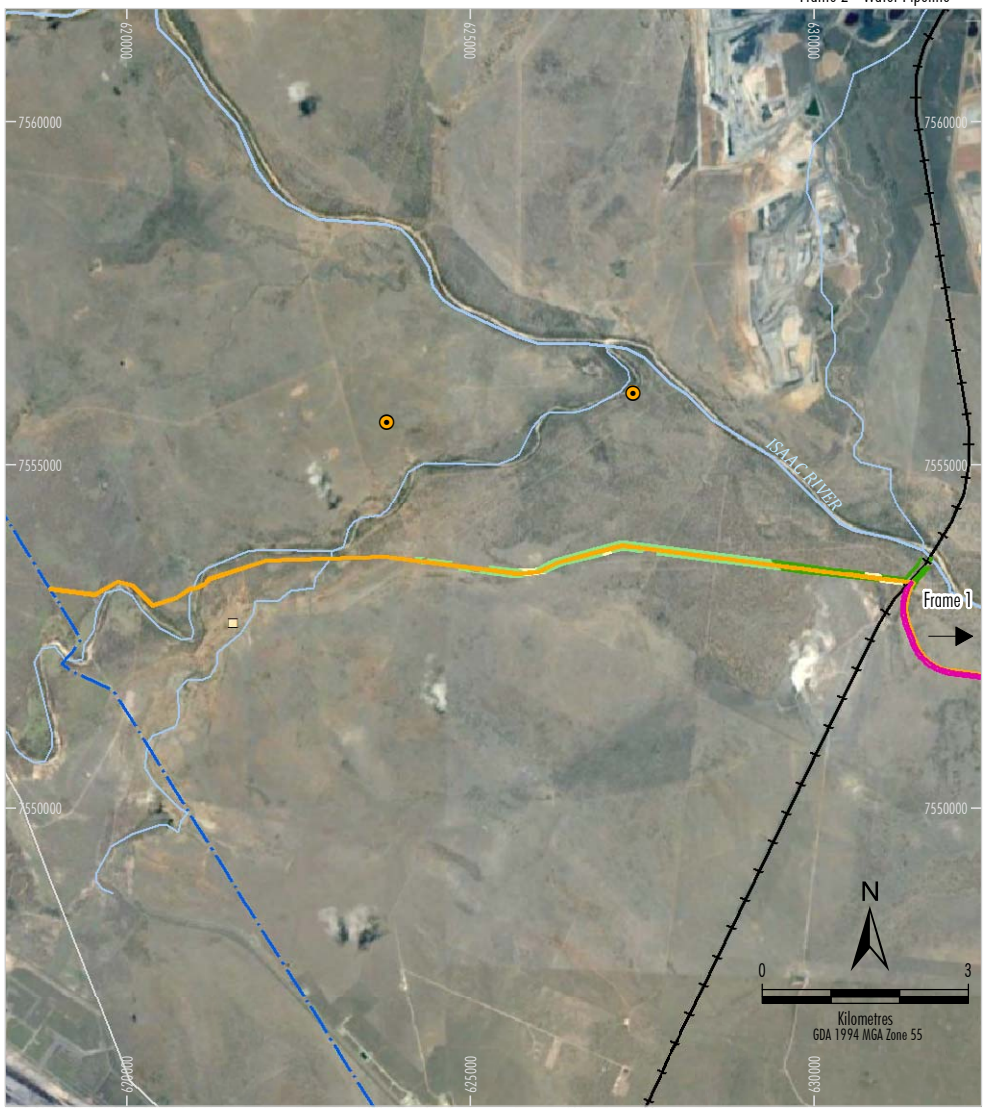
Threatened Species Habitat Mapping Squatter Pigeon - ETL

Figure 7-1b

Frame 1 - Rail Spur



Frame 2 - Water Pipeline



PRN-16-02_EIS-AI_MT_229A

LEGEND

- Dwelling
- Railway
- Eungella Pipeline Network
- Olive Downs Project Rail Spur (EPBC 2017/7870)
- Olive Downs Project Water Pipeline (EPBC 2017/7868)
- Squatter Pigeon
- Dispersal Habitat for Squatter Pigeon
- Foraging Habitat for Squatter Pigeon
- Breeding Habitat for Squatter Pigeon

Source: DPM (2018), Pembroke (2018), Queensland Department of Natural Resources, Mines and Energy (2017)
Orthophoto: Google Image (2016)
(Enirety of the Olive Downs Project Water Pipeline (EPBC 2017/7868) and the Olive Downs Project Rail Spur (EPBC 2017/7870) is included in Stage 1 of the Project

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Threatened Species Habitat Mapping
Squatter Pigeon -
Rail Spur and Water Pipeline

Figure 7-1c

Table 7-1 (Continued)
Squatter Pigeon (Southern) Habitat Breakdown

Habitat Type	Habitat Descriptions (as per DEEs SPRAT Profile)	Project Area
Foraging habitat	• **Land Zones 5 & 7 and 3, 4 & 10)** – Remnant or regrowth open-forest to sparse, open-woodland or low-woodland dominated by *Eucalyptus*, *Corymbia*, *Acacia* or *Callitris* species within three kilometres of a suitable, permanent or seasonal waterbody. It is distinguished by ground-layer vegetation that: o consists of patchy, native, perennial tussock grasses, or a mix of perennial tussock grasses and low shrubs or forbs; and o does not cover more than 33% of the ground. – These preferred ground-layer vegetation conditions tend to occur on well-draining, sandy or gravelly soils low, gently sloping, flat to undulating plains and foothills, lateritic (duplex) soils on low 'jump-ups' and escarpments.	Within the Project area, it was determined that RE's and the areas of more advanced regrowth vegetation (i.e. lower abundance of weeds and higher abundance of native species in the early stages of regrowing) on land zones 3, 4, 5, 7 and 10 (where between 1 km and 3 km of a suitable, permanent or seasonal waterbody) provide potential foraging habitat for the Squatter Pigeon (southern). Those RE's (both remnant and regrowth) that were excluded are: • REs 11.9.5. The occurrence of this RE within the Project area was recorded as having a dense vine thicket understorey which limited the availability of native, perennial tussock grasses required by this species. • REs 11.3.27 and 11.5.17. The occurrence of these REs within the Project area have wetted groundcover and do not possess well-draining, sandy or gravelly soils. • REs 11.3.1, 11.4.8, 11.4.9 and 11.9.2. The occurrences of these REs within the Project area contain cracking clay soils (i.e. not sandy or gravelly soils low, gently sloping, flat to undulating plains and foothills, lateritic (duplex) soils) A total of 1,822 ha of foraging habitat for the Squatter Pigeon (southern) would be cleared by the Project (Figure 7-1).
Dispersal habitat	– Dispersal habitat is any forest or woodland occurring between patches of foraging or breeding habitat which facilitates movement between patches of foraging habitat, breeding habitat and/or waterbodies. – Dispersal habitat includes vegetation where the groundcover layer has been thinned through current land-use practices in a way that suits the species (e.g. light cattle grazing). The species does disperse into highly modified or degraded habitats, including cleared areas which are within 100 metres of remnant trees or patches of habitat.	Additional areas of dispersal habitat for the Squatter Pigeon (southern) have been mapped within the Project area. These comprise all remnant vegetation and areas of lower quality regrowth vegetation (i.e. areas which contain a high abundance of weeds and low abundance of native species in the early stages of regrowing, no greater than 100 m wide) between areas of breeding/foraging habitat. A total of 160 ha of dispersal habitat for the Squatter Pigeon (southern) would be cleared by the Project (Figure 7-1).

Source: DPM Enviroscienses (pers. comm.).

Ornamental Snake

The Ornamental Snake prefers habitat that is close to its prey (primarily frogs). It prefers moist woodlands and open forests, particularly gilgai mounds as well as lake margins and wetlands (DEE, 2019). It is found in low-lying subtropical areas with deep-cracking clay soils and persists in cleared, disturbed habitat, particularly where brigalow communities have been cleared (DSEWPC, 2011).

Four Ornamental Snakes were recorded at three locations within the Olive Downs South Domain and a further five locations within the Willunga Domain (Figure 7-2). Desktop mapping produced by GT Environmental (2018) across the Project area identified locations of gilgai relief, which would provide suitable habitat for this species (DPM Enviroscienses, pers. comm.).

Areas of potential habitat for the Ornamental Snake within the Project area occur in a significant portion of agricultural grasslands (where there was once brigalow), as well as small patches of palustrine wetlands (swamps) and acacia dominated open forests, woodlands and shrublands (DPM Envirosciences, pers. comm.).

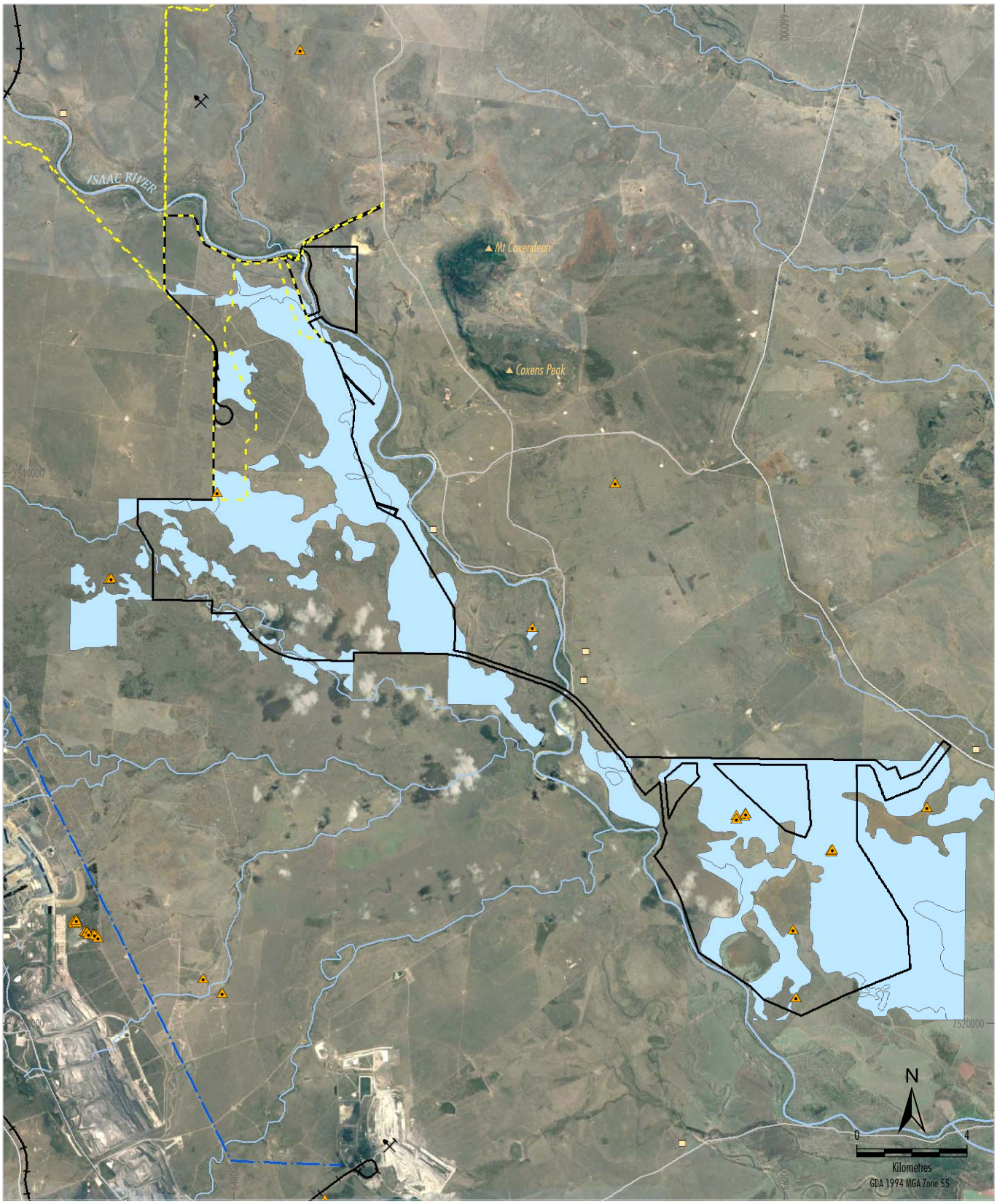
The areas mapped on Figure 7-2 as potential habitat for the Ornamental Snake also contain woody debris (which would provide sheltering habitat for the Ornamental Snake when gilgai cracks are not available), are low lying, and during the wet season would hold water long enough for frogs to inhabit them, providing a food source for the Ornamental Snake (DPM Envirosciences, pers. comm.).

Table 7-2 provides a breakdown of the habitat types available within the Project Area for the Ornamental Snake.

Table 7-2
Ornamental Snake Habitat Breakdown

Habitat Type	Habitat Descriptions (as per DEE's SPRAT profile)	Project Area
Important Habitat	Known important habitat is defined in Table 2 of the Draft Referral guidelines for the nationally listed Brigalow Belt reptiles (DSEWPC, 2011) as "*gilgai depressions and mounds, and habitat connectivity between gilgais and other suitable habitats*", particularly where the species has been recorded during survey (DSEWPC, 2011).	Within the Project area, it was determined that all areas of brigalow TEC and mapped gilgai represent potential 'known important habitat' for the Ornamental Snake, as do wetland REs 11.3.3, 11.3.27 and 11.5.17 because the species was recorded on several occasions within these habitats across the Project area. In the Project area, the gilgai landform is associated with cleared agricultural grasslands. Cracking clays and woody debris (each considered refuge) and burrowing frogs (considered prey) were observed in representative gilgai surveyed within the Project area. Some of the gilgai are likely to be used for breeding and foraging and some may only be suitable for dispersal, however any habitat that allows connectivity between gilgais and other 'suitable habitat' is also considered 'important' in accordance with DSEWPC (2011).
Suitable Habitat	Suitable habitat is defined in Table 2 of the Draft Referral guidelines for the nationally listed Brigalow Belt reptiles (DSEWPC, 2011) as "open-forests to woodlands associated with gilgai formations and wetlands. These are commonly mapped as REs 11.3.3, 11.4.3, 11.4.6, 11.4.8, 11.4.9, 11.5.16 or mapped as cleared but where the above REs formerly occurred".	Given the Ornamental Snake was recorded within the Project area, and it was determined that all areas of mapped gilgai represent potential important habitat for this species, no additional areas of suitable habitat have been identified.
Dispersal/ Connective Habitat	The SPRAT profile does not provide a definition of dispersal habitat for this species.	Dispersal habitat for this species has not been mapped within the Project area given: • there is no definition of dispersal habitat for this species on the SPRAT; and • habitat that allows connectivity between gilgais and other suitable habitat has also be considered to be important.

Source: DPM Envirosciences (pers. comm.).



PRN-16-02_EIS-AI_MT_222A

LEGEND

- Olive Downs Project Mine Site and Access Road (EPBC 2017/7867)
- Indicitive Stage 1 Disturbance Extent
- Approved/Operating Coal Mine
- Eungella Pipeline Network
- Railway
- Peaks
- Dwelling
- Known Important Habitat[1]
- Ornamental Snake

[1] *Note, this also includes area of dispersive/connective habitat.*

Source: DPM (2018), Pembroke (2018), Queensland Department of Natural Resources, Mines and Energy (2017)
Orthophoto: Google Image (2016)

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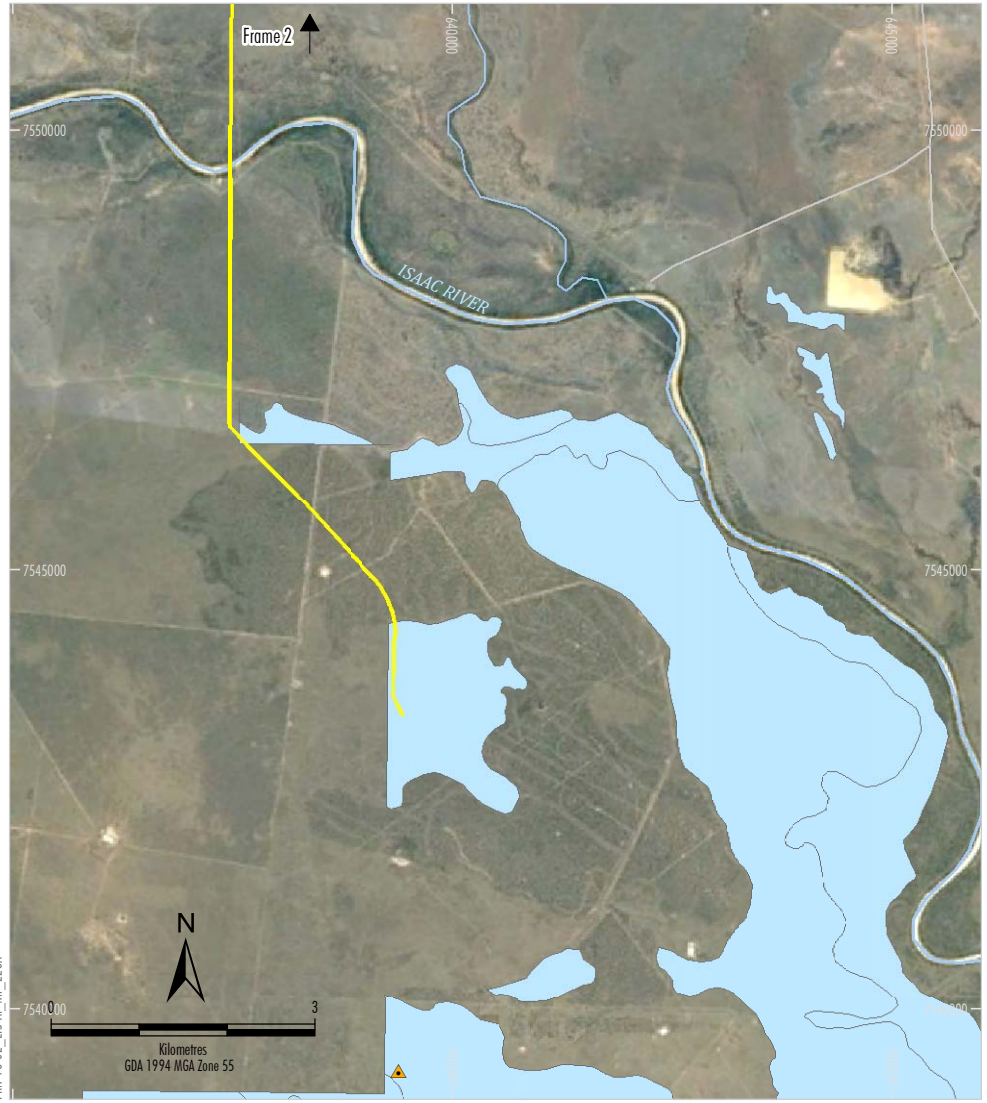
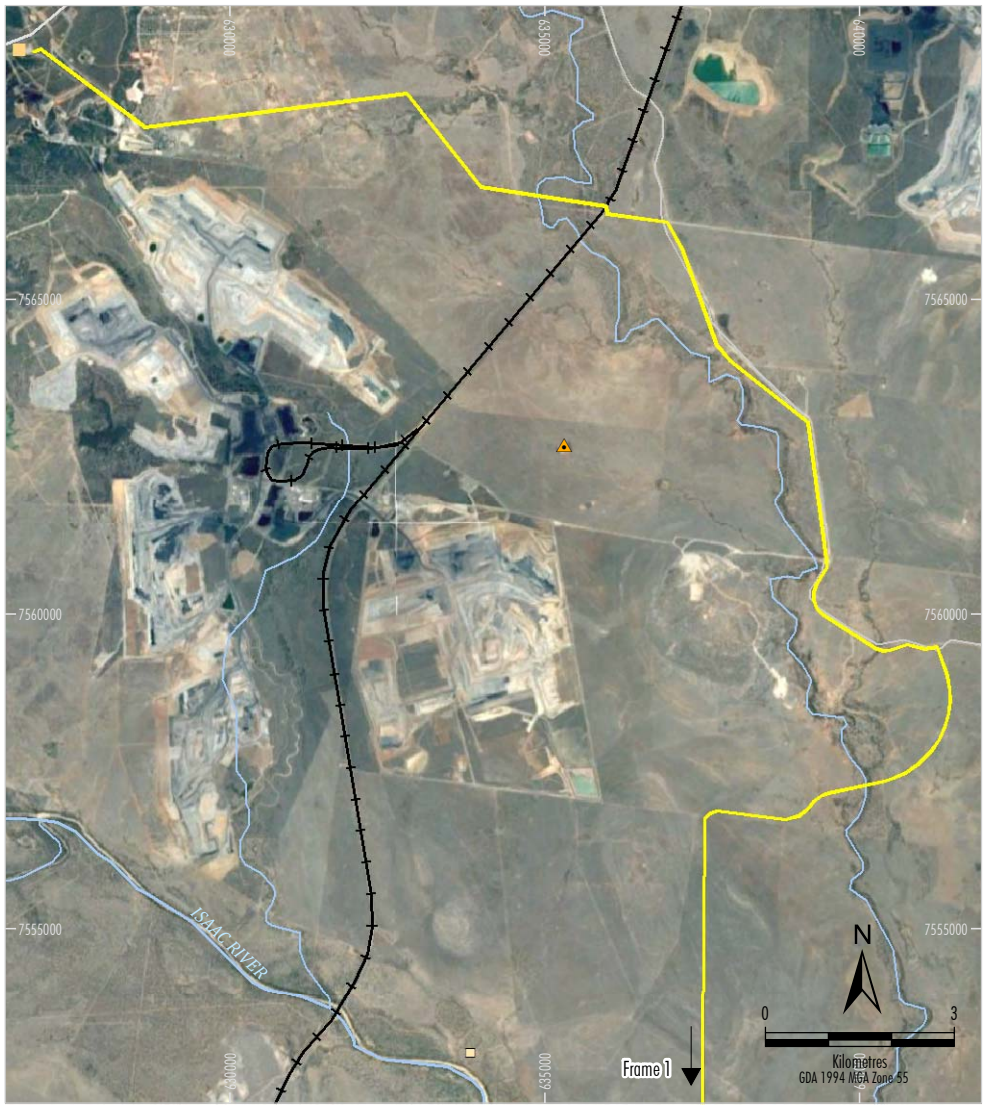
Threatened Species Habitat Mapping
Ornamental Snake -
Mine Site

Figure 7-2a

Frame 1 - ETL Southern Section



Frame 2 - ETL Northern Section



PRN-16-02_EIS-AI_MT_223A

LEGEND

- Olive Downs Project Electricity Transmission Line (EPBC 2017/7869)
- Dwelling
- Railway
- Known Important Habitat[1]
- Ornamental Snake

[1] *Note, this also provides foraging habitat for this species.*

Source: DPM (2018), Pembroke (2018), Queensland Department of Natural Resources, Mines and Energy (2017)
Orthophoto: Google Image (2016)
(Enirety of the Olive Downs Project Electricity Transmission Line (EPBC 2017/7869) is included in Stage 1 of the Project)

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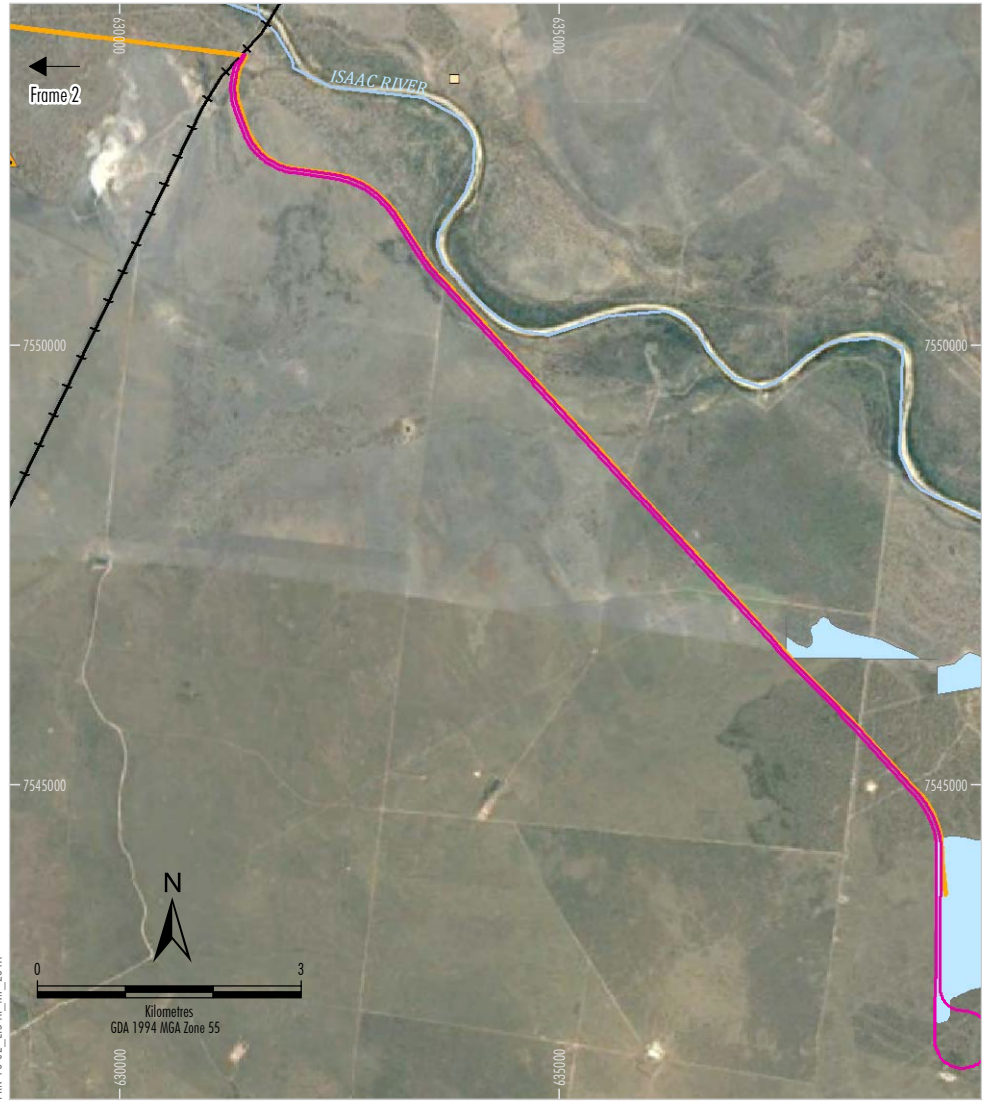
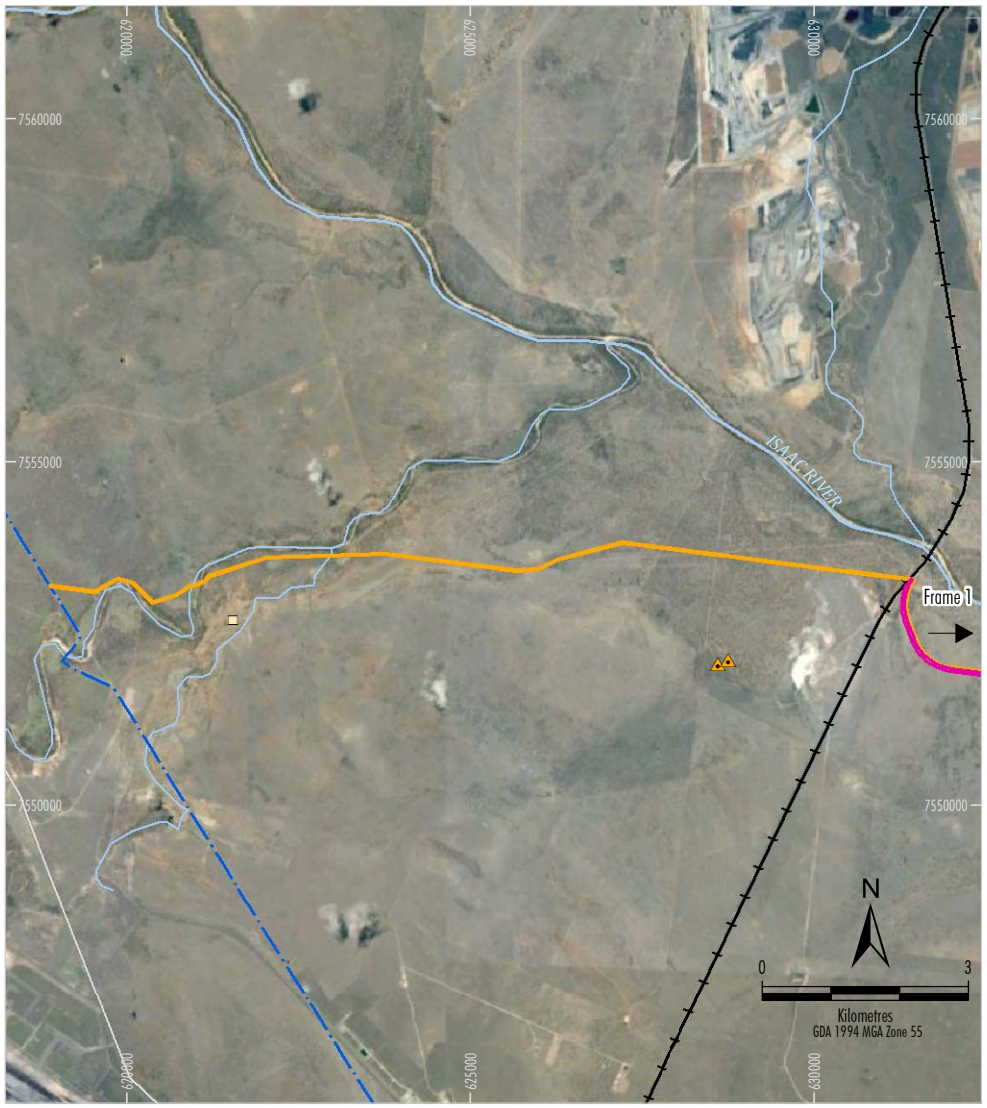
Threatened Species Habitat Mapping Ornamental Snake - ETL

Figure 7-2b

Frame 1 - Rail Spur



Frame 2 - Water Pipeline



PRN-16-02_EIS-AI_MT_231A

LEGEND

- Dwelling
- Railway
- Eungella Pipeline Network
- Olive Downs Project Rail Spur (EPBC 2017/7870)
- Olive Downs Project Water Pipeline (EPBC 2017/7868)
- Ornamental Snake
- Known Important Habitat[1]

[1] *Note, this also provides foraging habitat for this species.*

Source: DPM (2018), Pembroke (2018), Queensland Department of Natural Resources, Mines and Energy (2017)
Orthophoto: Google Image (2016)
(Enirety of the Olive Downs Project Water Pipeline (EPBC 2017/7868) and the Olive Downs Project Rail Spur (EPBC 2017/7870) is included in Stage 1 of the Project)

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Threatened Species Habitat Mapping
Ornamental Snake -
Rail Spur and Water Pipeline

Figure 7-2c

Australian Painted Snipe

The Australian Painted Snipe generally inhabits shallow terrestrial freshwater wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire (DEE, 2019).

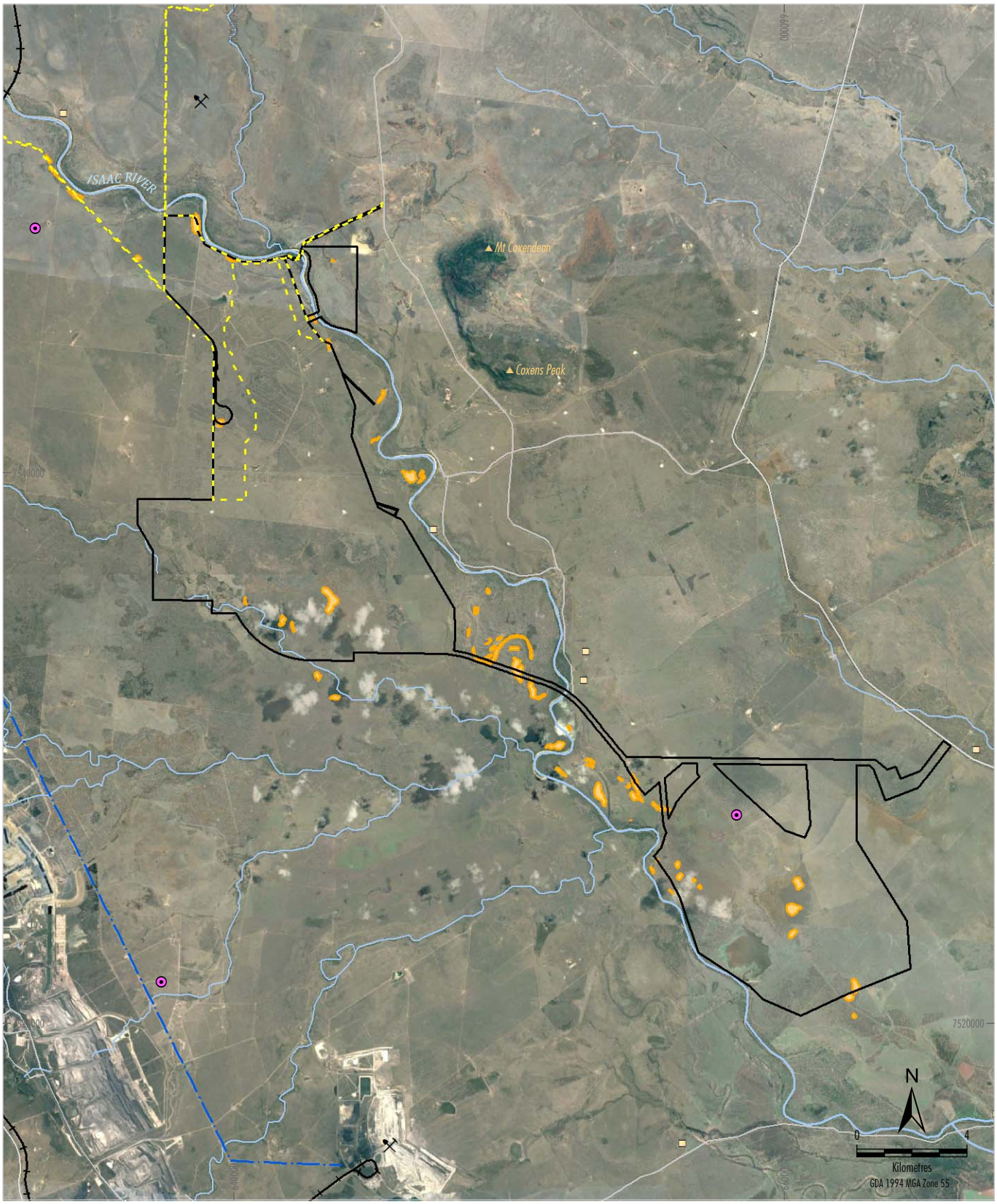
A single Australian Painted Snipe was observed during the field surveys in a small wetted gilgai within the Agricultural grassland habitat type in the Willunga Domain. Additional records for this species existing within the wider locality and are all located along waterways, with the closest being approximately 2.5 km south of the Water Pipeline (Figure 7-3). Within the Project area, all areas of wetlands (lacustrine or palustrine) are considered potential habitat for this species (Figure 7-3) (DPM Envirosciences, pers. comm.).

Table 7-3 provides a breakdown of the habitat types available within the Project Area for the Australian Painted Snipe.

Table 7-3
Australian Painted Snipe Habitat Breakdown

Habitat Type	Habitat Descriptions (as per DEE's SPRAT profile)	Project Area
Breeding habitat	This species requires suitable wetland areas even in drought conditions. The species can move to suitable habitat if necessary (Marchant & Higgins 1993). Breeding habitat requirements may be quite specific: shallow wetlands with areas of bare wet mud and dense low cover and sometimes some tall dense cover nearby, particularly on or near small muddy islands or mounds surrounded by water in freshwater wetlands (DEE, 2019, Threatened Species Scientific Committee [TSSC], 2013). Nest records are all, or nearly all, from or near small islands in freshwater wetlands (D. Rogers 2002, pers. comm.), provided that these islands are a combination of very shallow water, exposed mud, dense low cover and sometimes some tall dense cover (Rogers et al., 2005).	Within the Project area, it was determined that all areas of lacustrine and palustrine wetlands (including palustrine wetland REs 11.3.27, 11.3.3 and 11.5.17) represent potential breeding habitat for the Australian Painted Snipe, particularly as water levels change seasonally and islands or mounds and bare earth are exposed.
Foraging habitat	The Australian Painted Snipe eats vegetation, seeds, insects, worms and molluscs, crustaceans and other invertebrates (Marchant & Higgins 1993). The species may have quite specific foraging habitat requirements, but these are not well understood and further study is required (DEE, 2019). They generally remain in dense cover when feeding, although may forage over nearby mudflats and other open areas such as ploughed land or grassland (Marchant & Higgins 1993). This species requires suitable wetland areas even in drought conditions.	The Project area does not contain any foraging habitat that would not also provide the potential for breeding (i.e. breeding habitat). As outlined in the Terrestrial Fauna Assessment, the gilgai habitat would only be suitable for a short period after rainfall when the gilgai are full. In addition, these areas lack the dense cover reported in the SPRAT database as being required by this species for foraging.
Dispersal habitat	The SPRAT profile does not provide a definition of dispersal habitat for this species.	Dispersal habitat for this species has not been mapped within the Project area given: • there is no definition of dispersal habitat for this species on the SPRAT database; and • this species does not require specific habitat features to assist it in dispersing.

Source: DPM Envirosciences (pers. comm.).



PRN-16-02_EIS-A1_MT_220A

LEGEND

- Olive Downs Project Mine Site and Access Road (EPBC 2017/7867)
- Indicitive Stage 1 Disturbance Extent
- Approved/Operating Coal Mine
- Eungella Pipeline Network
- Railway
- Peaks
- Dwelling
- Breeding Habitat - Australian Painted Snipe[1]
- Australian Painted Snipe

[1] *Note, this also provides foraging habitat for this species.*

Source: DPM (2018), Pembroke (2018), Queensland Department of Natural Resources, Mines and Energy (2017)
Orthophoto: Google Image (2016)

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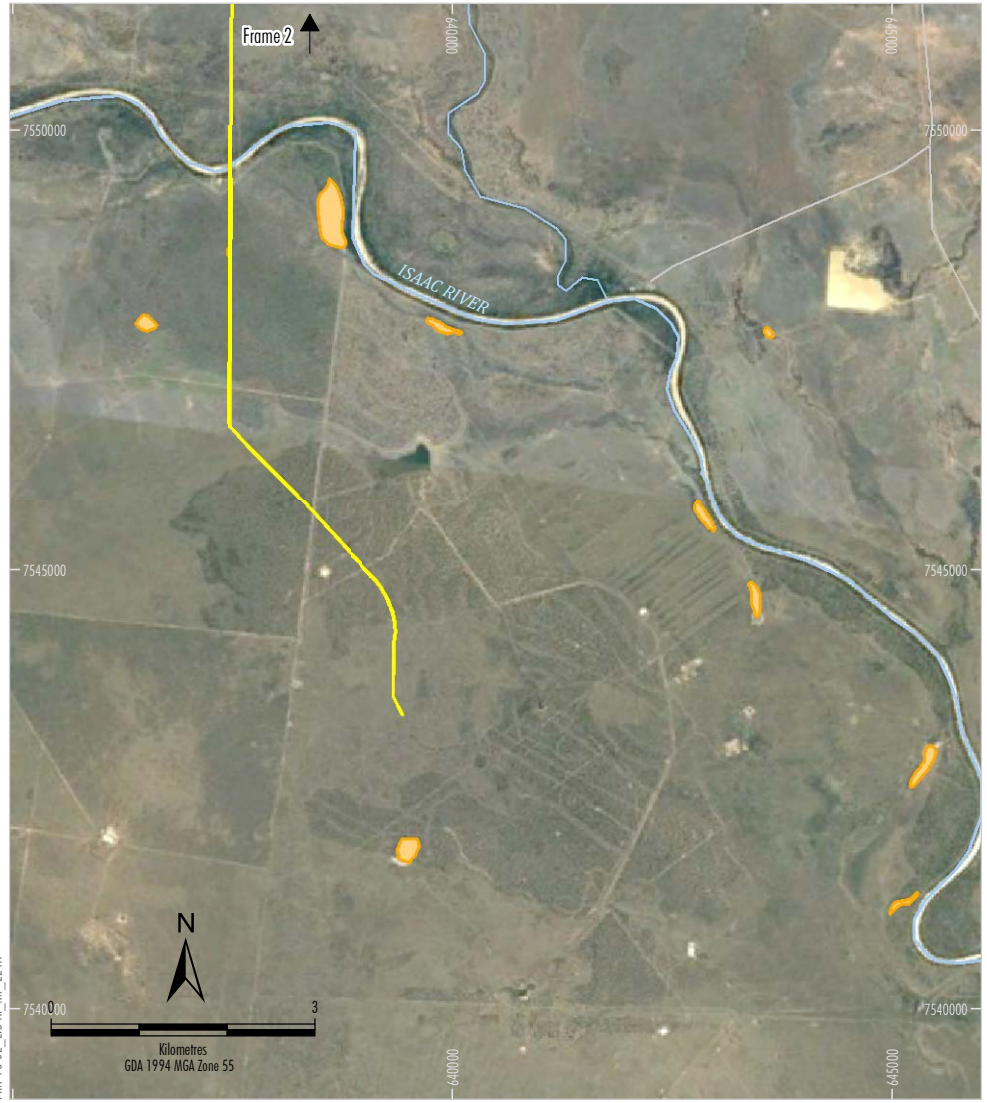
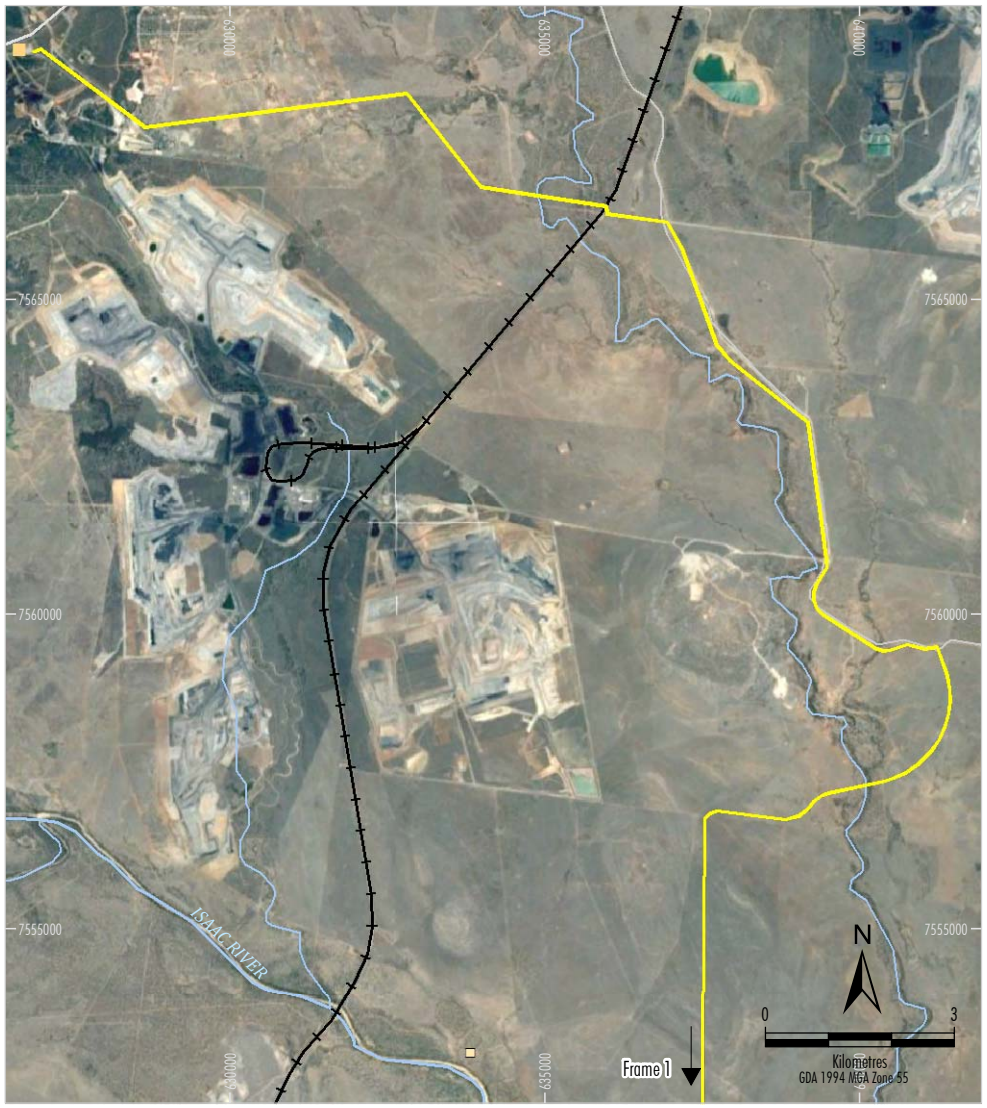
Threatened Species Habitat Mapping
Australian Painted Snipe - Mine Site

Figure 7-3a

Frame 1 - ETL Southern Section



Frame 2 - ETL Northern Section



PRN-16-02_EIS-AI_MT_221A

LEGEND

- Olive Downs Project Electricity Transmission Line (EPBC 2017/7869)
- Dwelling
- Railway
- Breeding Habitat - Australian Painted Snipe[1]

[1] *Note, this also provides foraging habitat for this species.*

Source: DPM (2018), Pembroke (2018), Queensland Department of Natural Resources, Mines and Energy (2017)
Orthophoto: Google Image (2016)
(Enirety of the Olive Downs Project Electricity Transmission Line (EPBC 2017/7869) is included in Stage 1 of the Project)

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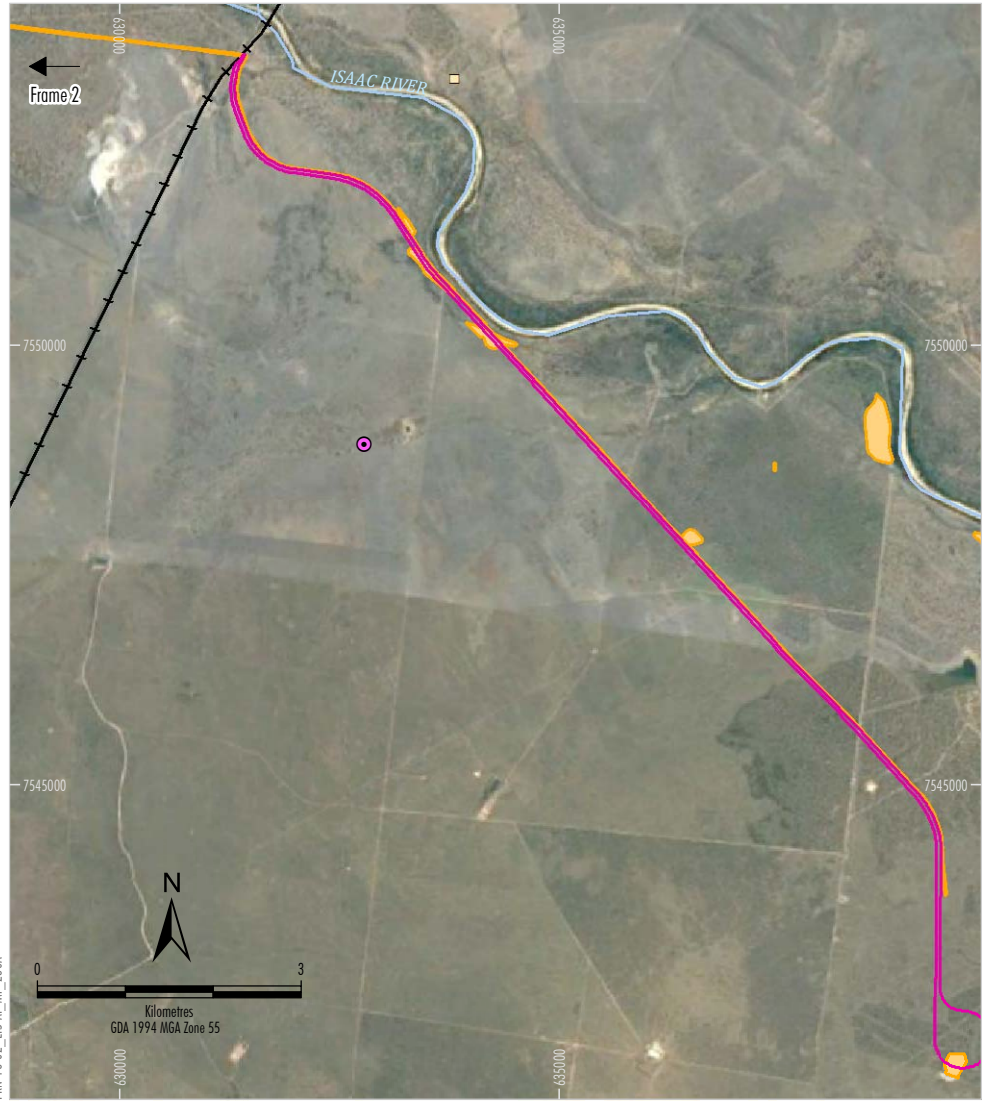
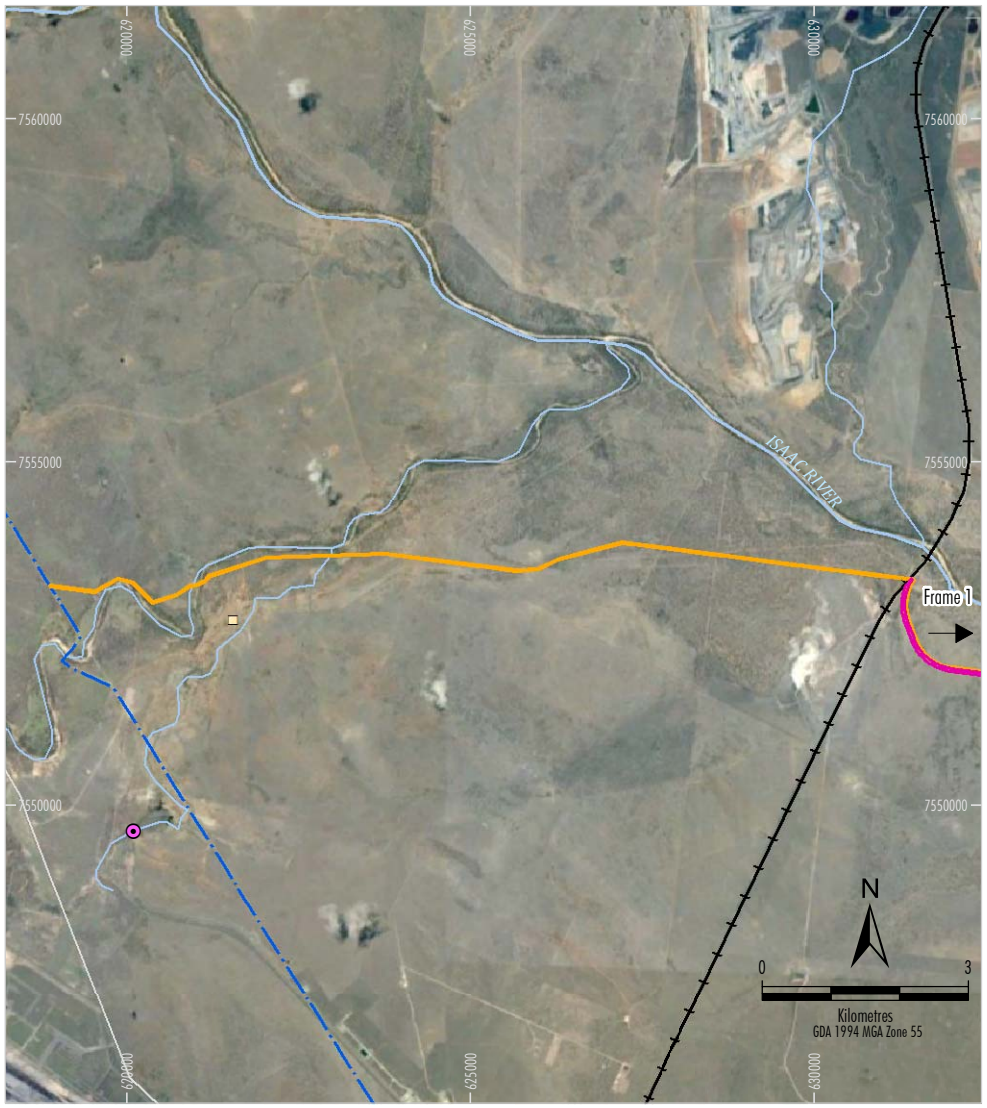
Threatened Species Habitat Mapping Australian Painted Snipe - ETL

Figure 7-3b

Frame 1 - Rail Spur



Frame 2 - Water Pipeline



PRN-16-02_EIS-AI_MT_230A

LEGEND

- Dwelling
- Railway
- Eungella Pipeline Network
- Olive Downs Project Rail Spur (EPBC 2017/7870)
- Olive Downs Project Water Pipeline (EPBC 2017/7868)
- Australian Painted Snipe
- Breeding Habitat - Australian Painted Snipe[1]

[1] *Note, this also provides foraging habitat for this species.*

Source: DPM (2018), Pembroke (2018), Queensland Department of Natural Resources, Mines and Energy (2017)
Orthophoto: Google Image (2016)
(Enirety of the Olive Downs Project Water Pipeline (EPBC 2017/7868) and the Olive Downs Project Rail Spur (EPBC 2017/7870) is included in Stage 1 of the Project)

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Threatened Species Habitat Mapping
Australian Painted Snipe -
Rail Spur and Water Pipeline

Figure 7-3c

Koala

The Koala has one of the largest distributions of any terrestrial threatened species listed under the EPBC Act (DotE, 2014). It occupies a variety of vegetation types across this large distribution, is capable of moving long distances, and is variably affected by a range of threats (DEE, 2019). Koala habitat is defined by the vegetation community present and the vegetation structure; Koalas do not necessarily have to be present (DotE, 2014). Any forest or woodland containing species that are known Koala food trees, or shrubland with emergent food trees can be considered as 'potential Koala habitat' (DEE, 2019). This can include remnant and non- remnant vegetation in natural, agricultural, urban and peri-urban environments. Koala food trees can generally be considered to be those of the genus *Angophora, Corymbia, Eucalyptus, Lophostemon* and *Melaleuca* (DEE, 2019).

Within the Project area, the Koala was recorded on numerous occasions along the Isaac River and associate tributaries (Figure 7-4). Recordings included direct observation and identification of scats and scratches within Eucalypt dry woodlands on inland depositional plains, Eucalypt open forest to woodlands on floodplains, and around wetlands.

Based on information provided in the SPRAT database (DEE, 2019), and associated guidelines (DotE, 2014b), there are no specific definitions for foraging, breeding and dispersal habitat for the Koala. It is not possible to separate foraging and breeding habitat requirements with the available information. It is likely that foraging and breeding habitats share the same characteristics. Other examples of detailed Koala habitat modelling, such as that undertaken by the Queensland Government to facilitate the application of the *Koala State Planning Regulatory Provisions* (Koala SPRP), have not differentiated between breeding or foraging requirements (DERM, 2009) (DPM Enviros ciences, pers. comm.).

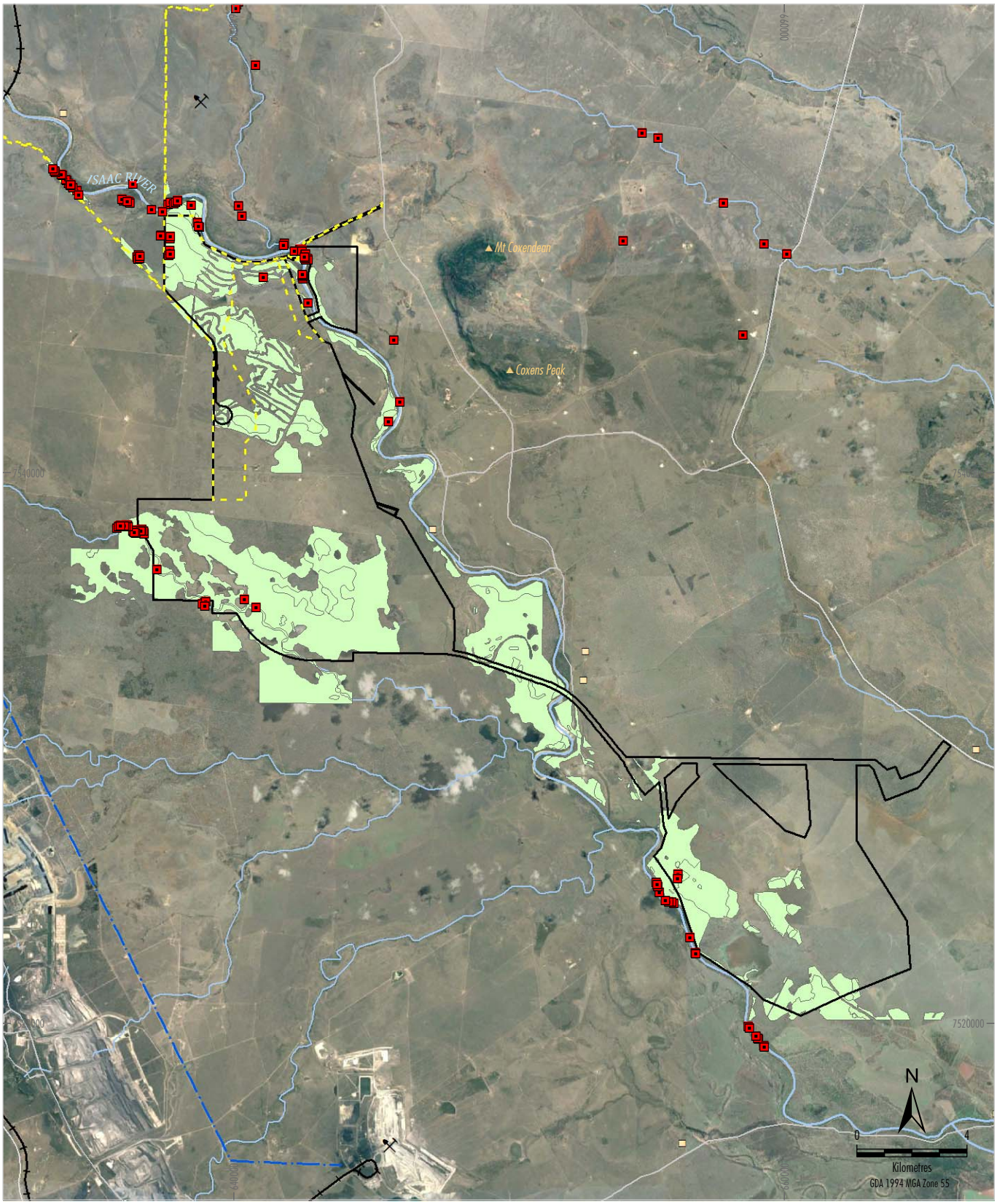
Within the Project area it was determined that Koala habitat includes all areas of eucalypt open forests to woodlands on floodplains (i.e. REs 11.3.3, 11.3.4, 11.3.7 and 11.3.25), eucalypt dry woodlands on inland depositional plains (i.e. REs 11.3.2, 11.5.3, 11.5.8c, 11.5.9, 11.5.9b and 11.9.2) and the vegetation surrounding and within the lacustrine and palustrine wetlands (i.e. REs 11.3.27f, 11.3.27i, 11.3.3c and 11.5.17) (Figure 7-4) (DPM Enviros ciences, pers. comm.). DPM Enviros ciences (pers. comm.) has also determined that these remnant vegetation communities meet the definition of Critical Koala Habitat, in accordance with the *EPBC Act Referral Guidelines for the Vulnerable Koala* (DotE, 2014). This comprises 5,583.5 ha of critical habitat for the Koala (DPM Enviros ciences, pers. comm.).

Those areas of non-remnant vegetation in the Project area, included in the 'Agricultural Grasslands' habitat type, do not contain Koala feed trees of an adequate size to support Koalas (i.e. *Eucalyptus spp. Corymbia spp. Lophostemon spp*. or *Melaleuca spp*. that are > 4 m in height and > 10 cm diameter at breast height [DBH]), in accordance with the definition of non-juvenile Koala habitat in the *Planning Regulation, 2017*. Other habitat types, such as 'Other coastal communities and heath' and 'Acacia dominated open forests, woodlands and shrublands', also do not contain Koala food trees required to support the species.

Greater Glider

The Greater Glider is largely restricted to eucalypt forests and woodlands. It is typically found in higher abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows (TSSC, 2016). The distribution may be patchy even in suitable habitat (TSSC, 2016).

Within the Project area, the Greater Glider was recorded on numerous occasions along the Isaac River and associated tributaries (Figure 7-5). Recordings included direct observation and identification of scats within Eucalypt dry woodlands on inland depositional plains and Eucalypt open forest to woodlands on floodplains.



LEGEND

- Olive Downs Project Mine Site and Access Road (EPBC 2017/7867)
- Indicitive Stage 1 Disturbance Extent
- Approved/Operating Coal Mine
- Eungella Pipeline Network
- Railway
- Peaks
- Dwelling
- Critical Habitat
- Koala

Source: DPM (2018), Pembroke (2018), Queensland Department of Natural Resources, Mines and Energy (2017)
Orthophoto: Google Image (2016)

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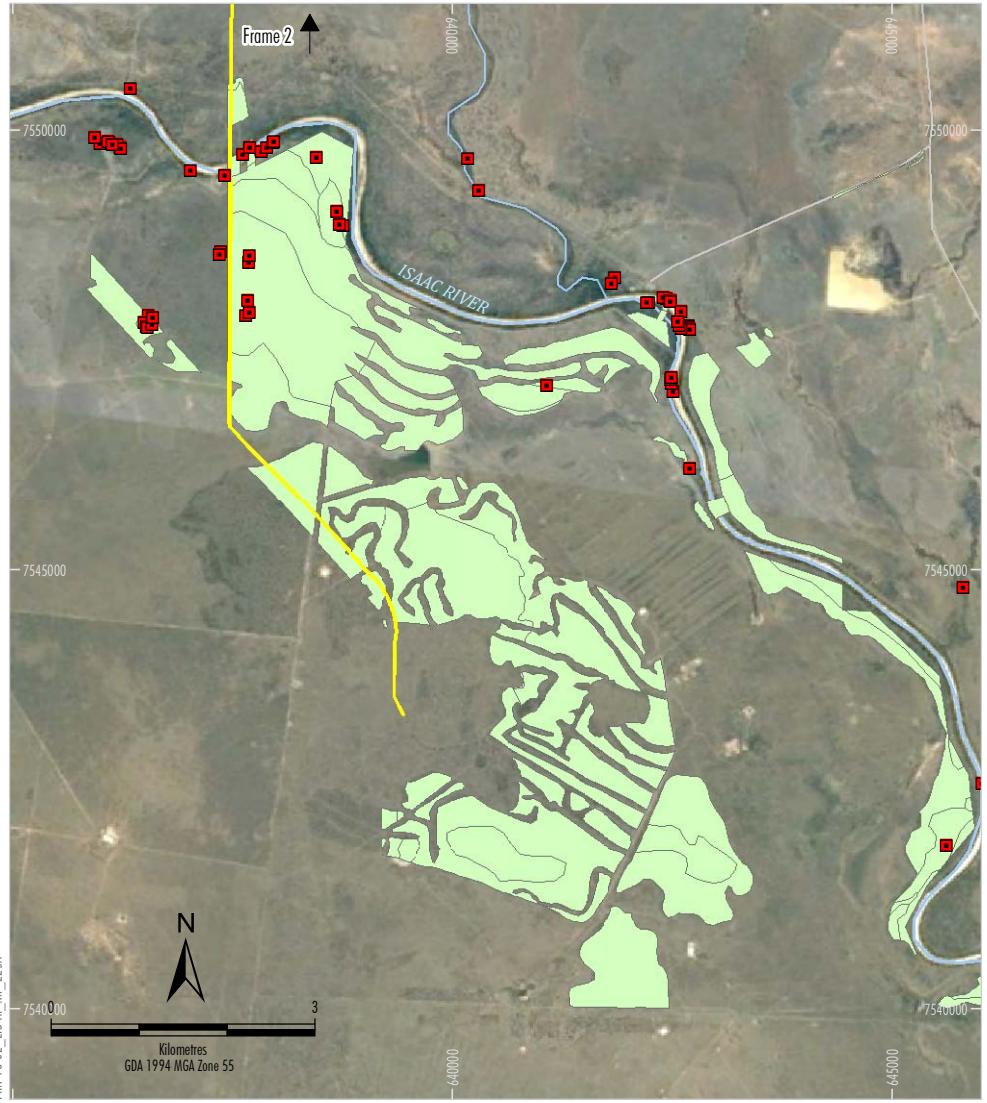
OLIVE DOWNS COKING COAL PROJECT

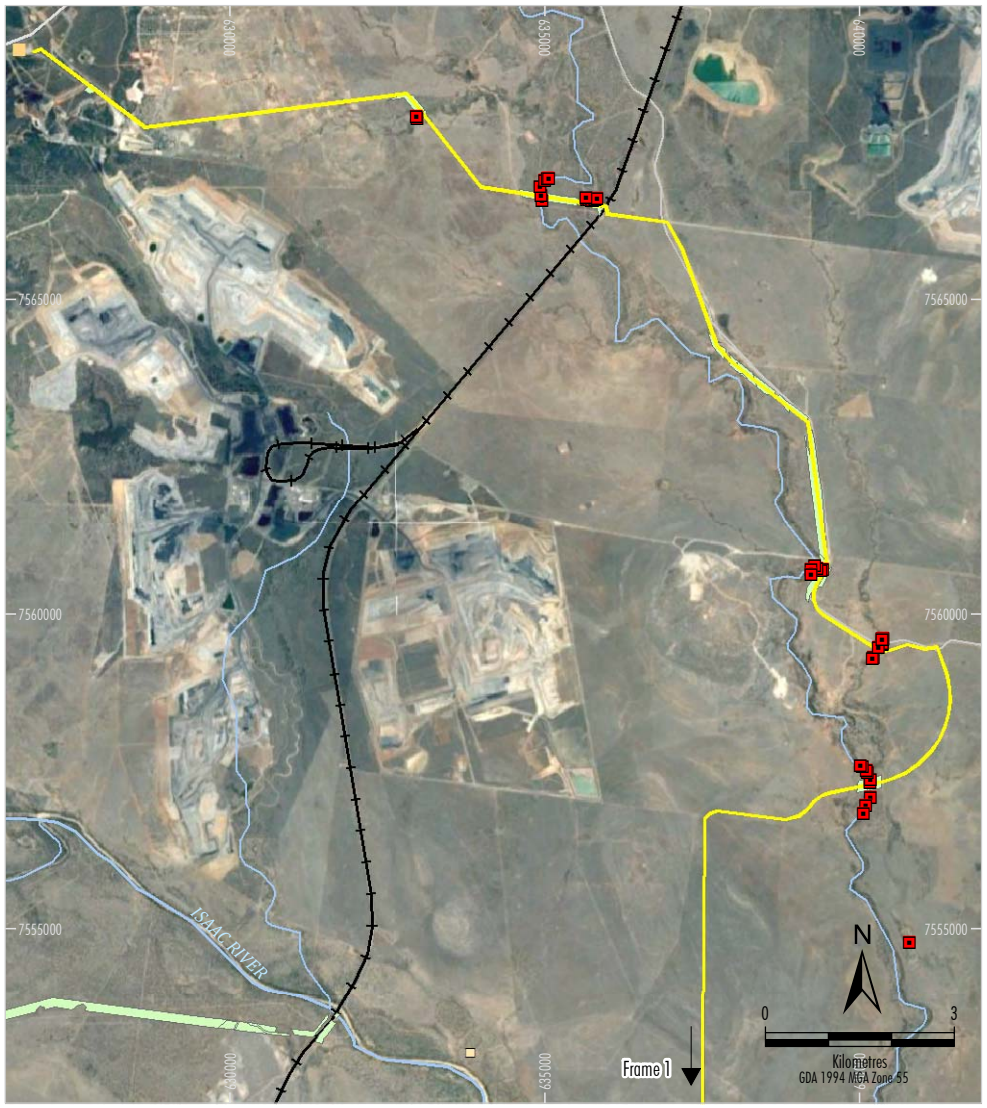
Threatened Species Habitat Mapping
Koala -
Mine Site

Figure 7-4a

Frame 1 - ETL Southern Section



Frame 2 - ETL Northern Section



PRN-16-02_EIS-AI_MT_225A

LEGEND

- Olive Downs Project Electricity Transmission Line (EPBC 2017/7869)
- Dwelling
- Railway
- Critical Habitat
- Koala

Source: DPM (2018), Pembroke (2018), Queensland Department of Natural Resources, Mines and Energy (2017)
Orthophoto: Google Image (2016)
(Enirety of the Olive Downs Project Electricity Transmission Line (EPBC 2017/7869) is included in Stage 1 of the Project

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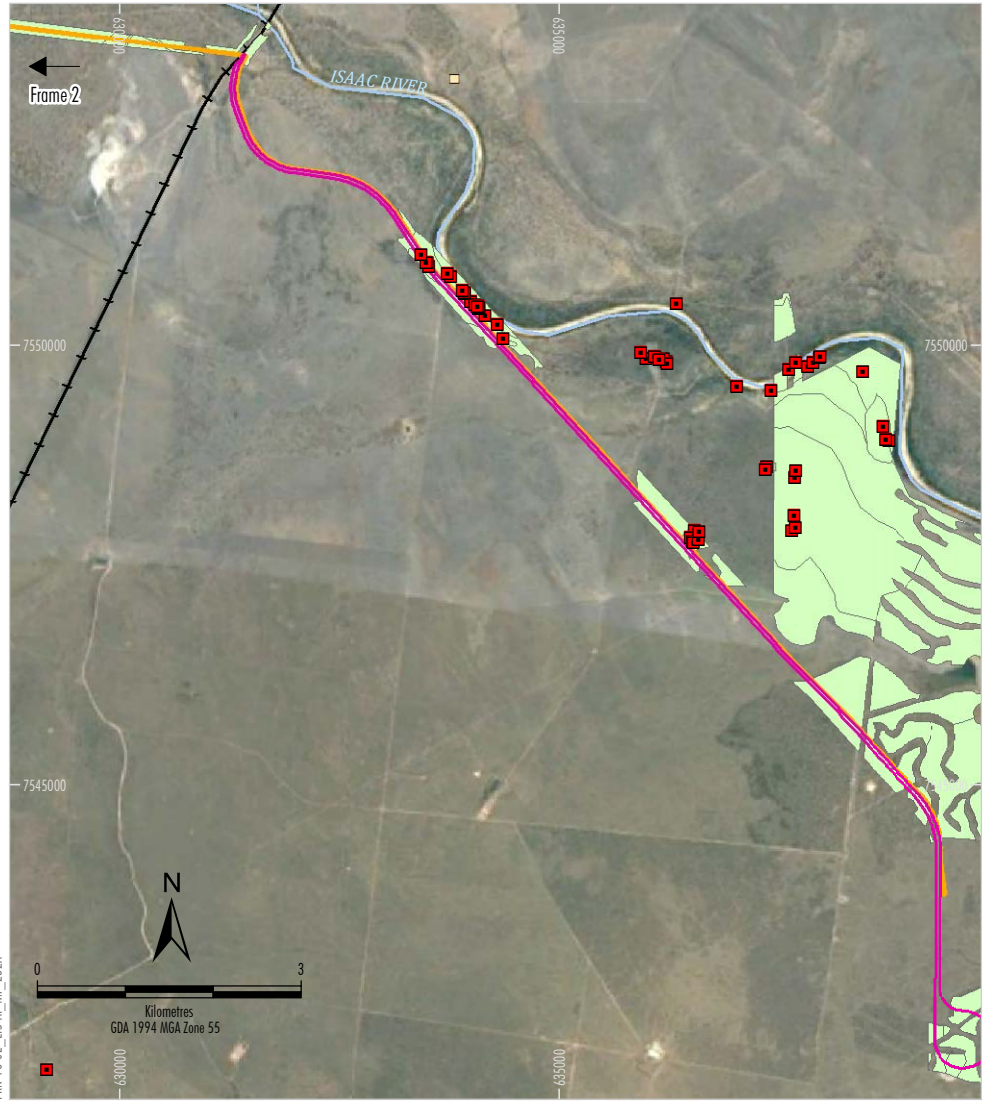
OLIVE DOWNS COKING COAL PROJECT

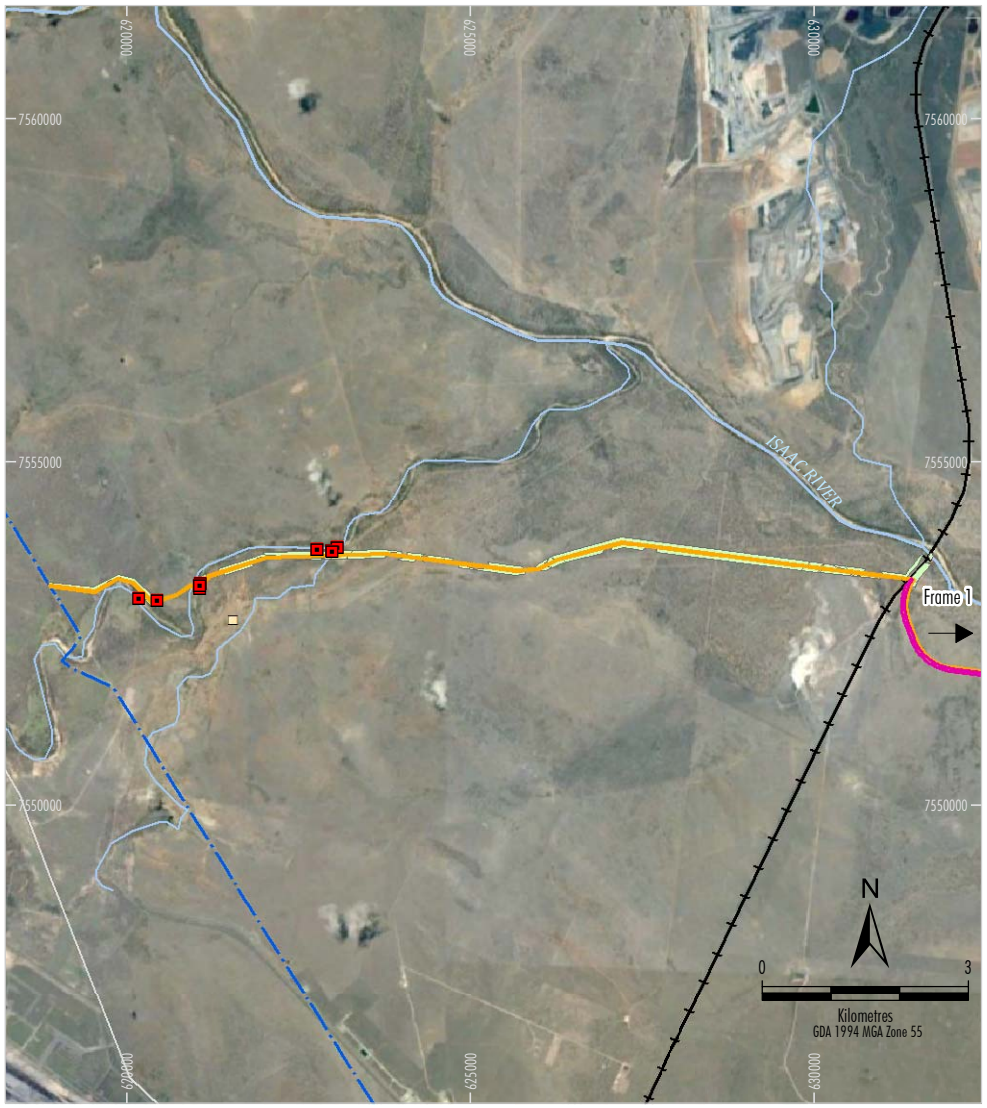
Threatened Species Habitat Mapping Koala - ETL

Figure 7-4b

Frame 1 - Rail Spur



Frame 2 - Water Pipeline



PRN-16-02_EIS-AI_MT_232A

LEGEND

- Dwelling
- Railway
- Eungella Pipeline Network
- Olive Downs Project Rail Spur (EPBC 2017/7870)
- Olive Downs Project Water Pipeline (EPBC 2017/7868)
- Koala
- Critical Habitat

Source: DPM (2018), Pembroke (2018), Queensland Department of Natural Resources, Mines and Energy (2017)
Orthophoto: Google Image (2016)
(Enirety of the Olive Downs Project Water Pipeline (EPBC 2017/7868) and the Olive Downs Project Rail Spur (EPBC 2017/7870) is included in Stage 1 of the Project

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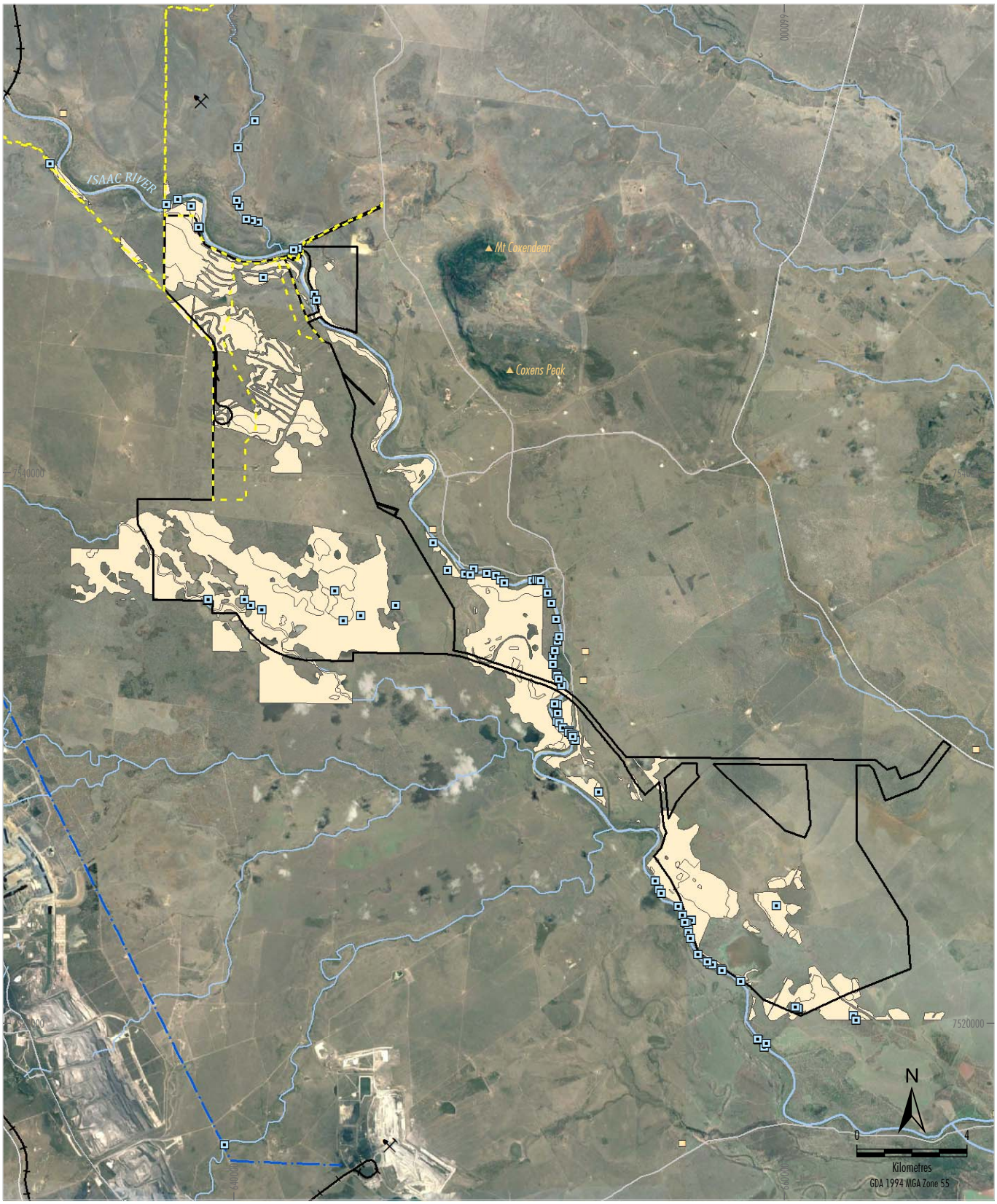
OLIVE DOWNS COKING COAL PROJECT

Threatened Species Habitat Mapping
Koala -
Rail Spur and Water Pipeline

Figure 7-4c



LEGEND

- Olive Downs Project Mine Site and Access Road (EPBC 2017/7867)
- Indicitive Stage 1 Disturbance Extent
- Approved/Operating Coal Mine
- Eungella Pipeline Network
- Railway
- Peaks
- Dwelling
- Known Habitat[1]
- Greater Glider

[1] *Note, this includes suitable breeding and foraging habitat.*

Source: DPM (2018), Pembroke (2018), Queensland Department of Natural Resources, Mines and Energy (2017)
Orthophoto: Google Image (2016)

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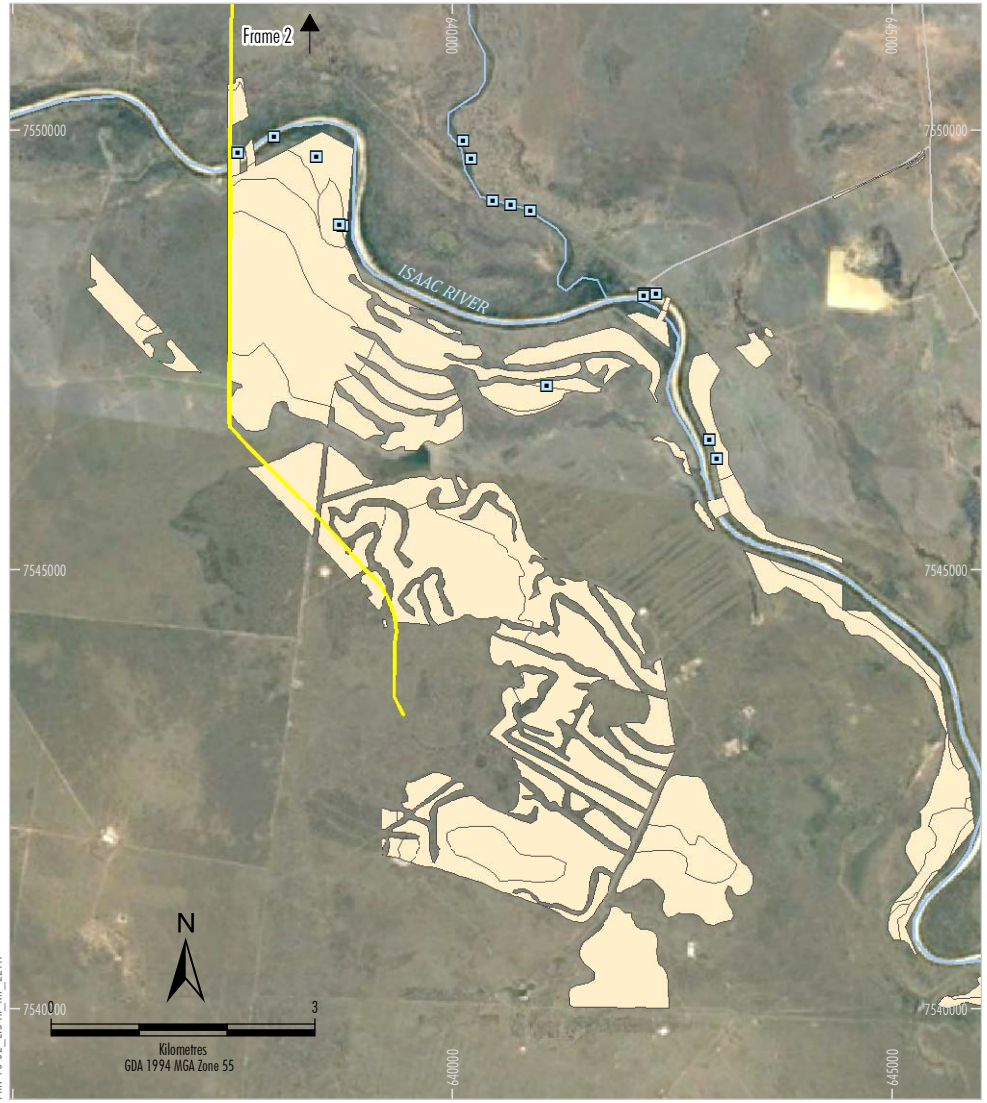
OLIVE DOWNS COKING COAL PROJECT

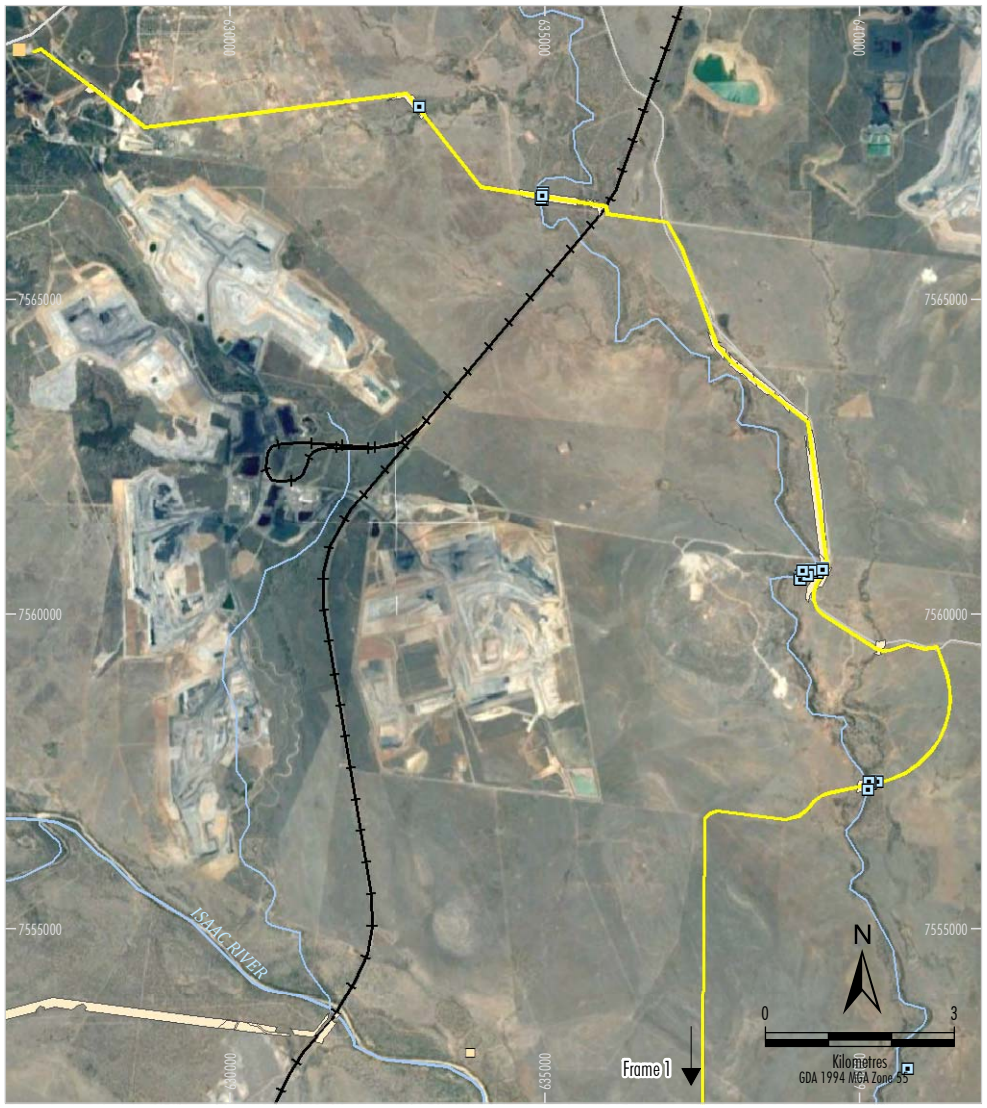
Threatened Species Habitat Mapping
Greater Glider -
Mine Site

Figure 7-5a

Frame 1 - ETL Southern Section



Frame 2 - ETL Northern Section



PRN-16-02_EIS-AI_MT_227A

LEGEND

- Olive Downs Project Electricity Transmission Line (EPBC 2017/7869)
- Dwelling
- Railway
- Known Habitat[1]
- Greater Glider

[1] *Note, this includes suitable breeding and foraging habitat.*

Source: DPM (2018), Pembroke (2018), Queensland Department of Natural Resources, Mines and Energy (2017)
Orthophoto: Google Image (2016)
(Enirety of the Olive Downs Project Electricity Transmission Line (EPBC 2017/7869) is included in Stage 1 of the Project

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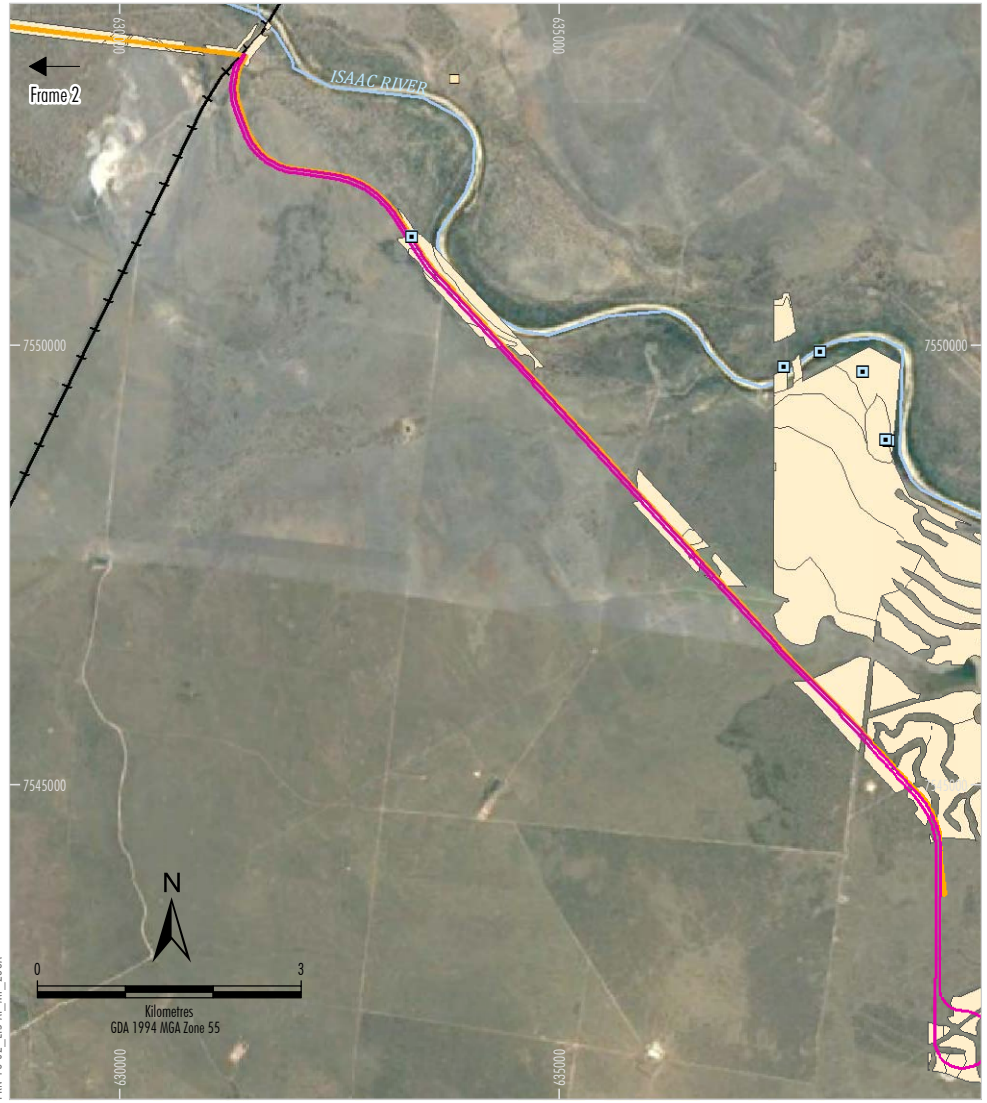
OLIVE DOWNS COKING COAL PROJECT

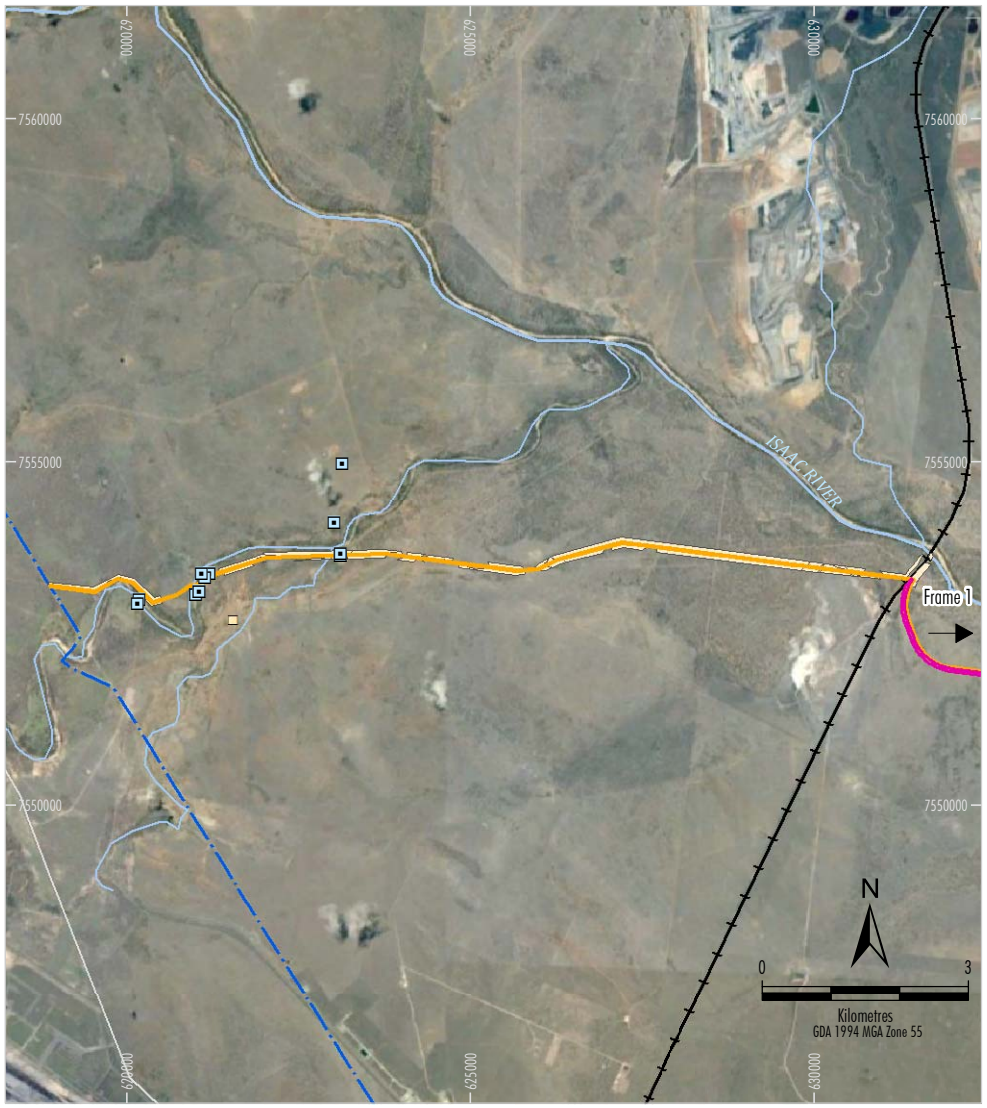
Threatened Species Habitat Mapping Greater Glider - ETL

Figure 7-5b

Frame 1 - Rail Spur



Frame 2 - Water Pipeline



PRN-16-02_EIS-AI_MT_233A

LEGEND

- Dwelling
- Railway
- Eungella Pipeline Network
- Olive Downs Project Rail Spur (EPBC 2017/7870)
- Olive Downs Project Water Pipeline (EPBC 2017/7868)
- Greater Glider Known Habitat[1]

[1] *Note, this includes suitable breeding and foraging habitat.*

Source: DPM (2018), Pembroke (2018), Queensland Department of Natural Resources, Mines and Energy (2017)
Orthophoto: Google Image (2016)
(Enirety of the Olive Downs Project Water Pipeline (EPBC 2017/7868) and the Olive Downs Project Rail Spur (EPBC 2017/7870) is included in Stage 1 of the Project

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OLIVE DOWNS COKING COAL PROJECT

Threatened Species Habitat Mapping
Greater Glider -
Rail Spur and Water Pipeline

Figure 7-5c

There is no habitat definition on DEEs SPRAT database (DEE, 2019) for Greater Glider. The Conservation Advice for the species suggests it is largely restricted to eucalypt forests and woodlands, preferring forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species (TSSC, 2016). It feeds only on myrtaceous species and is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old, large trees (>50cm diameter at breast height) with large hollows (TSSC, 2016). Home ranges are typically relatively small (1−4 ha), but are larger in lower productivity forests and more open woodlands (up to 16 ha) (TSSC, 2016). The Greater Glider is considered to be particularly sensitive to forest clearance and may be sensitive to fragmentation, having relatively low persistence in small forest fragments and poor dispersal across vegetation that is not native forest (TSSC, 2016).

Based on the information provided in the SPRAT database (DEE, 2019) and listing advice (TSSC, 2016), there are no specific definitions for foraging, breeding and dispersal habitat for the Greater Glider. However, it is likely that foraging, breeding and dispersal habitats share the same characteristics, particularly as the Greater Glider requires large hollows to shelter in during the day, limiting the distance it can travel away from habitats that provide these hollows. Smith et al. (2007) noted that den tree species included the same species used for foraging (DPM Envirosciences, pers. comm.).

Within the Project area it was determined that Greater Glider habitat includes all areas of ‘Eucalypt open forests to woodlands on floodplains’ (i.e. REs 11.3.3, 11.3.4, 11.3.7 and 11.3.25), ‘Eucalypt dry woodlands on inland depositional plains’ (i.e. REs 11.3.2, 11.5.3, 11.5.8c, 11.5.9, 11.5.9b and 11.9.2) and the vegetation surrounding and within the lacustrine and palustrine wetlands (i.e. REs 11.3.27f, 11.3.27i, 11.3.3c and 11.5.17). (Figure 7-5) (DPM Envirosciences, pers. comm.).

These habitat types contain Greater Glider food trees (Eucalyptus spp.), which are not found or not in high abundance (as suggested in the Conservation Advice) within other habitat types (that are cleared or Acacia communities) in the Project area. The species is known to have limited dispersal ability across vegetation that does not incorporate feeding or denning trees (TSSC, 2016). Denning trees (i.e. large trees containing suitable hollows) were confirmed to be present within a large portion of the REs providing habitat for the Greater Glider and given the size of the Project area. As a result, the suitable habitat for the Greater Glider within the Project area comprises approximately 5,583.5 ha of potential breeding/foraging/dispersal habitat.

Other habitat types within the Project area (including the ‘Agricultural Grasslands’ habitat type) are not considered suitable for the species because they lack a high density of large mature eucalypts, which are important for foraging and denning (Appendix B of the draft EIS).

2. Document the extent of impacts associated with each EPBC project (mine site and access road, ETL, rail loop and pipeline) on each relevant threatened species, using the habitat definitions developed in response to point 1 above.

Table 7-4 outlines the extent of impacts associated with each EPBC Act Action (i.e. Mine Site and Access Road, ETL, Rail Loop and Spur, and Water Pipeline) on each relevant threatened species using the habitat definitions developed in response to Item 1 above.

Table 7-4
Residual Significant Impact on MNES

MNES	Approximate Area of Clearance in Stage 1 (ha)					Stage 2	Stage 3	Stage 4	Total Project Impact	Significant Residual Impact Likely?
	Mine Site and Access Road	Water Pipeline*	Project ETL*	Rail Spur*	Total Stage 1					
Brigalow EEC	0	0	0	0	**0**	0	13	0	**13**	Yes
Ornamental Snake	461.5	7	10.5	27	**506**	1,596	3,916	1,648	**7,666**[1]	Yes
Australian Painted Snipe	14	1	0	6	**21**	24	50	25	**120**[2]	Yes
Squatter Pigeon	743	23	14	43	**823**	1,757	2,284	746	**5,610**[3]	Yes
Koala	743	28.5	12	43	**826.5**	1,762	2,261	734	**5,583.5**[4]	Yes
Greater Glider	743	28.5	12	43	**826.5**	1,762	2,261	734	**5,583.5**[5]	Yes

Source: DPM Enviros ciences (pers comm.).

[1] This is comprised entirely of 'Important Habitat' for the Ornamental Snake.

[2] This is comprised entirely of potential breeding habitat for the Australian Painted Snipe.

[3] This is comprised of approximately 3,628 ha of breeding habitat, approximately 1,822 ha of foraging and approximately 160 ha of dispersal habitat.

[4] This is comprised entirely of 'Critical Habitat' for the Koala.

[5] This is comprised entirely of potential breeding/foraging habitat for the Greater Glider.

3. Provide estimates of the areas of habitat available in the broader locality, catchment and region for each relevant threatened and migratory species and discuss the likely cumulative impacts of the projects on the habitats of those species. This should also consider the presence in the broader locality, catchment and region and the likely cumulative impacts of each EPBC project on the Brigalow Threatened Ecological Community.

As described in Section 3.2 of the draft EIS, the Project is located within the Brigalow Belt North Bioregion (as defined by DEE [2018]). In a local context, the Project is located within the Bowen Basin mining area where, in parallel with agricultural activities, open cut (and underground) coal mining is a key land use. As a result, the majority of the Project area comprises agricultural grasslands with tracts of remnant vegetation (Appendix A of the draft EIS).

The REs to be cleared during the life of the Project all occur more widely in surrounding landscapes and subregions (Accad et al., 2017), with clearance associated with the Project representing approximately 0.4% of the remaining remnant vegetation in the Northern Bowen Basin and Isaac-Comet Downs biodiversity sub-regions (Accad et.al., 2017).

Table 7-5 outlines the area of potential habitat for the relevant threatened species and communities listed under the EPBC Act (using the habitat definitions developed in response to Item 1 above), proposed to be removed by the Project, relative to the area of potential habitat within the broader locality (i.e. within 10 km of the Project area), Isaac River Catchment and Isaac-Comet Subregion.

Figures 7-1a to 7-5c show the presence of each of the fauna species listed in Table 7-5 within the broader locality.

Table 7-5
Habitat Clearance Summary

Action	Habitat Type	Habitat Clearance (ha)					
		Brigalow EEC	**Ornamental Snake**	**Squatter Pigeon (Southern)**	**Australian Painted Snipe**	**Koala**	**Greater Glider**
Mine Site and Access Road	Remnant	13	144	5,530	113	5,500	5,500
	Non-remnant	0	7,477.5	0	0	0	0
	Sub-total	**13**	**7,621.5**	**5,530**	**113**	**5,500**	**5,500**
Water Pipeline	Remnant	0	0	23	1	27.5	27.5
	Non-remnant	0	7	0	0	0	0
	Sub-total	**0**	**7**	**23**	**1**	**27.5**	**27.5**
Project ETL	Remnant	0	0	14	0	12	12
	Non-remnant	0	10.5	0	0	0	0
	Sub-total	**0**	**10.5**	**14**	**0**	**12**	**12**
Rail Spur and Loop	Remnant	0	0	43	6	43	43
	Non-remnant	0	27	0	0	0	0
	Sub-total	**0**	**27**	**43**	**6**	**43**	**43**
Total		**13**	**7,666[3]**	**5,610[4]**	**120[5]**	**5,583.5[6]**	**5,583.5[7]**
Approximate Area of Habitat within the broader locality (i.e. 10 km of the Project boundary)[1]		16,068	43,178	62,978	655	63,633	63,633
Approximate Area of Habitat within the Isaac River Catchment[2]		41,621	57,657	598,855	271,100	883,471	883,471
Approximate Area of Habitat within the Isaac-Comet Downs Subregion[2]		81,369	122,842	524,567	174,573	413,453	413,453

[1] Based on the REs identified as potential habitat on DEE (2018a) from the DSITI (2018) regional mapping available over the area. This area does not include dispersal habitat as the identification of potential dispersal habitat requires field validation.

[2] Based on the REs identified as potential habitat on DEE (2018a) from Accad et. al. (2017). This area does not include dispersal habitat as the identification of potential dispersal habitat requires field validation.

[3] This is comprised entirely of 'Important Habitat' for the Ornamental Snake.

[4] This is comprised of approximately 3,628 ha of breeding habitat, approximately 1,822 ha of foraging and approximately 160 ha of dispersal habitat.

[5] This is comprised entirely of potential breeding habitat for the Australian Painted Snipe.

[6] This is comprised entirely of 'Critical Habitat' for the Koala.

[7] This is comprised entirely of potential breeding/foraging habitat for the Greater Glider.

As demonstrated in Table 7-5, although the Project would result in removal of potential habitat for each of these MNES, the area of habitat proposed to be cleared is only a small portion of the habitat available for each of these MNES within the broader locality, catchment and subregion.

It is noted that the Lake Vermont Coal Mine Northern Extension Project (EPBC 2016/7701) (Lake Vermont Project) was approved on 29 June 2018. Although the Lake Vermont Project was not determined to be a Controlled Action for threatened species and communities, the Squatter Pigeon (southern) was recorded during the ecology surveys, and it was determined that suitable habitat for the southern Squatter Pigeon (southern) exists throughout the Lake Vermont Project site (AARC, 2016). The area of habitat of the Squatter Pigeon (southern) within the Lake Vermont Project site is taken into consideration in the areas of habitat within the broader locality, catchment and region within Table 7-5.

As outlined in Table 7-5, the Project would result in the removal of approximately 5,610 ha of potential habitat for the Squatter Pigeon, which would, in conjunction with the Lake Vermont Project, further minimise the area of potential habitat for this species in the broader locality.

In addition to the progressive rehabilitation of the Project, Pembroke would provide a biodiversity offset for the impacts associated with the Project in accordance with the Queensland Environmental Offsets Policy (Version 1.4) (DEHP, 2017) and EPBC Act Environmental Offsets Policy (SEWPaC, 2012a) (and supporting EPBC Act Offsets Assessment Guide [SEWPaC, 2012b]) (Section 3.8 of the draft EIS). The biodiversity offset area (once established) would provide a beneficial conservation outcome for biodiversity in the broader locality, catchment and region.

Migratory Species

The cumulative effect of the existing mines and agricultural activities in the broader locality is already evident in the landscape, with most wetlands within the Project locality already exhibiting impacts from grazing stock (Appendix B of the draft EIS).

The Project would result in the clearance of some areas of wetland habitat, including palustrine (e.g. swamps) and lacustrine (e.g. dams) wetlands, along with areas of gilgai habitat that would provide temporary wetted habitat after rainfall (Appendix B of the draft EIS).

As demonstrated in Table 7-5, Accad et. al. (2017) indicates that large areas of wetland habitat, required by migratory species, exist within the broader locality, catchment and region as follows:

- 655 ha of wetlands within 10 km of the Project area;
- 271,100 ha of wetlands within the Isaac River Catchment; and
- 174,573 ha of wetlands within the Isaac-Comet Downs Subregion.

With this in mind, it is evident that the wetland habitats proposed to be removed by the Project only represent a very small portion of the wetland habitat available for use by migratory species in the broader locality, catchment region, and indeed the greater extent of Queensland and Australia as demonstrated by the wide-ranging distribution of these species (DEE, 2018a).

4. Based on the revised habitat descriptions, impact estimates and assessment of cumulative impacts, discuss how the project, avoids, mitigates or manages impacts on the relevant threatened or migratory species and avoids, mitigates or manages impacts for the Brigalow Threatened Ecological Community.

As detailed in Section 4.1.4 of the draft EIS, consistent with the DES' management hierarchy, the mitigation strategy for the Project has focused on a hierarchy of:

1. avoidance;
2. minimisation;
3. mitigation; then
4. offset of residual impacts.

Section 3.3.7 of the draft EIS outlines the proposed avoidance and mitigation measures proposed to be implemented to manage impact on the relevant MNES. These sections have been reproduced below, with updates to reflect the revised habitat definitions, where relevant.

Refinement of the Mine Design to Avoid and Minimise Land Clearance

The following measures would be implemented to avoid and / or minimise impacts on terrestrial ecology:

- Mine – Impacts to known habitat for MNES along the Isaac River has been minimised in the mine design and a minimum buffer zone of 200 m between the mine pits and Isaac River has been implemented.
- Overland conveyor – The overland conveyor would run North-west from the Willunga Domain and cross the Isaac River approximately 4.5 km from its origin point. The conveyor would be restricted to a construction corridor of 180 m however this would be minimised when crossing the Isaac River; where, within 200 m of the defining bank, the construction corridor width would be limited to 45 m to minimise impact on the riparian habitat which provides known habitat for MNES.
- Access road – the proposed 3.5 km access road would be co-located with existing public and private roads as far as possible to minimise impacts to known habitat to MNES. The access road would be restricted to 40 m at the crossing point to minimise the impact on the riparian habitat which provides known habitat for MNES.
- Haul road crossing – The haul road crossing of the Isaac River would provide access to the waste emplacement on Deverill from the Olive Downs South Domain. The crossing would be located approximately 2 km south-south east of the access road where it crosses the Isaac River entering an area ground-truthed as being RE 11.3.25 of Least Concern. The haul road would be restricted to a construction corridor of 60 m.
- Water pipeline – the proposed water pipeline would connect to the existing Eungella Pipeline west of the Project. The water pipeline would be approximately 23 km long and has been co-located with the rail corridor as far as possible (for a distance of 15 km from the mine site to the existing Norwich Park Branch to minimise known habitat for MNES. All patches of Brigalow EEC have been avoided and impacts to Endangered and Of Concern REs minimised by minimising the corridor for the water pipeline to 20 m.
- ETL – the proposed ETL utilises an existing easement between the sub-station on Peak Downs Highway and the rail (Norwich Park Branch), then follows Daunia Road and Annandale Road before heading south for 13 km across predominately cleared land to the MLA. The ETL would be restricted to a construction corridor of 10 m.
- Rail spur – The final location of the rail spur would maintain a buffer zone of approximately 85 m to the riparian vegetation along the bank of the Isaac River at its closest point (affecting 1.5 km of the rail alignment) as this vegetation if known to provide habitat for MNES. It has avoided all areas of BrigalowEC and most Endangered RE (with the exception of waterway crossings).

Ornamental Snake

The following measures would be undertaken by Pembroke to minimise potential adverse impacts on important habitat for the Ornamental Snake:

- Vegetation clearance procedures outlined in Table 7-6. This includes progressive vegetation clearing, demarcation of habitats proposed to be cleared, the implementation of pre-clearance surveys and the use of a qualified fauna spotter catcher.
- Implementation of a Weed and Pest Management Plan to monitor and control feral animals (including feral pigs which can degrade important habitat for the Ornamental Snake [DEE, 2018a]).
- Bushfire prevention would be undertaken, noting that the important habitat for the Ornamental Snake occurs in Brigalow Woodland and this species uses groundcover which is susceptible to fire (DEE, 2018a).

A National or State recovery plan has not been prepared for this species. The above measures are predicted to be effective in minimising potential adverse impacts from the Project on the important and dispersal habitat for the Ornamental Snake because they are focused on addressing the recognised threats to the species and they are consistent with the relevant threat abatement actions (e.g. avoiding additional habitat loss and minimising the risk of invasive and predatory species) (DEE, 2018a).

Further to this, the unavoidable loss of habitat for the Ornamental Snake associated with the Project would be offset in accordance with the *EPBC Act Environmental Offsets Policy* (DSEWPC, 2012a) (Section 10).

Australian Painted Snipe

The following measures would be undertaken by Pembroke to minimise potential adverse impacts on breeding/foraging habitat for the Australian Painted Snipe:

- Vegetation clearance procedures outlined in Table 7-6. This includes progressive vegetation clearing, demarcation of habitats proposed to be cleared, the implementation of pre-clearance surveys and the use of a qualified fauna spotter catcher.
- Implementation of a Weed and Pest Management Plan to monitor and control feral animals (including foxes and feral cats which are known threats to the Australian Painted Snipe) within the breeding/foraging habitat identified.

The above measures are predicted to be effective in minimising potential adverse impacts from the Project on potential foraging habitat for the Australian Painted Snipe because they are focused on addressing the recognised threats to the species identified in the *Approved Conservation Advice for Rostratula australis Australian Painted Snipe* (DSEWPC, 2013) and are consistent with the relevant threat abatement actions (e.g. avoiding additional habitat loss and controlling feral animals) (after DotE, 2014b).

Further to this, the unavoidable loss of habitat for the Australian Painted Snipe associated with the Project would be offset in accordance with the *EPBC Act Environmental Offsets Policy* (DSEWPC, 2012a) (Section 10).

Squatter Pigeon (southern)

The following measures would be undertaken by Pembroke to minimise potential adverse impacts on the breeding, foraging and dispersal habitat for the Squatter Pigeon (southern):

- Vegetation clearance procedures outlined in Table 7-6. This includes progressive vegetation clearing, demarcation of habitats proposed to be cleared, the implementation of pre-clearance surveys and the use of a qualified fauna spotter catcher.
- A Weed and Pest Management Plan would be implemented to monitor and control feral animals (such as the European Rabbit, Feral Cat and European Red Fox which are known threats to the Squatter Pigeon [southern]) in the breeding, foraging and dispersal habitat for this species.

The above measures are predicted to be effective in minimising potential adverse impacts from the Project on the breeding, foraging and dispersal habitat for the Squatter Pigeon (southern) because they are focused on addressing the recognised threats to the species and are consistent with the relevant threat abatement actions (e.g. avoiding additional habitat loss and controlling predators and herbivores) (DEE, 2018a). A National or State recovery plan has not been prepared for this species.

Further to this, the unavoidable loss of habitat for the Squatter Pigeon (southern) associated with the Project would be offset in accordance with the *EPBC Act Environmental Offsets Policy* (DSEWPC, 2012a) (Section 10).

Koala

The following measures would be undertaken by Pembroke to minimise potential adverse impacts on critical habitat for the Koala:

- Impact avoidance measures outlined in Table 7-6 of the Additional Information to the EIS (including minimising potential impacts to the riparian corridor associated with the Isaac River).
- Vegetation clearance procedures outlined in Table 7-6. This includes progressive vegetation clearing, demarcation of habitats proposed to be cleared, the implementation of pre-clearance surveys and the use of a qualified fauna spotter catcher.
- Implementation of fauna crossings to ensure safe fauna movement across haul roads (between areas of critical habitat).
- A Weed and Pest Management Plan would be implemented to monitor and control feral animals (such as the feral dog which is a known threat to the Koala) in the critical habitat for the Koala.

The above measures are predicted to be effective in minimising potential adverse impacts from the Project on critical habitat for the Koala because they are focused on addressing the recognised threats to the species and are consistent with the relevant threat abatement actions (e.g. avoiding additional habitat loss and controlling predators) (DEE, 2018a). A National or State recovery plan has not been prepared for this species.

Further to this, the unavoidable loss of habitat for the Koala associated with the Project would be offset in accordance with the *EPBC Act Environmental Offsets Policy* (DSEWPC, 2012a) (Section 10).

Greater Glider

The following measures would be undertaken by Pembroke to minimise potential adverse impacts on habitat for the Greater Glider:

- Impact avoidance measures outlined in Table 7-6 of the Additional Information to the EIS (including minimising potential impacts to the riparian corridor associated with the Isaac River).
- Vegetation clearance procedures outlined in Table 7-6. This includes progressive vegetation clearing, demarcation of habitats proposed to be cleared, the implementation of pre-clearance surveys and the use of a qualified fauna spotter catcher.
- Implementation of fauna crossings to ensure safe fauna movement across haul roads (between patches of Greater Glider habitat).
- A Weed and Pest Management Plan would be implemented to monitor and control pests and feral animals in Greater Glider habitat.

The above measures are predicted to be effective in minimising potential adverse impacts from the Project on habitat for the Greater Glider because they are focused on addressing the recognised threats to the species and are consistent with the relevant threat abatement actions (e.g. avoiding additional habitat loss and controlling predators) (DEE, 2018a). A National or State recovery plan has not been prepared for this species.

Further to this, the unavoidable loss of habitat for the Greater Glider associated with the Project would be offset in accordance with the *EPBC Act Environmental Offsets Policy* (DSEWPC, 2012a) (Section 10).

Brigalow

The Project would remove approximately 13 ha of Brigalow EEC (represented by RE 11.4.9). These patches are already degraded by edge effects and are highly fragmented. A further two patches of Brigalow EEC would be avoided by the Project and it is unlikely that any potential indirect impacts would result in significant impacts to these patches of Brigalow EEC.

The following measures would be undertaken by Pembroke to minimise potential adverse impacts on the Brigalow EEC:

- Vegetation clearance procedures, including demarcation of clearing zones to protect the areas of Brigalow EEC to be retained.
- Bushfire prevention would be undertaken (Table 7-6).
- A Weed and Pest Management Plan would be implemented to monitor and control weed species in areas of Brigalow EEC to be retained.

The above measures are predicted to be effective in minimising potential adverse impacts from the Project on Brigalow EEC because they are focused on addressing the recognised threats to the community and are consistent with the relevant threat abatement actions (e.g. avoiding additional clearance, minimising the risk of fire, weeds and pest animals) (DEE, 2018a). A National or State recovery plan has not been prepared for this community.

Further to this, the unavoidable loss of Brigalow EEC associated with the Project would be offset in accordance with the *EPBC Act Environmental Offsets Policy* (DSEWPC, 2012a) (Section 10).

Table 3-25 of the draft EIS has been also been updated and reproduced below as Table 7-6.

Table 7-6
Proposed Avoidance and Mitigation Measures for the Project

Potential impact	Mitigation measures
Vegetation clearing	• Demarcate exclusion zones prior to clearing to protect areas of vegetation to be retained. • Clearing of native vegetation would be undertaken progressively over the life of the mine and only in areas required for mining activities within the following year. This would have the effect of minimising the area of exposed land. • Vegetation clearing / excavation to be subject to internal permitting system. • Salvage felled vegetation for millable timber, as appropriate. • Collection of native seed from the Project area for use in rehabilitation program. • Implement vegetation clearance procedures. • Implement Rehabilitation and Mine Closure Plan.
Fauna mortality	• Limit time of construction to avoid breeding seasons for threatened species. • Licenced fauna spotter-catchers to undertake detailed inspection of areas to be cleared • Retain hollow-bearing trees and large stags as potential nesting and roosting habitat. • Appropriate signage in prominent positions to reduce vehicle speeds in the Project area. • Vehicular traffic generally to be restricted to access tracks and an on-site speed limit would be applied.
Fragmentation	• Design bridge structures to maximise vegetation retention. • Maintain fencing and fauna crossings to ensure safe fauna movement.
Reduction of threatened fauna populations	• Implement management measures for fauna mortality, as outlined above. • Progressive rehabilitation. • Prepare a Species Management Program (in accordance with section 332 of the *Nature Conservation [Wildlife Management] Regulation, 2006*) • Implement Rehabilitation and Mine Closure Plan.
Increased numbers of feral animals	• Ensure site waste management measures reduce the potential to attract vermin and other fauna. • Any waste storage facilities associated with the Project to be designed and located to restrict fauna access. • Management of feral animals, particularly dogs, cats and pigs. • Restrictions around allowing domestic pets on-site. • Implement Weed and Pest Management Plan.

Table 7-6 (Continued)
Proposed Avoidance and Mitigation Measures for the Project

Potential impact	Mitigation measures
Weed management and edge effects	• Clearing of vegetation to be restricted to the minimum required to enable the safe construction, operation and maintenance of the Project, including infrastructure corridors. • Conduct rehabilitation activities for disused areas of the Project, as soon as possible. • Identification of weed infestations. • Prioritisation of treatment of weed infestations or weed species and ongoing treatment regimes (as necessary). • Strategies for preventing weed spread i.e. machinery wash-down, boot scrubbing facilities, appropriate disposal of weed material. • Implement the Weed and Pest Management Plan.
Increased occurrence of wildfire	• Provide appropriate buffer distances between the MLA and surrounding bushland and manage vegetation within the buffer areas to maintain safe fuel loads. • Any chemicals used in the Project area would be handled and disposed of in accordance with the relevant Safety Data Sheet. • Access tracks would be able to be used for fire-fighting and other emergency purposes by Queensland Fire and Rescue Service. • Implement an Emergency Response Procedure prepared in consultation with emergency services.

Source: (Appendix B of the draft EIS).

5. Discuss indirect impacts of the project on the relevant threatened and migratory species including habitat fragmentation, lighting, noise, dust, changes to hydrology, invasive weeds, fencing or any other relevant matter. Alternatively, identify where this has been addressed in the draft EIS.

Section 6 of the Terrestrial Flora Assessment and Terrestrial Fauna Assessment provides a detailed assessment of potential indirect impacts on native flora and fauna species (including threatened species). This includes an assessment of edge effects, fauna mortality (from clearance activities and vehicle strike), weeds, feral animals, hydrological changes, loss in connectivity, noise, dust, bushfire, artificial lighting and cumulative impacts.

Further to this, an additional assessment of potential hydrological impacts to MNES is provided in Appendix E. This includes an assessment of potential impacts associated with groundwater drawdown on riparian vegetation, which is known to provide habitat for the Koala, Greater Glider and Squatter Pigeon (southern).

As outlined in Appendix E, the areas of terrestrial riparian vegetation (RE 11.3.25 and RE 11.3.4) associated with the Isaac River are likely to be facultative GDEs, following period of heavy rainfall, when the thickness of saturate alluvium increases to the extent that these communities may be able to access it. In addition, the areas of terrestrial riparian vegetation along the downstream reaches of Ripstone Creek may also be facultative GDEs. These communities are unlikely to constantly rely on access to the groundwater under normal conditions for their survival.

Groundwater drawdown predictions were modelled by HydroSimulations (Appendix D of the draft EIS), indicating that drawdown in the alluvium is only predicted to reach/extend past the Isaac River in a 4 km stretch of the Isaac River at the very northern extent of the Project area and a 2.5 km stretch of the Isaac River adjacent to the Willunga domain. The drawdown in these areas is not expected to exceed 2 m, while the potential drawdown at the downstream reaches of Ripstone Creek may reach up to 5 m (Appendix D of the draft EIS).

Although the potential drawdown of approximately 2 to 5 m is predicted to occur in areas where vegetation may be intermittently dependent on subsurface expression of groundwater, it is unlikely that this potential impact would result in a significant impact to terrestrial riparian vegetation. This is due to the fact that this vegetation is subject to continuous (natural) wetting and drying cycles and these communities are most likely facultative GDEs which rely more heavily on the replenishment of moisture in the soil following rainfall rather than access to the groundwater system (as shown on Figure 7 of Appendix E). The Project would not result in a drawdown in the alluvial aquifers that would dewater the aquifer to the extent that it would not recover following rainfall (HydroSimulations, pers comm.).

Given the above, it is unlikely that the Project would result in any impacts to the terrestrial riparian vegetation that would result in a decline in the quality or availability of habitat for threatened species, including the Koala, Greater Glider and Squatter Pigeon (southern).

6. Provide justification for the methods used to map and assess Koala habitat on the project site and review the assessment of impacts on the Koala with reference to the interim recovery objectives for the inland population of the Koala.

As outlined in response to Item 1 (a) above, within the Project area it was determined that Koala habitat includes all areas of eucalypt open forests to woodlands on floodplains (i.e. REs 11.3.3, 11.3.4, 11.3.7 and 11.3.25), eucalypt dry woodlands on inland depositional plains (i.e. REs 11.3.2, 11.5.3, 11.5.8c, 11.5.9, 11.5.9b and 11.9.2) and the vegetation surrounding and within the lacustrine and palustrine wetlands (i.e. REs 11.3.27f, 11.3.27i, 11.3.3c and 11.5.17) (Figure 7-4).

Those areas of non-remnant vegetation in the Project area, included in the 'Agricultural Grasslands' habitat type, do not contain Koala feed trees of an adequate size to support Koalas (i.e. *Eucalyptus spp. Corymbia spp. Lophostemon spp*. or *Melaleuca spp*. that are > 4 m in height and > 10 cm DBH), in accordance with the definition of non-juvenile Koala habitat in the *Planning Regulation, 2017*. Other habitat types, such as 'Other coastal communities and heath' and 'Acacia dominated open forests, woodlands and shrublands', also do not contain Koala food trees required to support the species.

In addition to this, The Koala Habitat Assessment table in Section 3.3.7.1 of the draft EIS (i.e. Table 3-13) identifies that the Project would remove habitat which meets the definition of 'Critical Habitat' for the Koala as defined in the *EPBC Act Referral Guidelines for the Vulnerable Koala (combined Qld, New South Wales and the Australian Capital Territory)* (DotE, 2014).

Notwithstanding, Pembroke has reassessed the likelihood of Critical Habitat being located within the Project area given the following comment from DEE:

> *The EIS has scored the "Recovery value" attribute in Table 3-12 as a '0' with the justification that it does not meet the recovery objectives of the coastal population.*
>
> *Based on the information available, the Department considers the project lies within the inland population of the Koala (as per the Koala referral guidelines). Further, the Department considers the habitat on the project site is important for achieving the interim recovery objectives because the site:*
>
> - *contains water courses and riparian vegetation; and*
> - *is adjacent to the Isaac River (where there is a high abundance of species records), which is considered a habitat refuge.*

Increasing the Recovery Value from a '0' to a '2' and reassessing the Koala habitat against the criteria of an 'inland population' still results in the identification of Critical Habitat for the Koala within the Project area. Given this, there is no change to the conclusion in Section 3.3.7.1 of the draft EIS (i.e. the Project would remove habitat which meets the definition of 'Critical Habitat' for the Koala), and no subsequent change to the Project offset requirements as outlined in Section 10.

The Biodiversity Offset Strategy prepared for the Project (Section 10) outlines how the Stage 1 Offset Area compensates for the loss of Koala habitat in accordance with the *EPBC Act Environmental Offsets Policy*.