TERRESTRIAL ECOLOGY MNES ASSESSMENT - ADDENDUM

BMC DRAGLINE MOVE PROJECT

Prepared for
Advisian

Biodiversity Assessment and Management Pty Ltd
PO Box 1376
CLEVELAND 4163

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Project Manager/s: Paulette Jones

Client: Advisian on behalf of BHP Billiton Mitsui Coal

Project Title: BMC Dragline Move Project Terrestrial Ecology MNES Assessment - Addendum

Project Author/s: Dr Lindsay Popple and Paulette Jones.

Project Summary: An addendum to the assessment of terrestrial ecology Matters of National Environmental Significance associated with the BMC Dragline Move Project corridor between Goonyella and South Walker Creek Mines north-east of Moranbah. The addendum provides the details of changes to the dragline transport route since the date of Project referral and responds to Department of Environment and Energy requests for further documentation.

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Biodiversity Assessment and Management Pty Ltd

Date: 08/12/2016

Managing Director

BMC DRAGLINE MOVE PROJECT TERRESTRIAL ECOLOGY MNES ASSESSMENT - ADDENDUM

GOONYELLA TO SOUTH WALKER CREEK, MORANBAH

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Table of Terms and Abbreviations

BAAM	Biodiversity Assessment and Management Pty Ltd
BMC	Billiton Mitsui Coal
DotEE	Department of the Environment and Energy
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
MNES	Matters of National Environmental Significance
TEC	Threatened Ecological Community

1.0 INTRODUCTION

This report has been prepared by Biodiversity Assessment and Management Pty Ltd (BAAM) for Advisian on behalf of BHP Billiton Mitsui Coal as an addendum to the BMC Dragline Move Project Terrestrial Ecology MNES Assessment (BAAM, 2016).

The purpose of this addendum is to:

1. Update the MNES assessment to reflect potential adjustments to the dragline move route that have arisen since the date of the Project referral, particularly in relation to yet-to-be-finalised designs for two powerline crossings, and
2. Respond to points 2.1, 2.2 and 2.3 of the DOtEE request of 18 November 2016 for additional information required for the Project Preliminary Documentation.

The amended impact quantities in hectares identified throughout this document represent a conservative worst case impact scenario associated with the two unresolved powerline crossing designs, with final impacts expected to be well less than the indicated quantities. The presented scenario involves an overall total of 105.63 ha of habitat that is core or essential habitat for one or more of the subject fauna species to be impacted, 9.73 ha of which also represent the Brigalow TEC. This compares with 99.45 ha of habitat and 9.73 ha of TEC nominated at the time of the referral. A further updated work-in-progress version of the two powerline crossing designs indicates potential to reduce the area of MNES impact back to below the totals indicated in the referral. This will be settled in early 2017.

2.0 UPDATED TOTAL DISTURBANCE AREAS ASSOCIATED WITH WORST CASE POWERLINE CROSSING DESIGNS

The dragline move route is shown in **Figure 2.1**. The total areas of MNES values expected to be impacted by the proposed dragline move are provided in **Table 2.1**. Note that there is considerable overlap of the habitat requirements for the subject species, as well as for the Brigalow TEC. In all, a total of 105.63 ha of habitat that is core or essential habitat for one or more of the subject fauna species will be impacted, 9.73 ha of which also represent the Brigalow TEC.

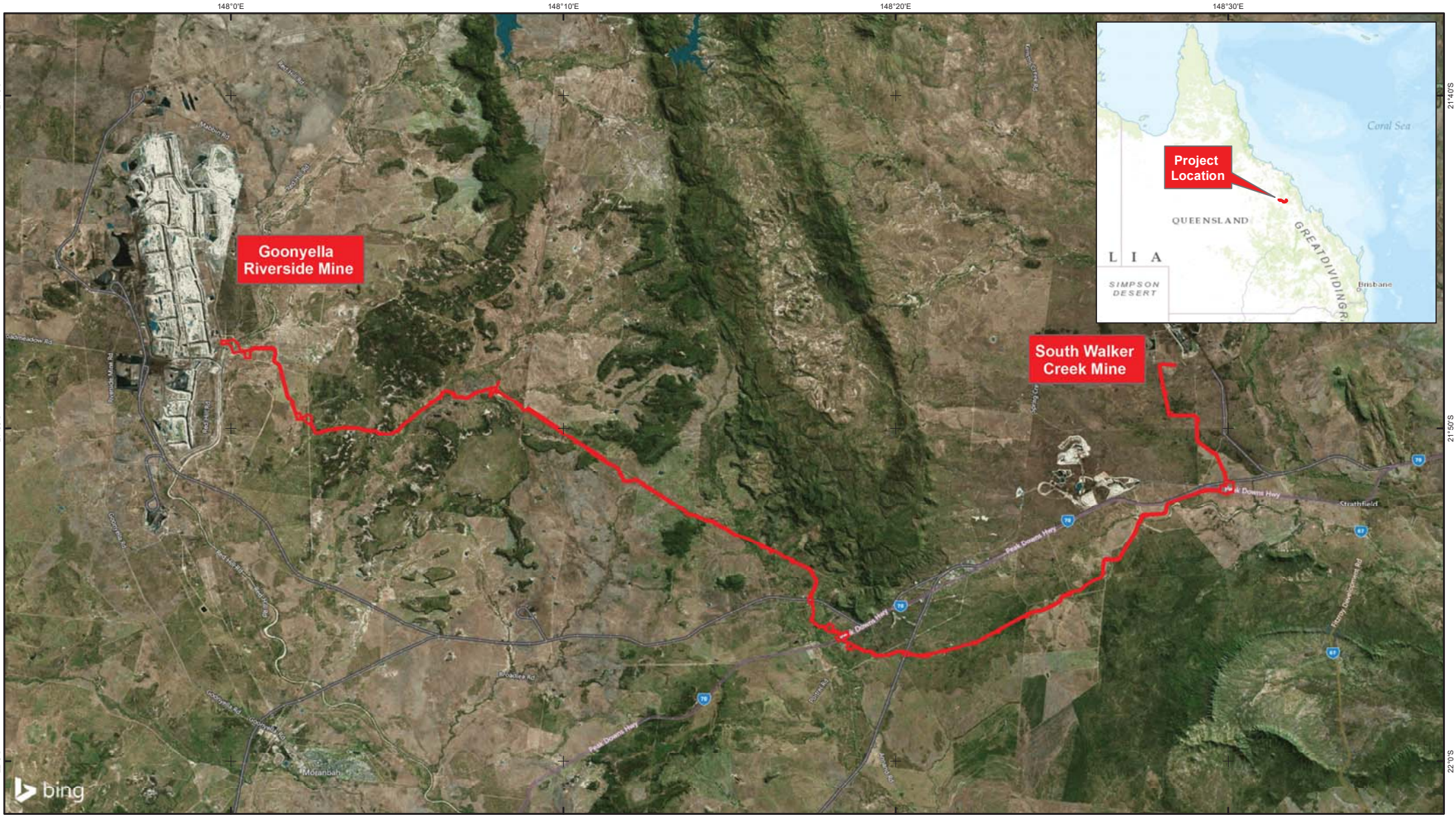
In addition, there are locations within the dragline move route used for this assessment that are wider than the approximate 40 m required for the dragline move. This assessment is based on the worst case scenario in these locations, and final impacted habitat areas may be less than those provided in this report.

The total disturbance footprint is approximately 711 ha in area. This represents approximately 8.1% of the broad investigation area over which MNES habitat values have been calculated for the purposes of this assessment (approximately 8740 ha). The broad investigation area is defined by a buffer of 500 m around the centreline of the proposed dragline move route.

Table 2.2 provides a comparison of the MNES habitat areas within the dragline move corridor with ground-truthed habitat present within a distance of approximately 500 m of the route.

Table 2.1 Field-verified MNES fauna habitat modelling results.

MNES Value	Area (ha)[1]	Area (ha)			
		Core Habitat	Essential Habitat	General Habitat	Unlikely Habitat
Brigalow TEC	9.73				
Koala		5.39	98.74	1.6	605.76
Squatter Pigeon		68.85	24.45	10.24	605.75
Ornamental Snake		0.28	52.16	18.02	641.02
Yakka Skink		0	105.63	0.1	605.75



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Datum: GDA 1994
Units: Degree

1:205,163 at A4
0 1,150 2,300 4,600 6,900 9,200 Meters

LEGEND

Dragline Move Route Revision D

Figure:	2.1
Title:	Locality Map
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment – Addendum
Client:	Advisian

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Table 2.2. Comparison of impacted MNES habitat within surrounding habitat extents.

MNES	Estimated habitat extent within 500m of the dragline transport route centreline (ha)	Potential core and essential habitat impacted within dragline transport route corridor (ha)	Estimated habitat remaining within 500m of the dragline transport route centreline (ha)	Estimated % habitat impacted within 500m of the dragline transport route centreline
Endangered Ecological Community				
Brigalow	190	9.73	180.27	5.1
Vulnerable Species[1]				
Koala	3549	104.13	3444.87	2.9
Ornamental Snake	1235	52.44	11822.56	4.2
Squatter Pigeon	3354	93.3	3254.8	2.8
Yakka Skink	3618	105.63	3512.37	2.9

[1] Estimates are the sum area of core and essential habitat (see **Table 2.1**).

3.0 IMPACT ASSESSMENT

3.1 ASSESSMENT AGAINST THE GUIDELINES

An assessment of the potential for the proposed Dragline Move Project to result in Significant Impacts on matters of national environmental significance has been undertaken against the Significant Impact Guidelines 1.1 (Department of the Environment, 2013).

The individual assessments of impacts take into account the short term nature of the project and the implementation of the proposed mitigation and management measures.

The adjustments to the dragline move route since the preparation of the Terrestrial Ecology MNES Assessment result in an additional 6.28 ha of unavoidable disturbance to habitat for MNES. The impact assessments for each relevant MNES have been updated accordingly.

3.1.1 Threatened Ecological Communities

Table A.1, Appendix A addresses impacts on the Endangered Brigalow (*Acacia harpophylla* dominant and co-dominant communities) occurring within the dragline move route. The assessment finds that clearing for the Project:

- would reduce the extent of the TEC (9.73 ha) and in accordance with the significant impact criteria, would result in a significant impact.
- would fragment a 13 ha patch of the TEC into two smaller patches (**Figure 3.1**), likely resulting in a significant impact.

3.1.2 Ornamental Snake

Figures 3.2a-3.2f, provided in **Appendix B,** show the location of modelled habitat for Ornamental Snake within the dragline move corridor.

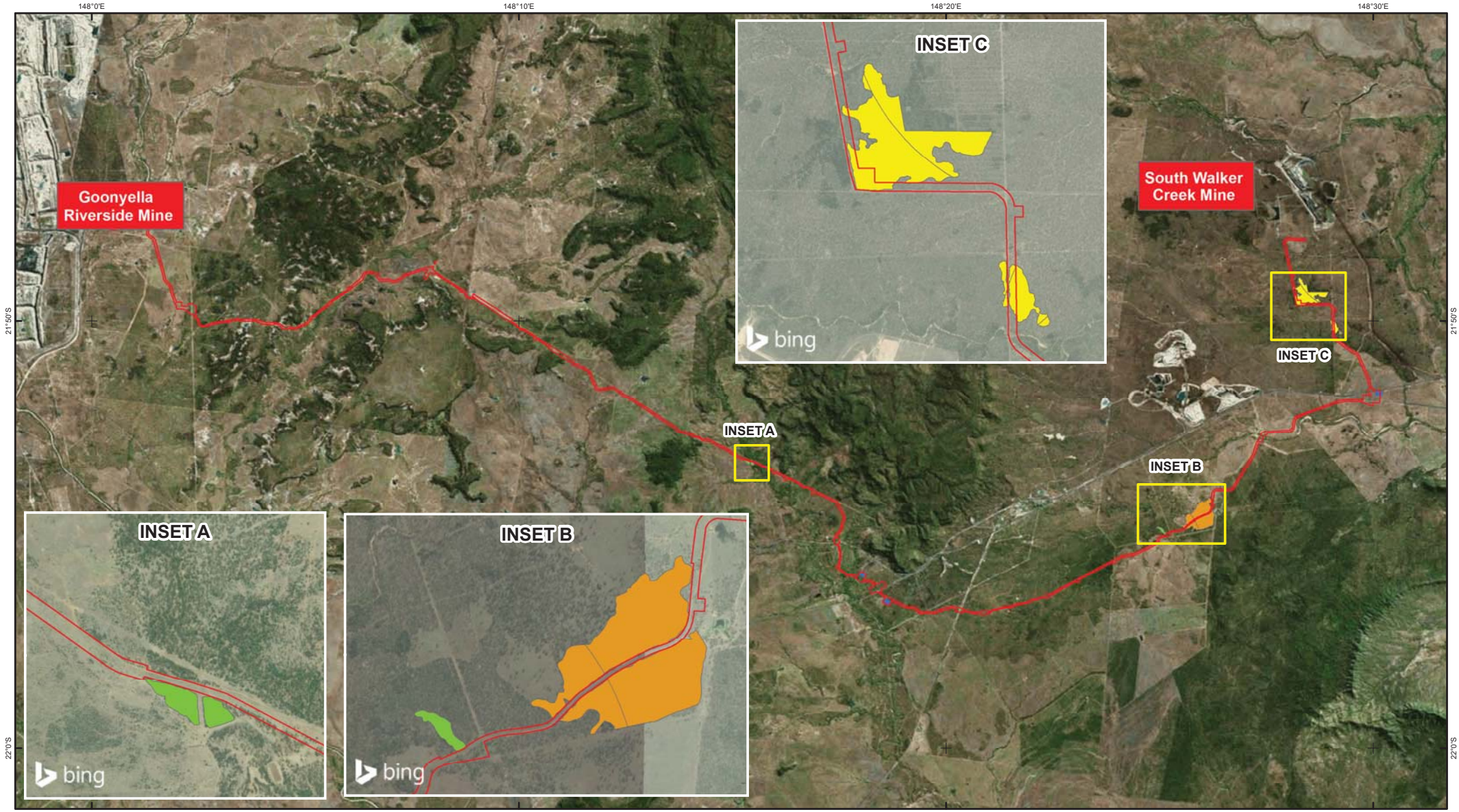
Table A.2, Appendix A addresses impacts on the Vulnerable Ornamental Snake. Given that the species is patchily distributed in the landscape, it must be considered that there is potential for the population in the study area to be an important population. The assessment finds that clearing for the Project:

- could potentially lead to a long-term decrease in the size of an important population of the species, resulting in a significant impact
- could potentially reduce the area of occupancy of an important population
- could potentially disrupt the breeding cycle of an important population of the species, resulting in a significant impact.

3.1.3 Squatter Pigeon (Southern Subspecies)

Figures 3.3a-3.2f, provided in **Appendix B,** show the location of modelled habitat for Squatter Pigeon within the dragline move corridor.

Table A.3, Appendix A addresses impacts of the Project on the Vulnerable Squatter Pigeon (Southern Subspecies). It finds that activities associated with the Project would not result in any significant impact for the species when assessed against the significant impact criteria.



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Datum: GDA 1994
Units: Degree

1:158,835 at A4
0 875 1,750 3,500 5,250 7,000 Meters

LEGEND

Ground-truthed Brigalow TEC

- Brigalow TEC 11.4.9
- Brigalow TEC 11.9.1/11.9.5
- Brigalow TEC 11.9.5

- Dragline Move Route Revision D
- Temporary Shutdown Areas

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Figure:	3.1
Title:	Occurrence of ground-truthed Brigalow TEC within the Dragline Move Route
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment – Addendum
Client:	Advisian

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3.1.4 Koala

Figures 3.4a-3.4f, provided in **Appendix B,** show the location of modelled habitat for Koala within the dragline move corridor.

Table A.4, Appendix A provides the results of the assessment of impacts of the Project on the Vulnerable Koala. It finds that activities associated with the Project would not result in any significant impact for the species when assessed against the significant impact criteria.

3.1.5 Yakka Skink

Figures 3.5a-3.5f, provided in **Appendix B,** show the location of modelled habitat for Yakka Skink within the dragline move corridor.

Table A.5, Appendix A provides the results of the assessment of impacts of the Project on the Vulnerable Yakka Skink.

Given that the species is patchily distributed in the landscape, it must be considered that there is potential for the population in the study area to be an important population. The assessment finds that clearing for the Project:

- could potentially lead to a long-term decrease in the size of an important population of the species, resulting in a significant impact.
- could potentially disrupt the breeding cycle of an important population of the species, resulting in a significant impact.

3.1.6 Migratory Species

Table A.6, Appendix A addresses impacts on EPBC Act listed Migratory species. It finds that activities associated with the Project would not result in any significant impact for Migratory species when assessed against the significant impact criteria.

3.2 ENVIRONMENTAL OFFSET REQUIREMENT

Where significant impacts on MNES cannot be avoided, mitigated or managed, the EPBC Act Environmental Offsets Policy (DSEWPaC 2012) allows compensation for those impacts through the provision of appropriate environmental offsets.

Along the entire dragline transport route, the proposed impact areas that have been assessed as representing 'significant impact' in accordance with the EPBC Act Significant Impact Guidelines 1.1 are:

- 9.73 ha of Brigalow TEC.
- 52.44 ha of "core" and "essential" habitat for Ornamental Snake.
- 105.63 ha of "core" and "essential" habitat for Yakka Skink.

4.0 ADDITIONAL ASSESSMENT OF IMPACTS ON KOALA

This section responds to the following specific requests for further information by DOtEE:

2.1 Explain (with supporting literature) the impact that the removal of 98 ha [now 104 ha for the revised dragline move corridor] of core and essential Koala habitat will have on local Koala population(s);

2.2 Explain (with supporting literature) the impact, if any, that the cleared track constructed for the dragline move will have on fragmenting Koala population(s); and

2.3 Provide a map which displays the extent of the Koala habitat that exists within the broader area of Map 5.4a, 5.4b, 5.4c, 5.4d, 5.4e, 5.4f (2016-778 Referral Attachment 3 Terrestrial Ecological MNES Assessment Appendices).

4.1 IMPACTS OF KOALA HABITAT REMOVAL

The broader Koala population in Queensland is known to be heterogeneous, with population densities varying widely across much of the state (Carrick 2013). There is generally limited information on Koala population densities for the majority of inland Australia (Fitzgibbon *et al.* 2013). However, there have been a number of recent studies on local Koala populations in central Queensland and these indicate that the overall population occurs at a low density in this region (Melzer *et al.* 2013, Tucker and Clifton 2013). Gordon *et al.* (2006) provides evidence for a population increase in central Queensland in the last decade of the first half of the 20th century, followed by a significant decline between 1980 and 2000. Concordantly, Melzer *et al.* 2013, notes a contraction in regional areas, including parts of central Queensland in association with a prolonged drought in the late 1990s/early 2000s. Tucker and Clifton (2013) provide an account of more detailed records between 2009 and 2011, centred on the Isaac Local Government Area, which shows widespread Koala occurrences along the Eton and Sarina Ranges and also further west from Dysart to north of Clermont. They point out that a considerable gap in records exists from west of

Nebo through the Moranbah region and a similar example exists between Emerald and Blackwater. Tucker and Clifton (2013) concluded that a broadly continuous but low density population exists through the northern areas of central Queensland.

Database records from the Queensland Government Wildnet Database and from the Atlas of Living Australia show a similar pattern for Koala in central Queensland to that provided in Tucker and Clifton (2013), with a paucity of records in the vicinity of the Peak Downs Highway from west of Nebo to Moranbah. There are very few records in the vicinity of the dragline transport route (see **Figure 4.1**). The combined evidence from supporting literature and database resources indicates that the project area occurs within the gap between local areas of higher population density or source populations in the ranges to the east and in the vicinity of Dysart. Given that habitats supporting Koala trees in the Moranbah area have already been extensively fragmented, mainly due to land clearing for cattle grazing, it is likely that Koala movement through this area would be along the major waterway corridors, as seen in districts with similar annual rainfall totals further west (Sullivan *et al.* 2003b). Koala food trees along major watercourses have more reliable access to moisture and are more likely to fulfil the nutrient requirements of Koala in such low rainfall areas (Sullivan *et al*. 2003a).

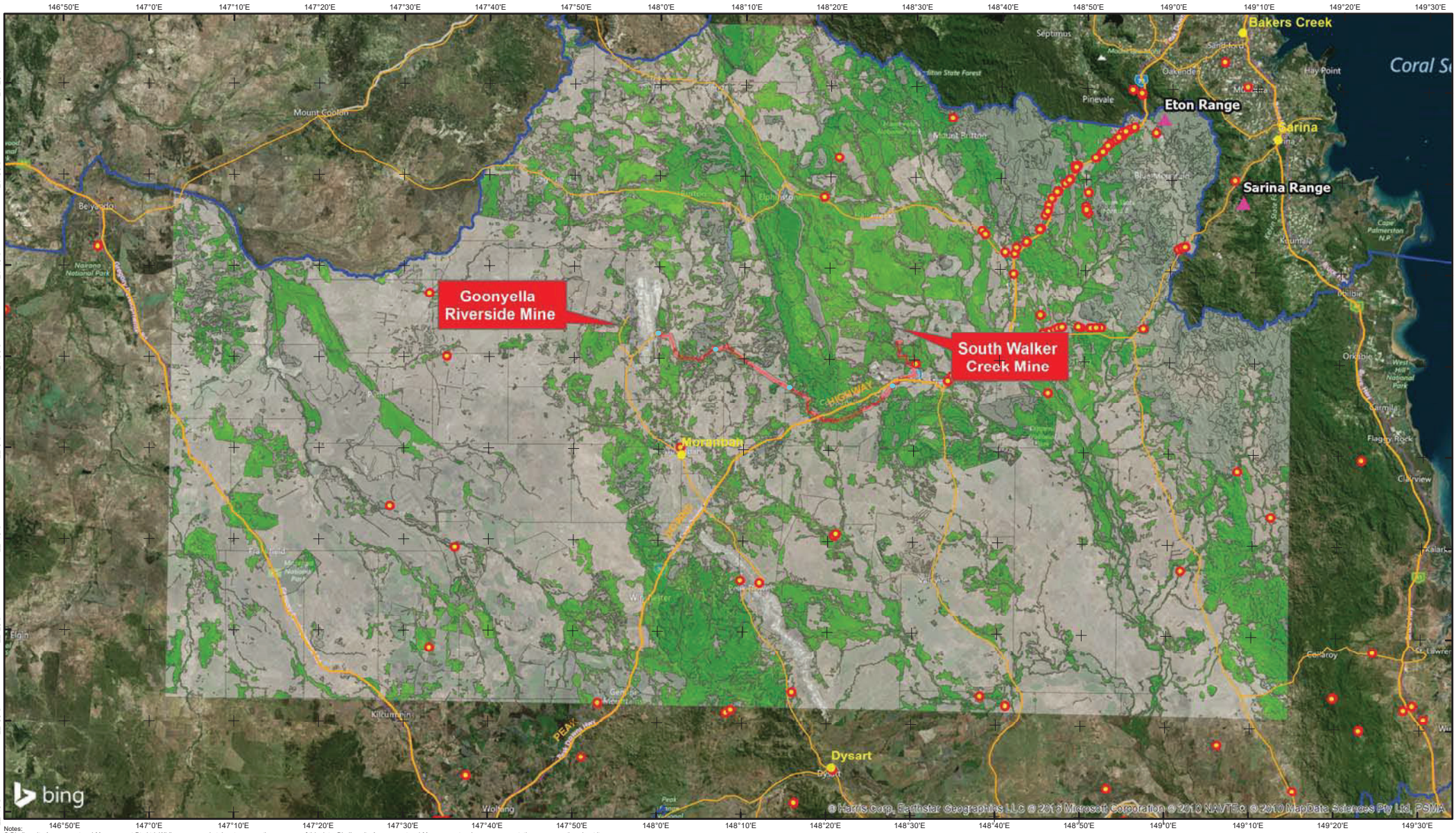
Therefore, in lower rainfall western areas, riparian eucalypt woodland along major watercourses can be regarded as high quality koala habitat whereas eucalypt woodland away from major watercourses can be regarded as low quality habitat.

During the field surveys associated with this project, active observations and the Spot Assessment Technique of Phillips and Callaghan (2000, 2011) were undertaken (where appropriate) at 30 fauna assessment sites in representative habitats along the dragline transport route (locations in **Figure 4.2**).

Despite extensive searches, no evidence of Koala activity was found at any of the assessment locations (see **Appendix C**).In the vicinity of the dragline transport route, Koala may effectively be absent, or alternatively it may occur at a very low density. The removal of a linear area of 104 ha of identified core and essential habitat from an area with ample food resources for Koala in the broader landscape (refer **Figure 4.1**) in an area where Koala is either absent or occurs at a very low population density is not anticipated to result in a significant impact on the local Koala population.

Notably, of the identified habitat within the dragline move route, approximately 8.5 ha (8.7%) constitutes eucalypt woodland along the large riparian zones that are understood to constitute high quality habitat for Koala movement and dispersal (calculated from area of REs 11.3.25 and 11.3.4 along watercourses of stream order 4 and above, shown on **Figure 4.1** and in more detail in **Figures 3.4a-f)**). Based on the pattern of distribution of the local Koala population (Melzer *et al.* 2013, Tucker and Clifton 2013) and observations of the distributions of Koala populations in similar climatic areas (Sullivan et al 2003a,b), only this proportion of the habitat should be considered as habitat critical to the survival of Koala. Therefore, it is anticipated that no more than 8.5 ha of this high quality habitat would be impacted. The clearing in these areas is unavoidable and is associated with the crossing of major watercourses at four widely separated locations along the 77 km dragline transport route (each major riparian area >10 km apart).

In accordance with Table 4 of the EPBC Act referral guidelines for the vulnerable Koala (Department of the Environment 2014), the dragline transport route achieved a score of 9 for habitat suitability (see BAAM 2016). According to the guidelines, a significant impact would not be expected if 5 ha if an area scoring 9 or 10 was selectively cleared. It is acknowledged that the 8.5 ha is greater than 5 ha; however, the individual areas containing high quality habitat are widely dispersed and riparian habitat is proposed to be reinstated following the dragline move. Consequently, the overall impact is not expected to be significant.



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0 4,200 8,400 16,800 25,200 33,600 Meters

Legend

- Regional Koala Records
- Dragline Move Route (Revision D)
- Isaac Regional Council LGA boundary

Koala Habitat

- No
- Yes

Riparian habitat on Stream order 4 or greater

Figure:	4.1
Title:	Regional Koala habitat and Koala records
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment – Addendum
Client:	Advisian

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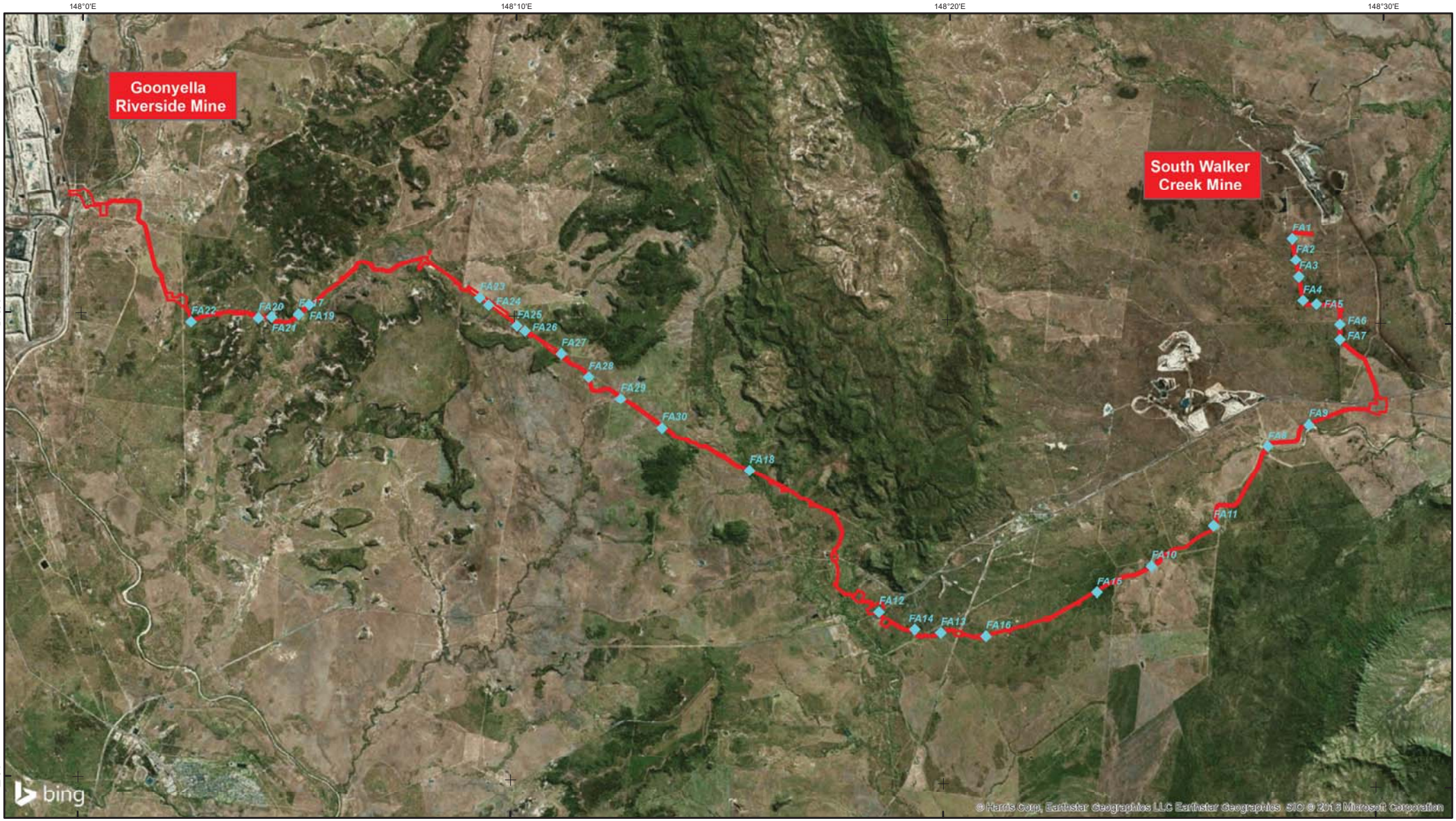

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Units: Meter

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0 800 1,600 3,200 4,800 6,400 Meters

Legend

- Koala habitat assessment sites
- Dragline Transport Route

Figure:	4.2
Title:	Koala survey sites
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment – Addendum
Client:	Advisian

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4.2 IMPACTS OF KOALA HABITAT FRAGMENTATION

Where clearing of Koala habitat is required, the dragline transport route will, for the most part, require a clearing width of approximately 40 m. Koalas are known to cross cleared areas frequently, both when dispersing and also when travelling within their typical home ranges (Lunney *et al.* 2002; Dique *et al.* 2003; Rhodes *et al.* 2006; Jones *et al.* 2013). The structure of the majority of habitat containing Koala food trees in the study area is sparse, meaning that in the local landscape an individual Koala would naturally have to travel across areas of open ground to move between food trees. The 40 m width of cleared land required for the dragline move in a landscape that is already fragmented under existing management practices is considered to be unlikely to result in the fragmentation of the local Koala population. As noted in **Section 4.1**, in the local landscape surrounding the dragline transport corridor, Koala is either generally absent or present at a very low population density. Therefore the dragline transport corridor is expected to have negligible impact upon the movement of Koala in the local landscape. Following consideration of the proposed activity, the structure of the local landscape and the density of the local Koala population, no significant impacts on Koala due to habitat fragmentation would be expected to occur as a result of the dragline move.

4.3 REGIONAL KOALA HABITAT MAP

Figure 4.1 shows the distribution of remnant Regional Ecosystems (REs) in the broader landscape that are predicted Koala habitat (**Table 4.1**). This broader habitat mapping is also shown on **Figures 3.4a-f** in **Appendix B**. The selection of remnant REs to predict Koala habitat was based on (1) those remnant REs identified as preferred habitat for the Project study area (BAAM 2016) and (2) remnant REs supporting known Koala food trees from which there are historical records of Koala in the Isaac region and comparable landscapes to the south. This predictive method may overestimate suitable habitat for Koala as it includes RE polygons made up of more than one RE, whereas the entire polygon has been included if one or more of the REs includes Koala food trees as dominant species or emergents. As discussed in **Section 4.1**, the high quality habitat for Koala movement and dispersal is associated with habitat on watercourses of stream order 4 and above. These locations are shown on **Figure 4.1**, which also shows the locations of historical Koala records from WildNet data in the portion of the Isaac region shown in the extent of the figure, including records from non-remnant vegetation).

Table 4.1 REs representing regional Koala habitat

RE code	RE short description
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains (includes *E. coolabah, E. populnea, E. orgadophila* as scattered emergents)
11.3.2	*Eucalyptus populnea* (Poplar Box) woodland on alluvial plains on a variety of soils, including texture contrast, deep uniform clays, massive earths and sometimes cracking clays
11.3.3	*Eucalyptus coolabah* woodland on alluvial plains or levees with clay or sometimes texture contrast soils
11.3.4	*Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines, on very deep, alluvial, grey and brown cracking clay soils
11.3.27	Lacustrine wetland (e.g. lake) on billabongs, often with fringing woodland, commonly *Eucalyptus camaldulensis* or *E. coolabah*
11.3.36	*Eucalyptus crebra* and/or *E. populnea* and/or *E. melanophloia* woodland with a grassy ground layer on Cainozoic alluvial plains
11.4.2	*Eucalyptus* spp. and/or *Corymbia* spp. grassy or shrubby woodland on Cainozoic clay plains, often on rises, with cracking clay and texture contrast soils (includes *E. populnea* or *E. melanophloia +/- E. crebra*)
11.4.13	*Eucalyptus orgadophila* open woodland on Cainozoic clay plains. Associated species include *Corymbia dallachiana* and *C. erythrophloia*.
11.5.2	*Eucalyptus crebra, Corymbia* spp., with *E. moluccana* woodland on lower slopes of Cainozoic sand plains and/or remnant surfaces
11.5.3	*Eucalyptus populnea +/- E. melanophloia +/- Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces
11.5.9b	*E. crebra, E. tenuipes, Lysicarpus angustifolius +/- Corymbia* spp. woodland on Cainozoic sand plains and/or remnant surfaces
11.7.1	*Acacia harpophylla* and/or *Casuarina cristata* and *Eucalyptus thozetiana* or *E. microcarpa* woodland on lower scarp slopes on Cainozoic lateritic duricrust
11.7.4	*Eucalyptus decorticans* (Gum-topped Ironbark) and/or *Eucalyptus* spp., *Corymbia* spp., *Acacia* spp., *Lysicarpus angustifolius* woodland on low hills and ranges with shallow soils (can include *Eucalyptus crebra*)
11.8.4	*Eucalyptus melanophloia* open woodland on Cainozoic igneous rocks
11.8.5	*Eucalyptus orgadophila* open woodland on undulating plains, rises, low hills or sometimes flat tablelands on top of mountains, formed from basalt, with generally shallow to moderately shallow soils, often rocky or stony clays (includes *E. melanophloia* and occasionally *E. crebra* as sub-dominants)
11.8.11	*Dichanthium sericeum* grassland on Cainozoic igneous rocks with or without trees such as *Eucalyptus orgadophila, E. melanophloia, Corymbia erythrophloia* and *Acacia salicina.*
11.8.15	*Eucalyptus brownii* or *Eucalyptus populnea* woodland on Cainozoic igneous rocks
11.9.1	*Eucalyptus cambageana* or *E. thozetiana* and *Acacia harpophylla* open forest or woodland on slopes and crests of undulating plains and below low ridges and escarpments formed from Cainozoic to Proterozoic consolidated, fine-grained sediments, with predominantly texture contrast soils
11.9.2	*Eucalyptus melanophloia +/- E. orgadophila* woodland on rises on undulating plains with cracking clay or texture contrast soils
11.9.7	*Eucalyptus populnea, Eremophila mitchellii* shrubby woodland on fine-grained sedimentary rocks
11.9.9	*Eucalyptus crebra* woodland on fine-grained sedimentary rocks
11.9.10	*Eucalyptus populnea* open forest with a secondary tree layer of *Acacia harpophylla* and sometimes *Casuarina cristata* on lower parts of undulating plains often with deep texture-contrast soils
11.10.1	*Corymbia citriodora* woodland on on hills and ranges, particularly on colluvial lower slopes, formed from medium to coarse-grained sediments (includes scattered *E. crebra*)
11.10.4	*Eucalyptus decorticans* (Gum-topped Ironbark), *Lysicarpus angustifolius* (Budgeroo/ Brown Hazelwood) +/- *Eucalyptus* species, *Corymbia* species, *Acacia* species woodland on crests, scarps and upper slopes of ranges formed from medium to coarse-grained sediments with shallow soils (includes *E. crebra*)

RE code	RE short description
11.10.7a	*Eucalyptus crebra* +/- *Callitris glaucophylla* +/- *Angophora leiocarpa* +/- *Eucalyptus* spp. woodland
11.11.1	*Eucalyptus crebra* +/- *Acacia rhodoxylon* woodland on old sedimentary rocks with varying degrees of metamorphism and folding
11.11.15	*Eucalyptus crebra* woodland on undulating rises and low hills formed on moderately to strongly deformed and metamorphosed sediments
11.11.19	*Eucalyptus thozetiana, Acacia harpophylla* woodland on old sedimentary rocks with varying degrees of metamorphism and folding
11.12.1	*Eucalyptus crebra* woodland on igneous rocks. *Eucalyptus crebra* +/- *Corymbia erythrophloia* shrubby woodland. *E. melanophloia* is often present and may be locally dominant. Also includes localised areas dominated by E. *persistens*.
11.12.2	*Eucalyptus melanophloia* woodland on igneous rocks
11.12.6	*Corymbia citriodora, Eucalyptus crebra, E. microcarpa/E. moluccana, Angophora leiocarpa* and *E. melanophloia* open forest to woodland on igneous rocks

5.0 REFERENCES

BAAM (2016). BMC Dragline Move Project Terrestrial Ecology MNES Assessment - Goonyella to South Walker Creek, Moranbah. Consultancy report prepared for for Advisian on behalf of BHP Billiton Mitsui Coal.

Carrick, F. N. (2013). National perspective on the current status of koalas: setting the scene for central Queensland koala conservation. In: Nicole Flint and Alistair Melzer, Conserving Central Queensland's Koalas. Conserving Central Queensland's Koalas Workshop, Rockhampton, QLD, Australia, (4–10).

Department of the Environment (DotE 2014). EPBC Act referral guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory). Commonwealth of Australia, 2014.

Department of the Environment (2013). Matters of National Environmental Significance – Significant impact guidelines 1.1. Commonwealth of Australia, Canberra.

Dique, D. S., Thompson, J., Preece, H. J., de Villiers, D. L. and Carrick, F. N. (2003). Dispersal patterns in a regional koala population in south-east Queensland. *Wildlife Research* **30**: 281–290.

DSEWPaC (2012). Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy. Department of Sustainability, Environment, Water, Population and Communities. Australian Government, Canberra.

FitzGibbon, S., Ellis, W. and Carrick, F. (2013). The Koala Venture research partnership: an overview of 24 years of regional koala research in central Queensland. In: Nicole Flint and Alistair Melzer, Conserving Central Queensland's Koalas. Conserving Central Queensland's Koalas Workshop, Rockhampton, QLD, Australia, (16–19).

Jones, D., Appleby, R., Dexter, C., Bernede, L. and Edgar, J. (2013). Understanding the movements of koalas in a road-dominated landscape. In: Conserving Central Queensland's Koalas. Conserving Central Queensland's Koalas Workshop, Rockhampton, QLD, Australia, (106–110).

Lunney, D., O'Neill, L., Matthews, A. and Sherwin, W.B. (2002). Modelling mammalian extinction and forecasting recovery: koalas at Iluka (NSW, Australia). *Biological Conservation* **106**: 101–113.

Melzer, A., Ellis, W., FitzGibbon, S. and Carrick, F. (2013). Drought and the koala: two case studies from the central highlands. In: Conserving Central Queensland's Koalas. Conserving Central Queensland's Koalas Workshop, Rockhampton, QLD, Australia, (95–99).

Phillips, S. and Callaghan, J. 2000. Tree species preferences of koalas (Phascolarctos cinereus) in the Campbelltown area south-west of Sydney, New South Wales. Wildlife Research, **27**: 509–516.

Phillips, S. and Callaghan, J. 2011. The *Spot Assessment Technique*: a tool for determining localised levels of habitat use by koalas *Phascolarctos cinereus*. *Australian Zoologist*, **35**: 774–780.

Rhodes, J. R.,Wiegand, T., McAlpine, C. A., Callaghan, J., Lunney, D., Bowen, M. and Possingham, H. P. (2006). Modelling species distributions for improving conservation in semi-urban landscapes: koala case study. *Conservation Biology* **20**: 449–459.

Sullivan, B. J., Norris, W. M. and Baxter, G. S. (2003a). Low-density koala (Phascolarctos cinereus) populations in the mulgalands of south-west Queensland. II. Distribution and diet. *Wildlife Research*, **30**: 331–338.

Sullivan, B. J., Baxter, G. S. and Lisle, A. T. (2003b). Low-density koala (Phascolarctos cinereus) populations in the mulgalands of south-west Queensland. III. Broad-scale patterns of habitat use. *Wildlife Research*, **30**: 583–591.

Tucker, G. and Clifton, I. D. (2013). What do we know about CQ koalas near rolling infrastructure. In: Conserving Central Queensland's Koalas. Conserving Central Queensland's Koalas Workshop, Rockhampton, QLD, Australia, (110–114).

APPENDIX A

EPBC Act Assessment of Significant Impacts – Listed Threatened Ecological Communities and Threatened Species

Table A.1 Brigalow (*Acacia harpophylla* dominant and co-dominant) assessment against Significant Impact Guidelines 1.1

Criteria	Assessment of Impact Significance
An action is likely to have a significant impact on an endangered ecological community if there is a real chance or possibility that it will:	**Brigalow (*Acacia harpophylla* dominant and co-dominant) communities** ***Description*** Brigalow is the commonly accepted name for the species *Acacia harpophylla* and the vegetation in which this species is dominant or co-dominant. Brigalow is either dominant in the tree layer or co-dominant with other species such as Belah *Casuarina cristata*, other species of Acacia, or Eucalyptus species (Butler, 2007). The structure of the community ranges from open forest to open woodland with a tree layer between about 9 m in low rainfall areas to 25 m in higher rainfall areas (Butler, 2007). A prominent shrub layer is usually present often comprising vine thicket species such as *Geijera parviflora, Pittosporum angustifolium, Melaleuca bracteata, Alectryon oleifolius* subsp*. elongatus, Alectryon diversifolius, Elaeodendron australe* var*. integrifolium, Ehretia membranifolium* as well as the weed *Opuntia stricta.* Ground cover percentage is variable with typical species being *Paspalidium caespitosum, Ancistrachne uncinulata, Aristida* spp., *Enchylaena tomentosa, Rhagodia spinescens, Einadia hastata,* and *Solanum parvifolium,* although *Harrisia martini** and *Bryophyllum delagoense** may be typically abundant. The Brigalow ecological community occurs roughly within the 500-750 mm annual rainfall belt with a predominance of summer rainfall (Butler, 2007). Community condition is impacted by edge effects created by massive fragmentation with invasion of declared weed species such as *Opuntia stricta* and *O. tomentosa** and *Harrisia martini** together with canopy gaps, caused by canopy dieback and senescence in the absence of recruitment (TSSC 2001). ***Distribution*** The ecological community extends from south of Charters Towers in Queensland, in a broad swathe east of Blackall, Charleville and Cunnamulla, south to northern New South Wales near Narrabri and Bourke. In Queensland, it occurs predominantly within the Brigalow Belt North, Brigalow Belt South, Darling Riverine Plains and Southeast Queensland bioregions, with smaller amounts in the Mitchell Grass Downs, Mulga Lands and Einasleigh Uplands bioregions (Butler, 2007). In Queensland, a number of regional ecosystems (REs) are considered to form the Brigalow ecological community. ***Community Assessment Approach*** A desktop study summarised current terrestrial ecological values within the Project area to inform subsequent ground surveys and impact assessment. Data relevant to the distribution and ecology of Brigalow ecosystems was sourced through a number of relevant and publicly available data sources and relevant literature and online sources. This was utilised in conjunction with a review of available aerial imagery and a field survey within the study area, with a subsequent amendments to the Queensland Herbarium vegetation mapping to increase the resolution of available vegetation mapping and add confidence to the assessment of likely impacts to the Brigalow Ecological Community. In accordance with the listing advice, only patches >15 years of age matching a Queensland Regional Ecosystem that is known to correspond to the EPBC-listed community, and in which *Acacia harpophylla* was included as a dominant or co-dominant part of the vegetation were considered to represent the community. Patches that did not meet the condition criteria (i.e. those with ≥50% cover of exotic plants in canopy, shrub or ground layers) were also excluded.

Criteria	Assessment of Impact Significance
	Community Assessment Results Within the Project area this community is restricted to areas ground-truthed as Regional Ecosystems (REs) 11.4.9, 11.9.1 and 11.9.5 dominated by native vegetation in all layers. The mapped occurrence of this community covers an area of approximately 190 ha within the broad area of investigation (a 500 m buffer of the centreline of the study area) (**Figure 3.1**). Eight separate patches were identified in total (one was divided into two subpatches, separated by a narrow track). These patches were found to be either consistent with remnant or mature regrowth and were generally in good condition, with patchy occurrences of Harrisia Cactus, Parthenium and Buffel Grass in association with some patches. The broad investigation area is approximately 8740 ha. Approximately 711 ha of this area are estimated to be impacted by the Project footprint (which equates to 8.1% of the area). Through the application of an unbiased, uniformly distributed clearing model, it would be reasonable to expect that 8.1% of the 190 ha (which equates to approximately 15 ha) of the community within the broad investigation area would be impacted. However, the impact area has been positioned to prioritise the avoidance of the endangered community, as well as other MNES. As a result, the overall impact has been reduced to 9.73 ha (or 5.1%), which is estimated to represent <0.05% of the equivalent REs that correspond to the TEC in the Northern Bowen Basin subregion.
Reduce the extent of an ecological community.	The clearing of vegetation corresponding to the Brigalow (*Acacia harpophylla* dominant and co-dominant) community within the study area is estimated to cover a total area of 9.73 ha. Given its Endangered status under Commonwealth legislation, any reduction in the extent of this ecological community is a significant impact that cannot be reduced to acceptable levels through the mitigation of impacts on retained patches. Therefore, the proposed must **be considered to have a significant impact** in this category.
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines.	The Project footprint has been sited to avoid fragmentation of any patches of the community, with one exception. A patch identified as being consistent with RE 11.4.9 in South Walker Creek will be fragmented into two patches. The patch is approximately 13 ha in size and currently consists two subpatches, separated by a 26 m wide track. The project footprint will widen this track to form a total gap of up to 80 m, with a disturbance area of approximately 3 ha. This will result in two separated patches, of approximately 8 ha and 2 ha respectively. For the other seven patches expected to be impacted, disturbance to the community will only remove a portion of the edges of any patch. Nevertheless, the chance of a significant impact due to fragmentation is considered **likely**.
Adversely affect habitat critical to the survival of an ecological community.	The Project footprint requires only the partial clearing of seven discrete patches of the TEC and will not reduce the size of any patch to <0.5 ha. Therefore, all existing patches of this community will be retained in the landscape, and there will not be an overall reduction in habitat critical to the survival of the community. The chance of significant impact in this category is considered to be **unlikely**.
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of	The transport of the dragline will be a one-off impact, requiring a minimal area of groundwork to ensure safe passage. It is not expected to result in changes to hydrology to the extent that the community will be impacted in any way by changes in water or nutrients. In addition, it is not considered to be the type of impact that would results in changes to groundwater levels. Therefore, the likelihood of significant impact in this category is considered to be **unlikely**.

Criteria	Assessment of Impact Significance
surface water drainage patterns.	
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting.	The Project footprint requires only the partial clearing of seven discrete patches of the TEC and will not reduce the size of any patch to <0.5 ha. Therefore, all existing patches of this community will be retained in the landscape, and there will not be an overall reduction in the extent of the community. The chance of significant impact in this category is considered to be **unlikely**.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: – Assisting invasive species, that are harmful to the listed ecological community, to become established; or – Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.	The transport of the dragline will be a one-off impact, requiring a defined area clearing and sometimes subsequent groundwork to ensure safe passage. This has the potential to promote the spread of invasive weeds; however weed control measures will be implemented as part of the Environmental Management Plan. The Project is not expected to result in significant changes to the vegetation and it is not expected to compromise the integrity of the community. Therefore, the likelihood of significant impact to the quality of the relevant patches of the community as a result of this Project is considered to be **unlikely**.
Interfere with the recovery of an ecological community.	The Project footprint requires only the partial clearing of seven discrete patches of the TEC and will not reduce the size of any patch to <0.5 ha. Therefore, all existing patches of this community will be retained in the landscape, and there will not be an overall reduction in the extent of the community. The chance of significant impact or interference with the recovery of this community is considered to be **unlikely**.

Table A.2 Ornamental Snake *Denisonia maculata* assessment against Significant Impact Guidelines 1.1

Criteria	Assessment of significance
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	This species occurs in the Brigalow Belt between Charters Towers and Rockhampton where it is associated with seasonally inundated areas, such as gilgais and channel beds in low-lying areas (Wilson 2005; Wilson and Swan 2008). The species is threatened by habitat loss, fragmentation and degradation, as well as changes to hydrology and water quality, cane toad, predation by feral species and weed invasion (Department of the Environment 2016a). ***Species Assessment*** Data relevant to the habitat, distribution and ecology of the species was sourced through relevant literature and online sources, as well as a number of relevant and publicly available data sources including the Atlas of Living Australia, EPBC online search tool and the Queensland Government Wildnet database. This information, together with a review of aerial photography and existing vegetation mapping by the Queensland Herbarium assisted in the prioritisation of sites for field habitat assessments throughout the Project area during August–September 2016. Determination of the potential occurrence of Ornamental Snake involved a general assessment of habitat features that could potentially support this species. There are several database records in the vicinity of the study area, although the presence of the species could not be confirmed during the field surveys due to the lineal nature and significant size of the study area and the known patchiness of the occurrence of the species. It was considered that a more conservative approach was to model potential habitat and ground-truth the presence of known habitat factors. In ground-truthing modelling results the presence of suitable habitat was confirmed in a number of locations. Modelling and ground-truthing potential habitat in the landscape surrounding the study area (500 m buffer relative to the centre line of the study area corridor) has identified approximately 1235 ha as preferred habitat for Ornamental Snake (comprising 4 ha of core habitat and 1231 ha of essential habitat). The broad investigation area is approximately 8740 ha. Approximately 711 ha of this area are estimated to be impacted by the Project footprint (which equates to 8.1% of the area). Through the application of an unbiased, uniformly distributed clearing model, it would be reasonable to expect that 8.1% of the 1235 ha (which equates to approximately 100 ha) of preferred habitat within the broad investigation area would be impacted. However, the impact area has been positioned to prioritise the avoidance of preferred habitat for MNES. As a result, the overall impact has been reduced to 52.4 ha (or 4.2%), which is estimated to represent approximately 0.1% of the equivalent remnant REs that correspond to preferred habitat for this species in the Northern Bowen Basin subregion.
Lead to a long-term decrease in the size of an important population of a species.	There are several database records from the vicinity of the study area. Given that the species is patchy in the surrounding landscape, it must be considered that there is potential for the population in the study area to be an important population. Therefore, there is **potential** for a significant impact leading to a long-term decrease in the size of an important population of this species.
Reduce the area of occupancy of an important population.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Therefore there is a **potential** that the proposed activity would result in reducing the overall area of occupancy of an important population.
Fragment an existing important population into two or more populations.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Therefore the activity is expected to be **unlikely** to result in fragmentation of an existing important population into two or more populations.
Adversely affect habitat critical to the survival of a species	The width of the disturbance is expected to be confined to approximately 40 metres in most areas and the dragline move will be a one-off impact. Therefore the activity is expected to be **unlikely** to adversely affect habitat critical to the survival of a species.

Criteria	Assessment of significance
Disrupt the breeding cycle of an important population.	There are several database records from the vicinity of the study area. Given that the species is patchy in the surrounding landscape, it must be considered that there is potential for the population in the study area to be an important population and that the breeding cycle of such a population could potentially be impacted. Therefore, there is **potential** for a disruption to the breeding cycle of an important population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. In addition, suitable habitat is patchy, but widespread across the broader study area. Therefore the activity is expected to be **unlikely** to result in significant modification, destruction, isolation or limits to availability of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	Wherever possible, the route of the proposed dragline move follows that of a previous dragline move which was undertaken approximately 16 years prior to this assessment. It is a not anticipated that the currently proposed move will result in an increase in invasive predators or weeds in addition to those that are already widespread and established in the potential habitat for this species and the chances of a significant impact in this category are considered to be **unlikely**.
Introduce disease that may cause the species to decline.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Therefore the activity is expected to be **unlikely** to result in introducing a disease that may cause the species to decline.
Interfere substantially with the recovery of the species.	The corridor of the proposed dragline move follows that of a previous dragline move, which was undertaken approximately 16 years prior to this assessment, with minimal deviation from the previous route. The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Therefore, whilst the study area may support an important population of the species, it is considered **unlikely** that the proposed impact would interfere substantially with the recovery of the species.

Table A.3 Squatter Pigeon (Southern Subspecies) *Geophaps scripta scripta* assessment against Significant Impact Guidelines 1.1

Criteria	Assessment of significance
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	Squatter Pigeon southern occurs singly, in pairs or in small groups in grassy woodland habitats throughout its range (Pizzey and Knight 2004). Its distribution has suffered a significant contraction since European settlement and it is threatened by habitat loss, fragmentation and degradation, as well as predation and weed invasion (Department of the Environment 2016b). ***Species Assessment*** Data relevant to the habitat, distribution and ecology of the species was sourced through relevant literature and online sources and a number of relevant and publicly available data sources including the Atlas of Living Australia, EPBC online search tool and the Queensland Government Wildnet database. This information, together with a review of aerial photography and existing vegetation mapping by the Queensland Herbarium assisted in the prioritisation of sites for field habitat assessments throughout the Project area during August–September 2016. Determination of the potential occurrence of Squatter Pigeon involved timed bird surveys throughout the study area, as well as opportunistic observations on foot and from a vehicle. Numerous database records have been obtained for the study area and several sightings were made during the field survey. This indicates that the species is relatively prevalent in the study area, just as it is across much of central and north Queensland (a different subspecies occurs even further north). Modelling and ground-truthing vegetation mapping in the landscape surrounding the study area (500 m buffer relative to the centre line of the study area corridor) has identified approximately 3354 ha as preferred habitat for Squatter Pigeon (comprising 2167 ha of core habitat and 1187 ha of essential habitat). The broad investigation area is approximately 8740 ha. Approximately 711 ha of this area are estimated to be impacted by the Project footprint (which equates to 8.1% of the area). Through the application of an unbiased, uniformly distributed clearing model, it would be reasonable to expect that 8.1% of the 3354 ha (which equates to approximately 271 ha) of preferred habitat within the broad investigation area would be impacted. However, the impact area has been positioned to prioritise the avoidance of preferred habitat for MNES. As a result, the overall impact has been reduced to 93.3 ha (or 2.8%), which is estimated to represent approximately <0.05% of the equivalent remnant REs that correspond to preferred habitat for this species in the Northern Bowen Basin subregion.
Lead to a long-term decrease in the size of an important population of a species.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. There is ample habitat for Squatter Pigeon in the broader landscape and it is considered **unlikely** that a total clearing area of up to 89 ha with a narrow width of this nature would lead to a long-term decrease in the size of an important population of this species.
Reduce the area of occupancy of an important population.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. There will only be a minor loss of habitat in a landscape that otherwise contains abundant resources for Squatter Pigeon. Therefore the activity is expected to be **unlikely** to result in reducing the overall area of occupancy of an important population.
Fragment an existing important population into two or more populations.	Squatter Pigeon (southern) across the remainder of its range, at least in central and north Queensland is expected to represent a single population. It is considered that the study area occupies a very minor portion of the habitat occupied by this population. The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. There will only be a minor loss of habitat in the landscape and it is not expected to create a barrier for the species given the tendency for individuals to disperse readily into and across areas of non-remnant vegetation. Therefore the activity is expected to be **unlikely** to result in fragmentation of an existing important population into two or more populations.

Criteria	Assessment of significance
Adversely affect habitat critical to the survival of a species	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Squatter Pigeon habitat is widespread in the overall landscape and it is considered **unlikely** that a total clearing area of up to 93 ha with a narrow width of this nature surrounded by a mixture of pastoral land and remnant vegetation would adversely affect habitat critical to the survival of a species.
Disrupt the breeding cycle of an important population.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Therefore the activity is expected to be **unlikely** to result in a disruption to the breeding cycle of an important population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The width of the disturbance is expected to be confined to approximately 80 m in most areas and the dragline move will be a one-off impact. In addition, suitable habitat is widespread throughout the broader study area. The Project is not expected to result in any additional barriers to dispersal or significant isolation and exposure to individual koalas in a landscape that is already a mixture of pastoral land and predominantly sparse remnant vegetation. Therefore the activity is expected to be **unlikely** to result in significant modification, destruction, isolation or limits to availability of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	Wherever possible, the route of the proposed dragline move follows that of a previous dragline move which was undertaken approximately 16 years prior to this assessment. It is a not anticipated that the currently proposed move will result in an increase in invasive predators or weeds in addition to those that are already widespread and established in the potential habitat for this species and the chances of a significant impact in this category are considered to be **unlikely**.
Introduce disease that may cause the species to decline.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Therefore the activity is expected to be **unlikely** to result in introducing a disease that may cause the species to decline.
Interfere substantially with the recovery of the species.	Squatter Pigeon (Southern Subspecies) across the remainder of its range, at least in central and north Queensland is expected to represent a single population. It is considered that the study area occupies a very minor portion of the habitat occupied by this population. The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. There will only be a minor overall loss of habitat in a landscape with abundant resources for Squatter Pigeon. Therefore the activity is expected to be **unlikely** to interfere substantially with the recovery of the species.

Table A.4 Koala *Phascolarctos cinereus* assessment against Significant Impact Guidelines 1.1 & EPBC Act referral guidelines for the vulnerable koala (Department of the Environment 2014)

Criteria	Assessment of significance
Assessing adverse effects on habitat critical to the survival of the Koala.	A habitat score of 9 was determined for Koala habitat within the impact area (see Table 5.1 of BAAM (2016)), the area proposed to be cleared contains known Koala food trees and an area ≥20 ha is proposed to be cleared within areas of known Koala food trees with a habitat score ≥8, therefore referral of the project is recommended and in addition to assessment against the Significant Impact Guidelines 1.1, Section 8 of the referral guidelines must be addressed (see below).
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of an important population of a species.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Koala food trees are prevalent in the overall landscape and it is considered **unlikely** that a total clearing area of up to 104 ha within a narrow corridor of this nature surrounded by a mixture of pastoral land and remnant vegetation would lead to a long-term decrease in the size of an important population of this species.
Reduce the area of occupancy of an important population.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. The Koala population in the vicinity of the study area is expected to be small and at a low density. There will only be a minor loss of habitat in a landscape that otherwise contains abundant resources for Koala. Therefore the activity is expected to be **unlikely** to result in reducing the overall area of occupancy of an important population.
Fragment an existing important population into two or more populations.	The Koala population in the vicinity of the study area is expected to be small and at a low density. A higher density population of Koala is present to the east in the vicinity of the Eton Range near Nebo. It is considered that the study area is located broadly on the margins of a larger Koala population to the east. Therefore the activity is expected to be **unlikely** to result in fragmentation of an existing important population into two or more populations.
Adversely affect habitat critical to the survival of a species	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Koala food trees are prevalent in the overall landscape and it is considered **unlikely** that a total clearing area of up to 104 ha with a narrow width of this nature surrounded by a mixture of pastoral land and remnant vegetation would adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Therefore the activity is expected to be **unlikely** to result in a disruption to the breeding cycle of an important population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. In addition, suitable habitat is widespread throughout the broader study area. The Project is not expected to result in any additional barriers to dispersal or significant isolation and exposure to individual koalas in a landscape that is already a mixture of pastoral land and predominantly sparse remnant vegetation. Therefore the activity is expected to be **unlikely** to result in significant modification, destruction, isolation or limits to availability of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	Wherever possible, the route of the proposed dragline move follows that of a previous dragline move which was undertaken approximately 16 years prior to this assessment. It is a not anticipated that the currently proposed move will result in an increase in invasive predators or weeds in addition to those that are already widespread and established in the potential habitat for this species and the chances of a significant impact in this category are considered to be **unlikely**.

Criteria	Assessment of significance
Introduce disease that may cause the species to decline.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Therefore the activity is expected to be **unlikely** to result in introducing a disease that may cause the species to decline.
Interfere substantially with the recovery of the species.	The Koala population in the vicinity of the study area is expected to be small and at a low density. A higher density (important) population of Koala is present to the east in the vicinity of the Eton Range near Nebo. It is considered that the study area is located broadly on the margins of a larger Koala population to the east. The Project is not expected to result in any additional barriers to dispersal or significant isolation and exposure to individual koalas in a landscape that is already a mixture of pastoral land and predominantly sparse remnant vegetation. In addition, ample food sources for Koala are present in the landscape. Therefore the activity is expected to be **unlikely** to interfere substantially with the recovery of the species.
Could the action interfere substantially with the recovery of the koala?	
Increasing koala fatalities in habitat critical to the survival of the koala due to dog attacks to a level that is likely to result in multiple, ongoing mortalities.	The project will not introduce any new human populations and associated dogs to the study area, therefore no increase in koala fatalities from dog attacks as a result of the project is predicted.
Increasing Koala fatalities in habitat critical to the survival of the Koala due to vehicle-strikes to a level that is likely to result in multiple, on-going mortalities.	There will be construction traffic during preparation of the dragline transport route for a once-off dragline move. Once the dragline has been moved, there will be no ongoing road traffic associated with the project. The Environmental Management Plan will include measures for reducing the potential impacts of construction traffic on fauna. No increase in Koala fatalities from vehicle strikes as a result of the project is predicted.
Facilitating the introduction or spread of disease or pathogens for example Chlamydia *or Phytophthora cinnamomi*, to habitat critical to the survival of the Koala, that are likely to significantly reduce the reproductive output of Koalas or reduce the carrying capacity of the habitat.	Habitat within and surrounding the project area is highly fragmented and intersected by many roads and tracks, therefore there is no opportunity for the project actions to result in exposure of habitats to pathogens that are not already present in the wider environment. The Environment Management Plan will include measures for ensuring that all vehicles and equipment are washed down prior to working within the dragline transportation route, limiting the possibility for the introduction or spread of disease or pathogens.
Creating a barrier to movement to, between or within habitat critical to the survival of the Koala that is likely to result in a long-term reduction in genetic fitness or	The project does not include any excavations or the construction of any structures that would create a barrier to Koala movement.

Criteria	Assessment of significance
access to habitat critical to the survival of the Koala.	
Changing hydrology which degrades habitat critical to the survival of the Koala to the extent that the carrying capacity of the habitat is reduced in the long term.	Where the dragline transport route crosses waterways, there is a commitment to stabilise creel banks and reinstate the riparian vegetation, including trees suitable for Koala feed and shelter. There will be no impacts of the project on hydrological conditions that would lead to degradation of Koala habitat.

Table E.5 Yakka Skink *Egernia rugosa* assessment against Significant Impact Guidelines 1.1

Criteria	Assessment of significance
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	**Yakka Skink *Egernia rugosa*** Yakka Skink lives in colonies, occupying communal burrows, often under dead timber or deep rock crevices. These skinks are found in dry open forests and woodlands, usually on coarse gritty soils that are well drained, although colonies have been recorded in a wider variety of habitats (Ehmann 1992; Cogger 2000; Drury 2001; Wilson 2005). They sometimes occupy old rabbit burrows. The species is threatened by loss of habitat, loss of shelter sites through agricultural practices, too-frequent fire, trampling of burrows by livestock and predation by foxes and cats (Drury 2001). ***Species Assessment*** Data relevant to the habitat, distribution and ecology of the species was sourced through relevant literature and online sources and a number of relevant publicly available data sources including the Atlas of Living Australia, EPBC online search tool and the Queensland Government Wildnet database. This information, together with a review of aerial photography and existing vegetation mapping by the Queensland Herbarium assisted in the prioritisation of sites for field habitat assessments throughout the Project area during August–September 2016. Determination of the potential occurrence of Yakka Skink involved a general assessment of habitat features that could potentially support this species. There are no database records from the Project area and the presence of the species could not be confirmed during the field surveys due to the lineal nature and significant size of the study area and the known patchiness of the occurrence of the species. It was considered that a more conservative approach was to model potential habitat and ground-truth the presence of known habitat factors. In ground-truthing modelling results, the presence of suitable habitat was confirmed in a number of locations. Nevertheless, this is a secretive species that occurs in a variety of habitats and it is considered to have the potential to occur on the basis of its known distribution and habitat preferences. Despite the lack of records, modelling of habitat based on existing vegetation mapping in the landscape surrounding the study area (500 m buffer relative to the centre line of the study area corridor) has identified approximately 3618 ha as preferred habitat for Yakka Skink. The broad investigation area is approximately 8740 ha. Approximately 711 ha of this area are estimated to be impacted by the Project footprint (which equates to 8.1% of the area). Through the application of an unbiased, uniformly distributed clearing model, it would be reasonable to expect that 8.1% of the 3618 ha (which equates to approximately 293 ha) of preferred habitat within the broad investigation area would be impacted. However, the impact area has been positioned to prioritise the avoidance of preferred habitat for MNES. As a result, the overall impact has been reduced to 105.6 ha (or 2.9%), which is estimated to represent approximately 0.0% of the equivalent remnant REs that correspond to preferred habitat for this species in the Northern Bowen Basin subregion.
Lead to a long-term decrease in the size of an important population of a species.	There are no database records from the Project area. However, the species is difficult to detect, the study area is positioned within the centre of the distribution of this species and the species is considered to have potential to occur in the study area. Given that the species is scarce in the surrounding landscape and there is potential for a local population to be present in the study area (i.e. many individuals occupying one or more communal burrows), it is reasonable to consider that there is potential for an important population to occur in the study area, especially in the context of the genetic diversity of the species. Therefore, there is **potential** for a significant impact leading to a long-term decrease in the size of an important population of this species. A pre-clearance survey is recommended (during the summer or autumn) in areas identified as preferred habitat for this species. If the species is located, opportunities for avoidance should be considered in the first instance and relocation of individuals to suitable habitat undertaken if avoidance is not possible.

Criteria	Assessment of significance
Reduce the area of occupancy of an important population.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Therefore the activity is expected to be **unlikely** to result in reducing the overall area of occupancy of an important population.
Fragment an existing important population into two or more populations.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Therefore the activity is expected to be **unlikely** to result in fragmentation of an existing important population into two or more populations.
Adversely affect habitat critical to the survival of a species	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Therefore the activity is expected to be **unlikely** to adversely affect habitat critical to the survival of a species.
Disrupt the breeding cycle of an important population.	There are no database records from the Project area. However, the species is difficult to detect, the study area is positioned within the centre of the distribution of this species and the species is considered to have potential to occur in the study area. Given that the species is scarce in the surrounding landscape and there is potential for a local population to be present in the study area (i.e. many individuals occupying one or more communal burrows), it is reasonable to consider that there is potential for the study area to support an important population and that the breeding cycle could potentially be impacted. Therefore, there is **potential** for a disruption to the breeding cycle of an important population. A pre-clearance survey is recommended in areas identified as preferred habitat for this species to identify potential burrow locations. If burrows are located and confirmed, opportunities for avoidance should be considered in the first instance and relocation of individuals to suitable habitat undertaken if avoidance is not possible.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. In addition, suitable habitat is widespread throughout the broader study area. Therefore the activity is expected to be **unlikely** to result in significant modification, destruction, isolation or limits to availability of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	Wherever possible, the route of the proposed dragline move follows that of a previous dragline move which was undertaken approximately 16 years prior to this assessment. It is a not anticipated that the currently proposed move will result in an increase in invasive predators or weeds in addition to those that are already widespread and established in the potential habitat for this species and the chances of a significant impact in this category are considered to be **unlikely**.
Introduce disease that may cause the species to decline.	The width of the disturbance is expected to be confined to approximately 40 m in most areas and the dragline move will be a one-off impact. Therefore the activity is expected to be **unlikely** to result in introducing a disease that may cause the species to decline.
Interfere substantially with the recovery of the species.	Yakka Skink is a widespread, yet scarce species. The study area is located a little to the north of the centre of the species' geographical distribution. It has yet to be confirmed whether the species is present in the vicinity of the study area and the impact area has been sited to avoid areas of remnant vegetation that hold the highest potential habitat value for the species. There remains a possibility that an as yet undetected population of Yakka Skink may be impacted by the Project; however it is considered **unlikely** that an impact in the study area would interfere substantially with the recovery of the species.

Table A.6 EPBC Act Assessment of Impact Significance on Listed Migratory Species in the Project Area

Criteria	Assessment of Significance
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:	Based on the assessment of existing terrestrial ecological values documented in the main report and the assessment of likelihood provided in **Appendix A**, the following terrestrial species listed as Migratory under the EPBC Act are currently recognised as known or having potential to occur within the study area: • White-throated Needletail *Hirundapus caudacutus*; • Fork-tailed Swift *Apus pacificus*; • Oriental Cuckoo *Cuculus optatus*. White-throated Needletail and Fork-tailed Swift are predicted to occur in the study area, possibly on an annual basis. Both are aerial species for which the Project area does not represent 'important habitat' and no impacts are expected due to the proposed action as these species forage over a wide variety of land use, including human infrastructure and large waterbodies.
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of *important habitat* for a migratory species.	The impact area has been positioned to avoid all permanent wetlands areas and crosses ephemeral watercourses only where absolutely necessary. None of the impact area is considered to represent important habitat for any migratory fauna. • **Oriental Cuckoo** This species may be an occasional, transient visitor to the study area. It would generally occur in open, wooded habitats. The proposed action is expected to have minimal effects on the migrating population of this species and no important habitat will be modified, destroyed or isolated. Therefore the impact is **unlikely** to be significant.
Result in invasive species that are harmful to the migratory species becoming established in an area of *important habitat* for the migratory species.	As noted above, none of the impact area is considered to represent important habitat for any migratory fauna. Therefore, the impact of the proposed action is **unlikely** to be significant.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an *ecologically significant proportion* of the *population* of a migratory species.	• **Oriental Cuckoo** This species may be an occasional, transient visitor to the study area. It does not breed in Australia. Therefore the impact is **unlikely** to be significant.

REFERENCES

BAAM (2016). BMC Dragline Move Project Terrestrial Ecology MNES Assessment -Goonyella to South Walker Creek, Moranbah. Consultancy report prepared for for Advisian on behalf of BHP Billiton Mitsui Coal.

Biolink Ecological Consultants (2008). 'The utility of regularised, grid-based SAT (RGB-SAT) sampling for the purposes of identifying areas being utilised by koalas (Phascolarctos cinereus) in the south-east forests of NSW—a pilot study'*. Report* to the NSW Department of Environment and Climate Change.

Butler, D.W. (2007). Recovrey plan for the "Brigalow (*Acacia harpophylla* dominant and co-dominant" endangered ecological community (draft of 1 May 2007). Report to the Department of the Environment and Water Resources, Canberra. Qld National Parks and Wildlife Service. Brisbane.

Cogger, HG (2000). *Reptiles and amphibians of Australia.* Reed New Holland, Sydney.

Drury, W (2001). *Reptiles under threat in Queensland's southern brigalow belt*. World Wide Fund for Nature, Brisbane.

Department of the Environment (2016a). *Denisonia maculata* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed 16/09/2016.

Department of the Environment (2016b). *Geophaps scripta scripta* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed 16/09/2016.

Department of the Environment (2014). EPBC Act referral guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory. Commonwealth of Australia, Canberra.

Drury, W (2001). *Reptiles under threat in Queensland's southern brigalow belt*. World Wide Fund for Nature, Brisbane.

Ehmann, H (1992). *Encyclopedia of Australian animals: Reptiles*. Angus and Robertson, Sydney.

Pizzey, G and Knight, F (2003). *The field guide to the birds of Australia.* HarperCollins, Sydney.

TSSC (2001). Brigalow (*Acacia harpophylla* dominant and co-dominant) recommendation to the Minister for the Environment and Water Resources from the Threatened Species Scientific Committee TSSC) on a public nomination for an ecological community listing on the *Environment Protection and Biodiversity Conservation Act 1999*.

Wilson, S (2005). *A field guide to reptiles of Queensland.* Reed New Holland, Sydney.

Wilson, S. and Swan, *A complete guide to reptiles of Australia*. Reed New Holland, Sydney.

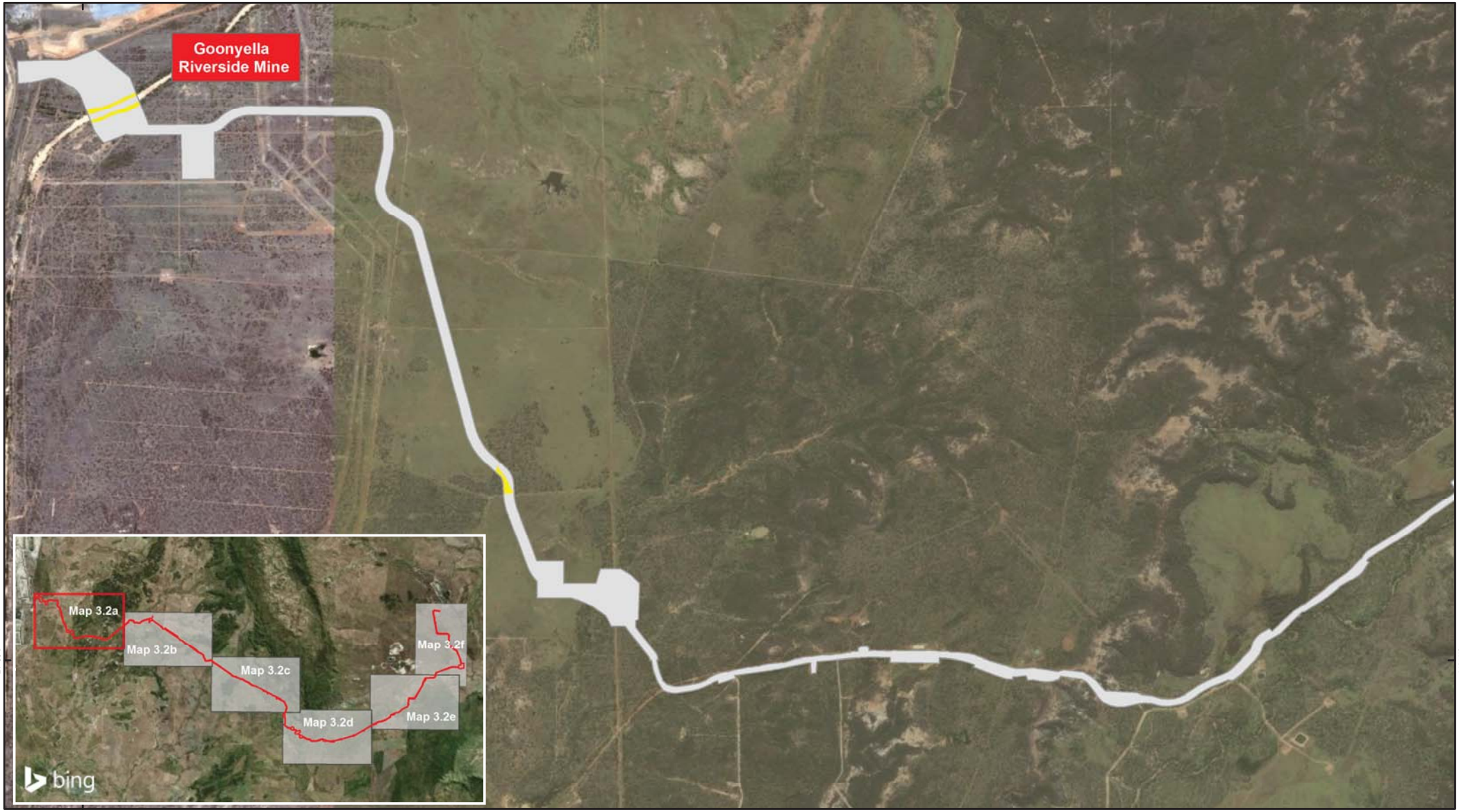
APPENDIX B

Figures 3.2a-f Modelled and Ground-truthed Ornamental Snake Habitat within the Dragline Move Route (RevD)

Figures 3.3a-f Modelled and Ground-truthed Squatter Pigeon (Southern Subspecies) Habitat within the Dragline Move Route (RevD)

Figures 3.4a-f Modelled and Ground-truthed Koala Habitat within the Dragline Move Route (Rev D)

Figures 3.5a-f Modelled and Ground-truthed Yakka Skink Habitat within the Dragline Move Route (Rev D)



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Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Ornamental Snake Habitat

- Essential Habitat
- Unlikely Habitat
- Dragline Move Route

Figure:	3.2a
Title:	Modelled and ground-truthed Ornamental Snake habitat within the Dragline Route
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

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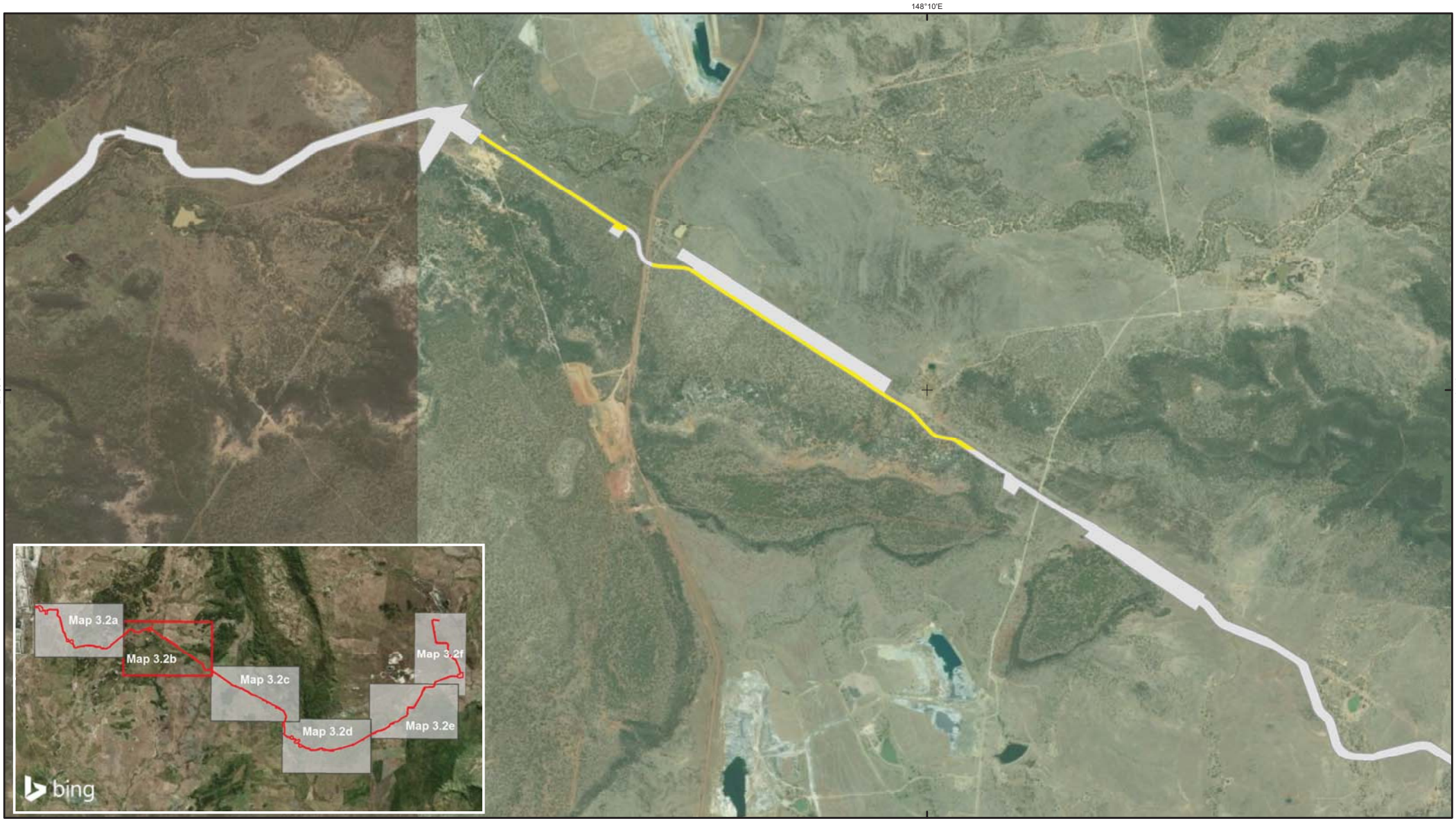

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Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Ornamental Snake Habitat

- Essential Habitat
- Unlikely Habitat
- Dragline Move Route

Figure:	3.2b
Title:	Modelled and ground-truthed Ornamental Snake habitat within the Dragline Route
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

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Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

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0 165 330 660 990 1,320 Meters

LEGEND

Ornamental Snake Habitat

- General Habitat
- Unlikely Habitat
- Dragline Move Route

Figure:	3.2c
Title:	Modelled and ground-truthed Ornamental Snake habitat within the Dragline Route
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

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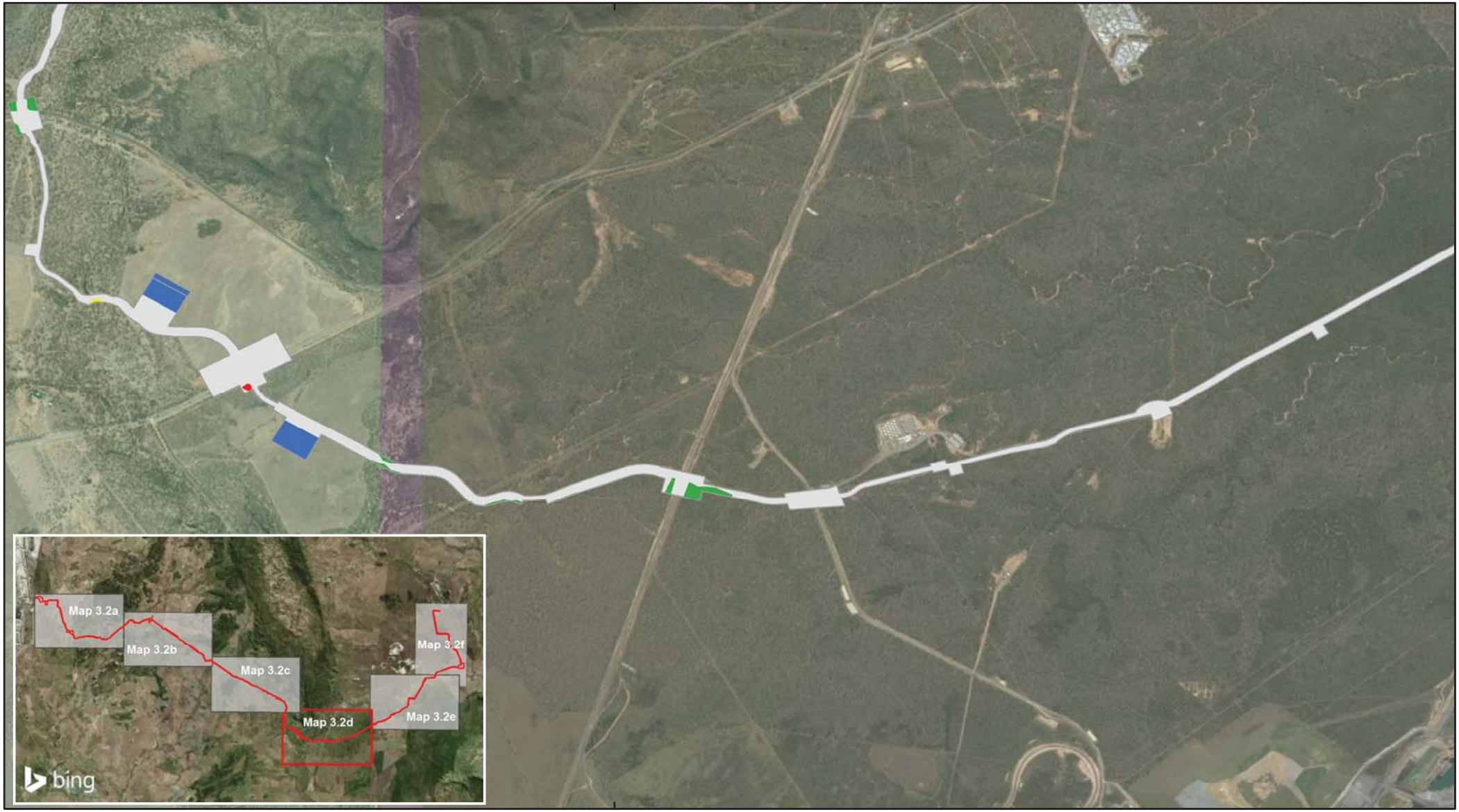

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Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

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LEGEND

Ornamental Snake Habitat

- Core Habitat
- Essential Habitat
- General Habitat
- Unlikely Habitat

- Dragline Move Route
- Temporary Shutdown Areas

Drawn By: MG Reviewed by: AC Date: 01-Dec-16

Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Landscape_series2_Dragline.mxdDate: 01-Dec-16 6:57:14 PM

Figure:	3.2d
Title:	Modelled and ground-truthed Ornamental Snake habitat within the Dragline Route
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

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Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Ornamental Snake Habitat

- Essential Habitat
- General Habitat
- Unlikely Habitat

Dragline Move Route

Drawn By: MG Reviewed by: AC Date: 01-Dec-16

Figure:	3.2e
Title:	Modelled and ground-truthed Ornamental Snake habitat within the Dragline Route
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

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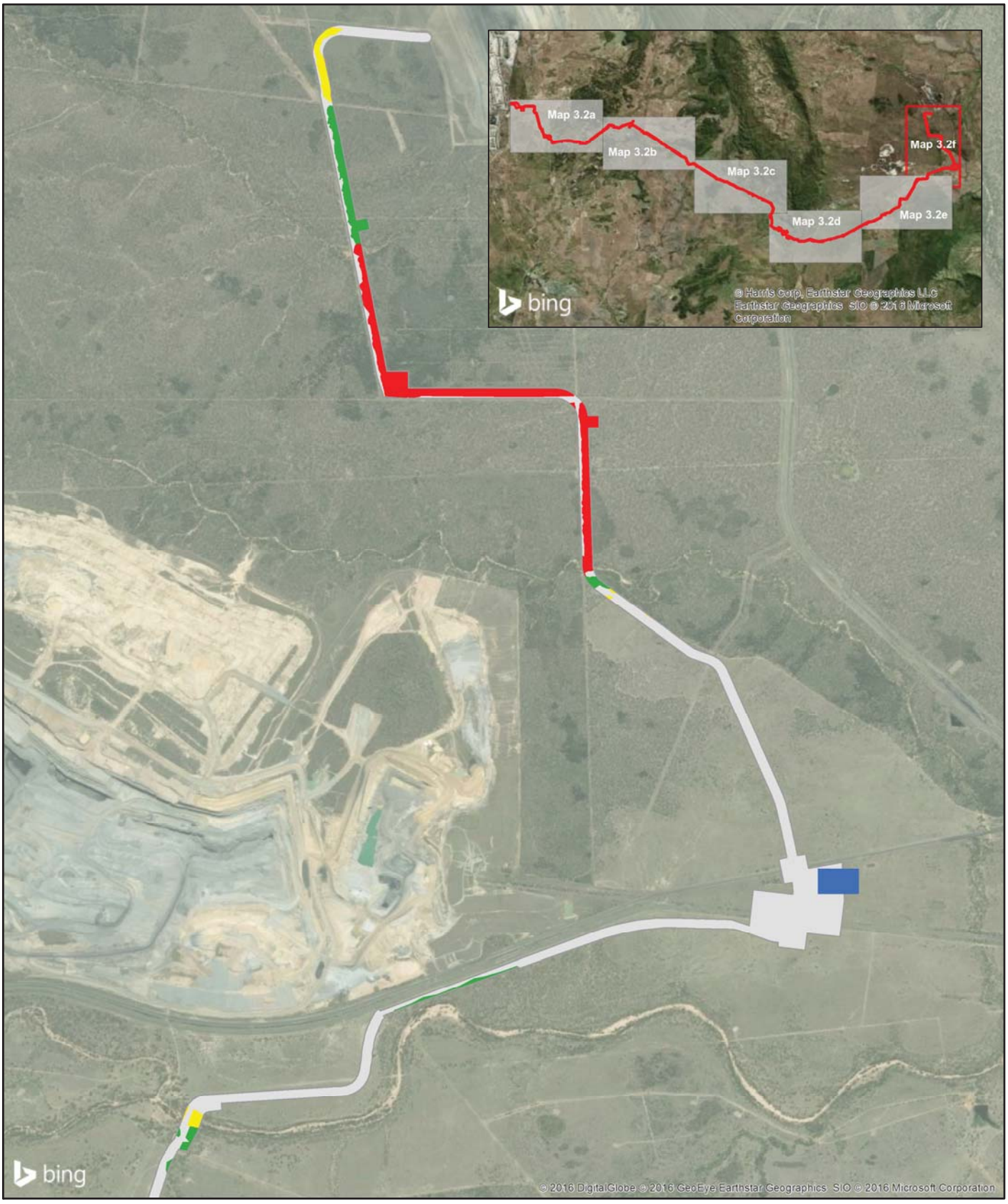

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Legend

Ornamental Snake Habitat
- Core Habitat
- Essential Habitat
- General Habitat
- Unlikely Habitat
- Temporary Shutdown Areas
- Dragline Transport Route

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Figure:	**3-2f**
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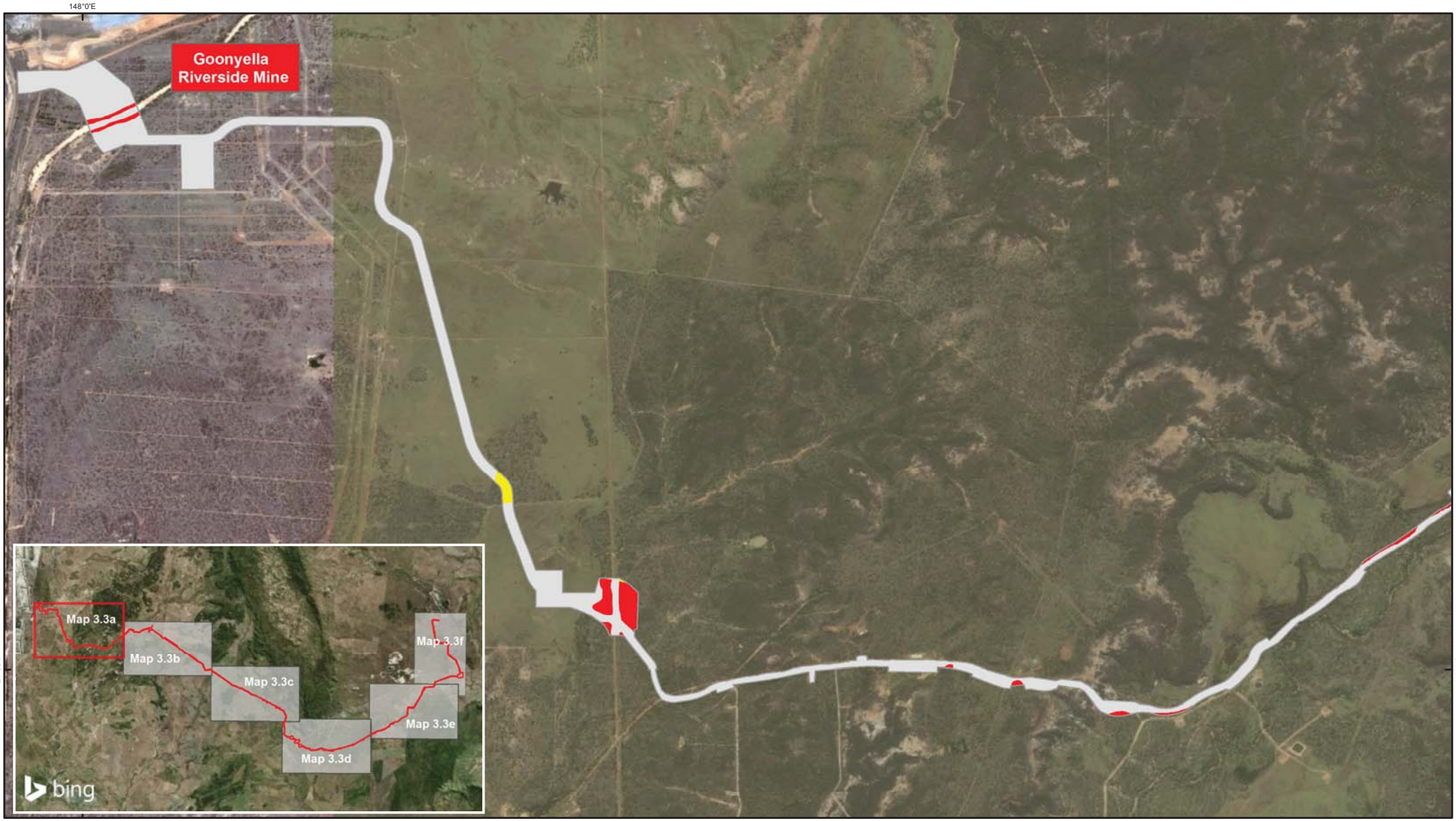
Project:	**BMC Dragline Move Project Terrestrial Ecology MNES Assessment**
Client:	Advisian

BAAM ECOLOGICAL CONSULTANTS



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Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Squatter Pigeon (Southern Subspecies)

- Core Habitat
- Essential Habitat
- General Habitat
- Unlikely Habitat
- Dragline Move Route

Figure:	3.3a
Title:	Modelled and ground-truthed Squatter Pigeon (Southern Subspecies)
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

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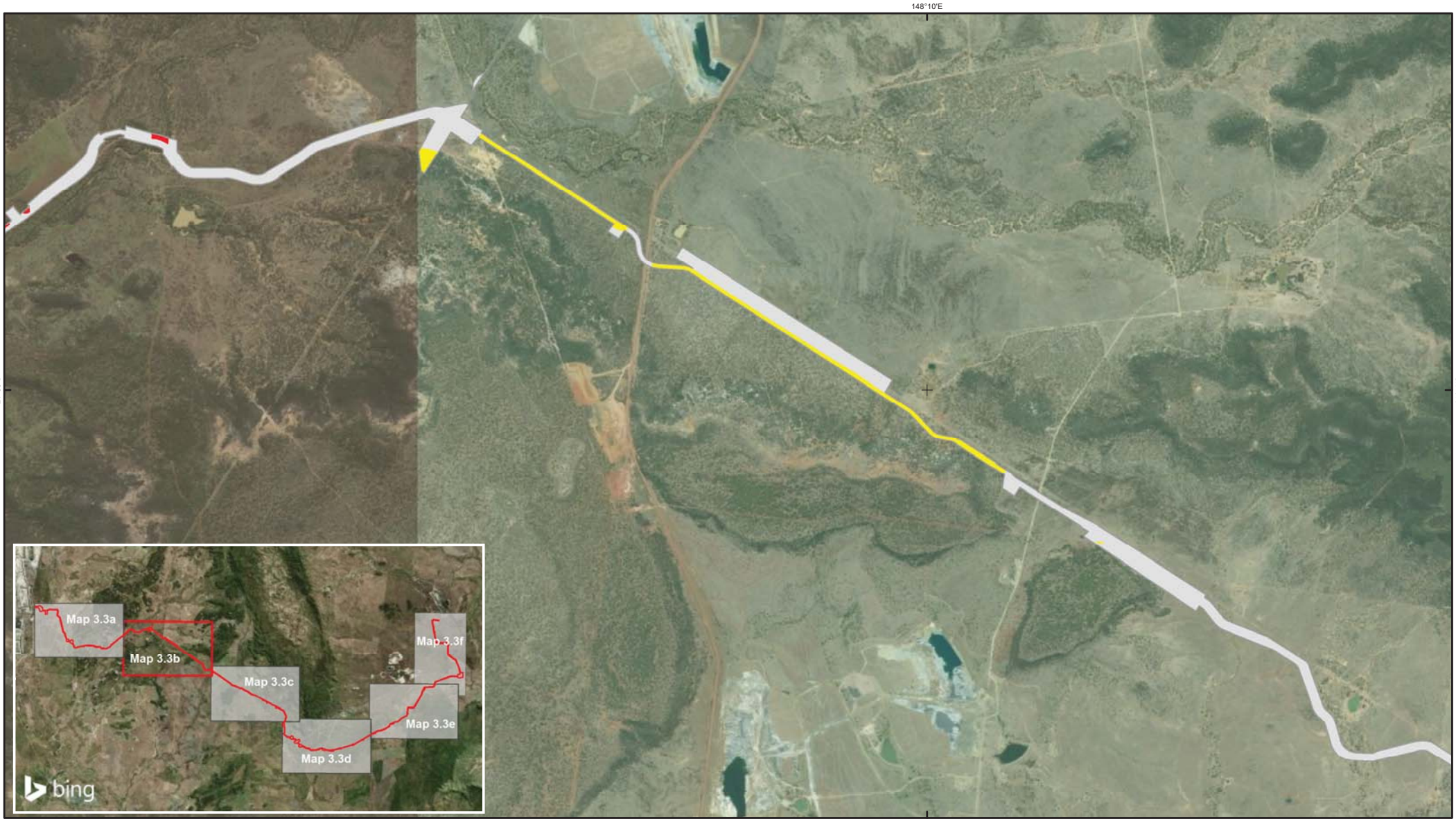

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Datum: GDA 1994
Units: Degree

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0 165 330 660 990 1,320 Meters

LEGEND

Squatter Pigeon (Southern Subspecies)
- Core Habitat
- Essential Habitat
- General Habitat
- Unlikely Habitat
- Dragline Move Route

Figure:	3.3b
Title:	Modelled and ground-truthed Squatter Pigeon (Southern Subspecies)
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

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0 165 330 660 990 1,320 Meters

LEGEND

Squatter Pigeon (Southern Subspecies)

- Core Habitat
- Essential Habitat
- General Habitat
- Unlikely Habitat
- Dragline Move Route

Figure:	3.3c
Title:	Modelled and ground-truthed Squatter Pigeon (Southern Subspecies)
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

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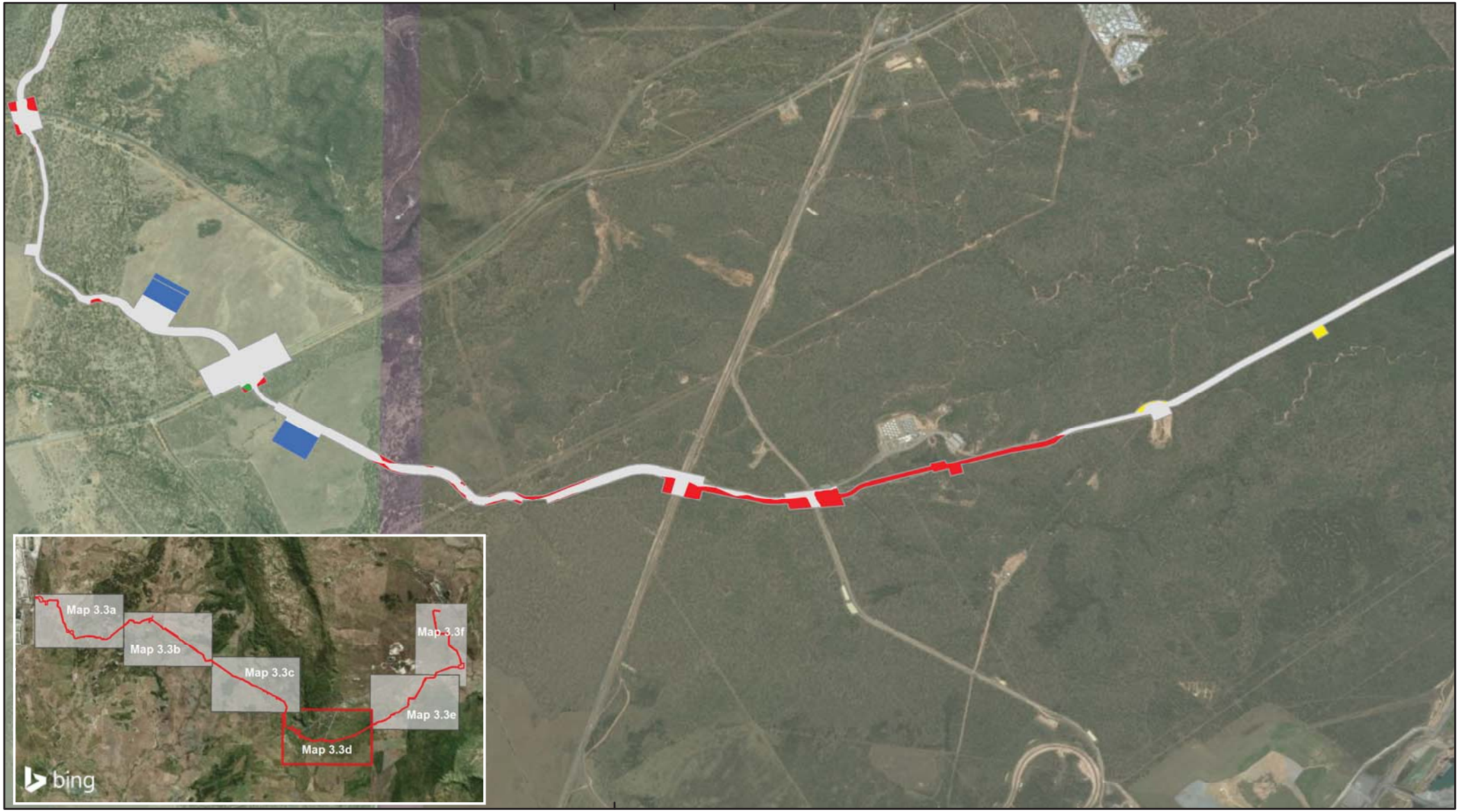

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Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Squatter Pigeon (Southern Subspecies)

- Core Habitat
- Essential Habitat
- General Habitat
- Unlikely Habitat
- Dragline Move Route
- Temporary Shutdown Areas

Figure:	3.3d
Title:	Modelled and ground-truthed Squatter Pigeon (Southern Subspecies)
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

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Drawn By: MG Reviewed by: AC Date: 01-Dec-16

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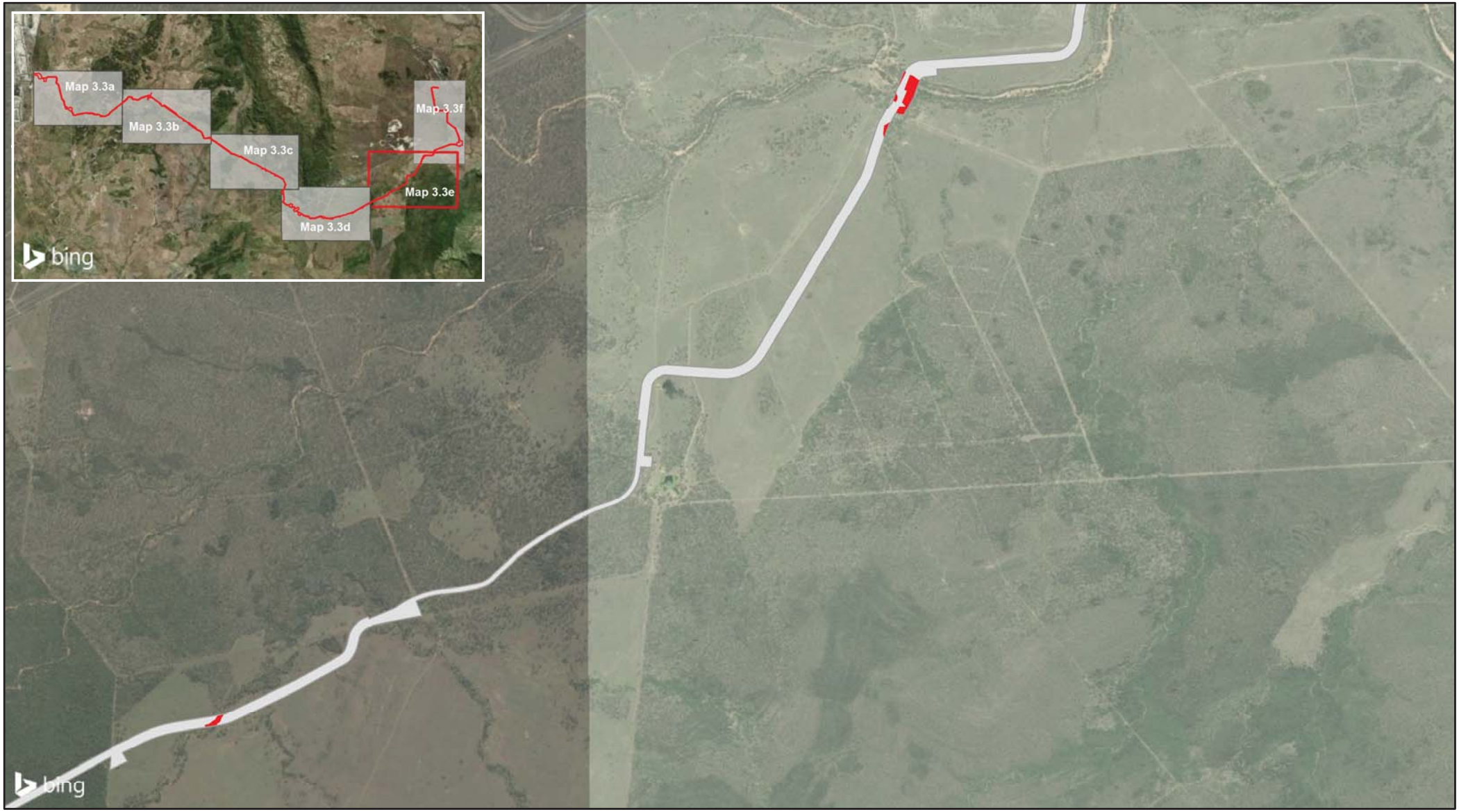

Notes:

Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Squatter Pigeon (Southern Subspecies)

- Core Habitat
- Essential Habitat
- General Habitat
- Unlikely Habitat
- Dragline Move Route

Drawn By: MG Reviewed by: AC Date: 01-Dec-16

Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Landscape_series2_Dragline.mxdDate: 01-Dec-16 6:57:14 PM

Figure:	3.3e
Title:	Modelled and ground-truthed Squatter Pigeon (Southern Subspecies)
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

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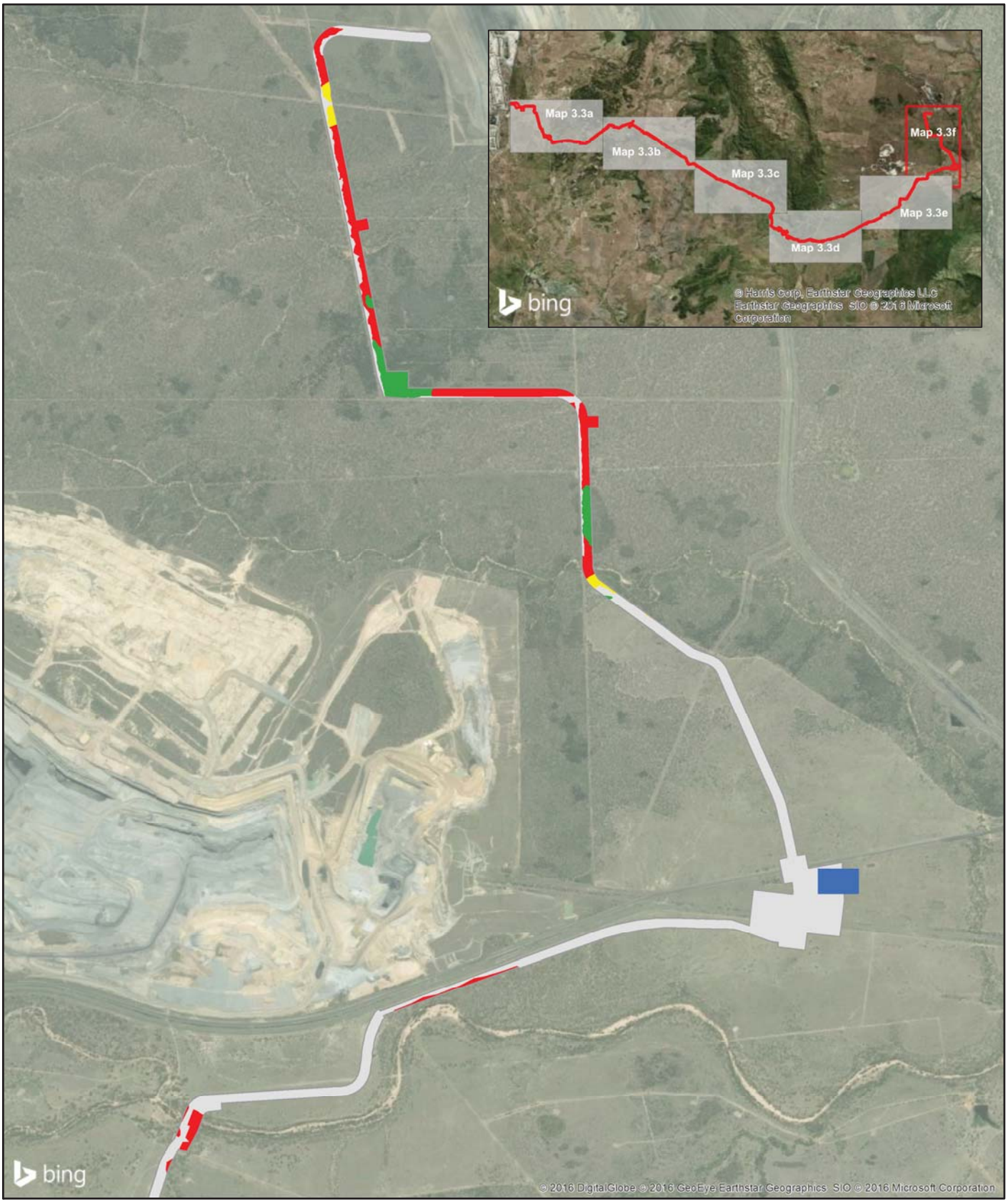

Notes:

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 0.15 0.3 0.6 0.9 1.2 Kilometers

Legend

Squatter Pigeon (Southern Subspecies)

- Core Habitat
- Essential Habitat
- General Habitat
- Unlikely Habitat
- Temporary Shutdown Areas
- Dragline Transport Route

Figure:	**3-3f**
Title:	Modelled and ground-truthed Squatter Pigeon (Southern Subspecies)
Project:	**BMC Dragline Move Project Terrestrial Ecology MNES Assessment**
Client:	Advisian

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Drawn By: MG Reviewed by: AC Date: 01-Dec-16

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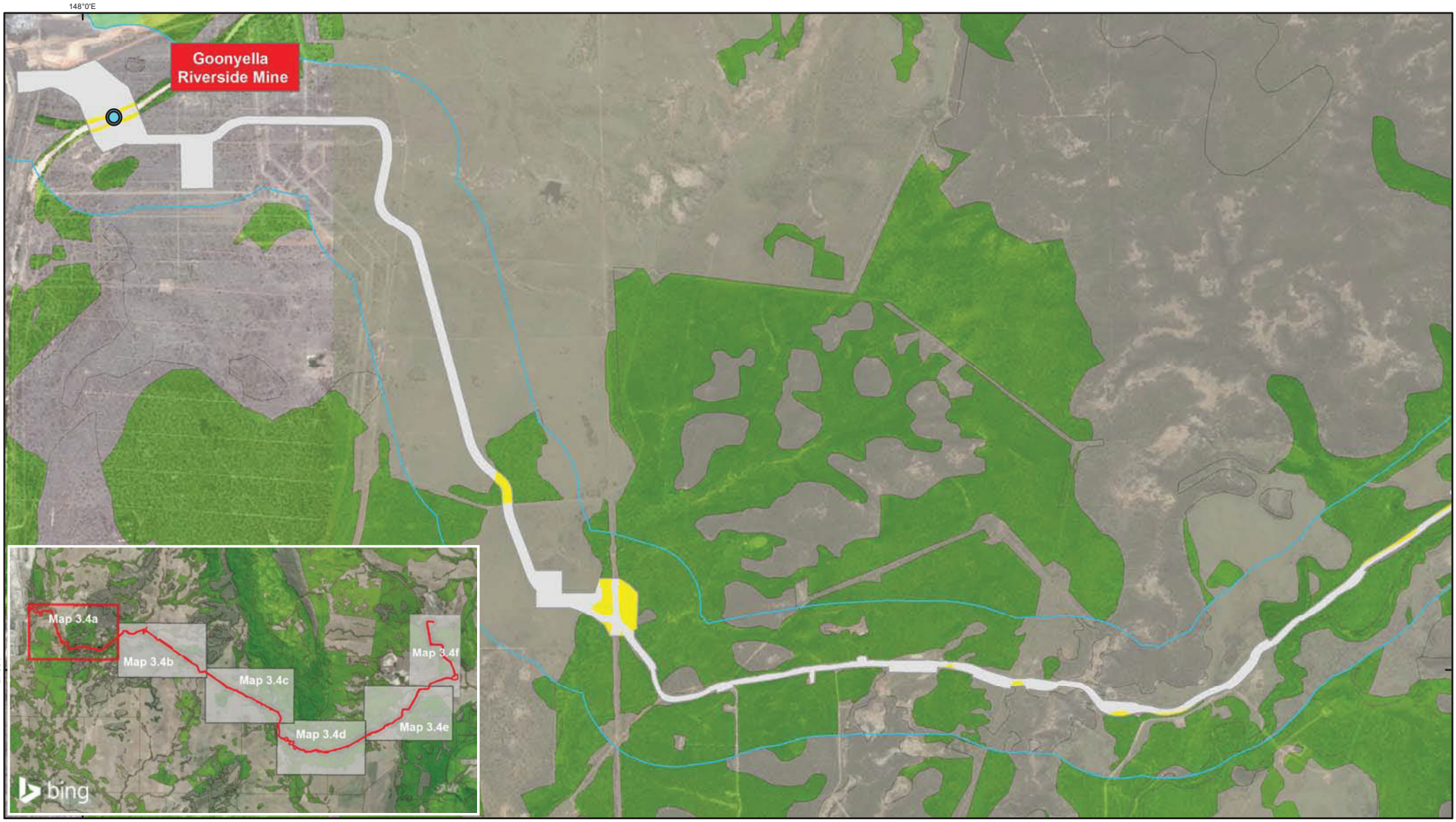

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Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Koala Habitat
- Essential Habitat
- Unlikely Habitat

Regional Koala Habitat
- No
- Yes

- Dragline Move Route
- 500m Corridor
- Riparian habitat on Stream order 4 or greater

Drawn By: MG Reviewed by: AC Date: 02-Dec-16

Figure:	3.4a
Title:	Modelled and ground-truthed Koala habitat within the Dragline Route
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

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Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Landscape_series2_Dragline.mxdDate: 02-Dec-16 7:25:42 AM

Notes:

Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

N

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Koala Habitat
- Essential Habitat
- General Habitat
- Unlikely Habitat

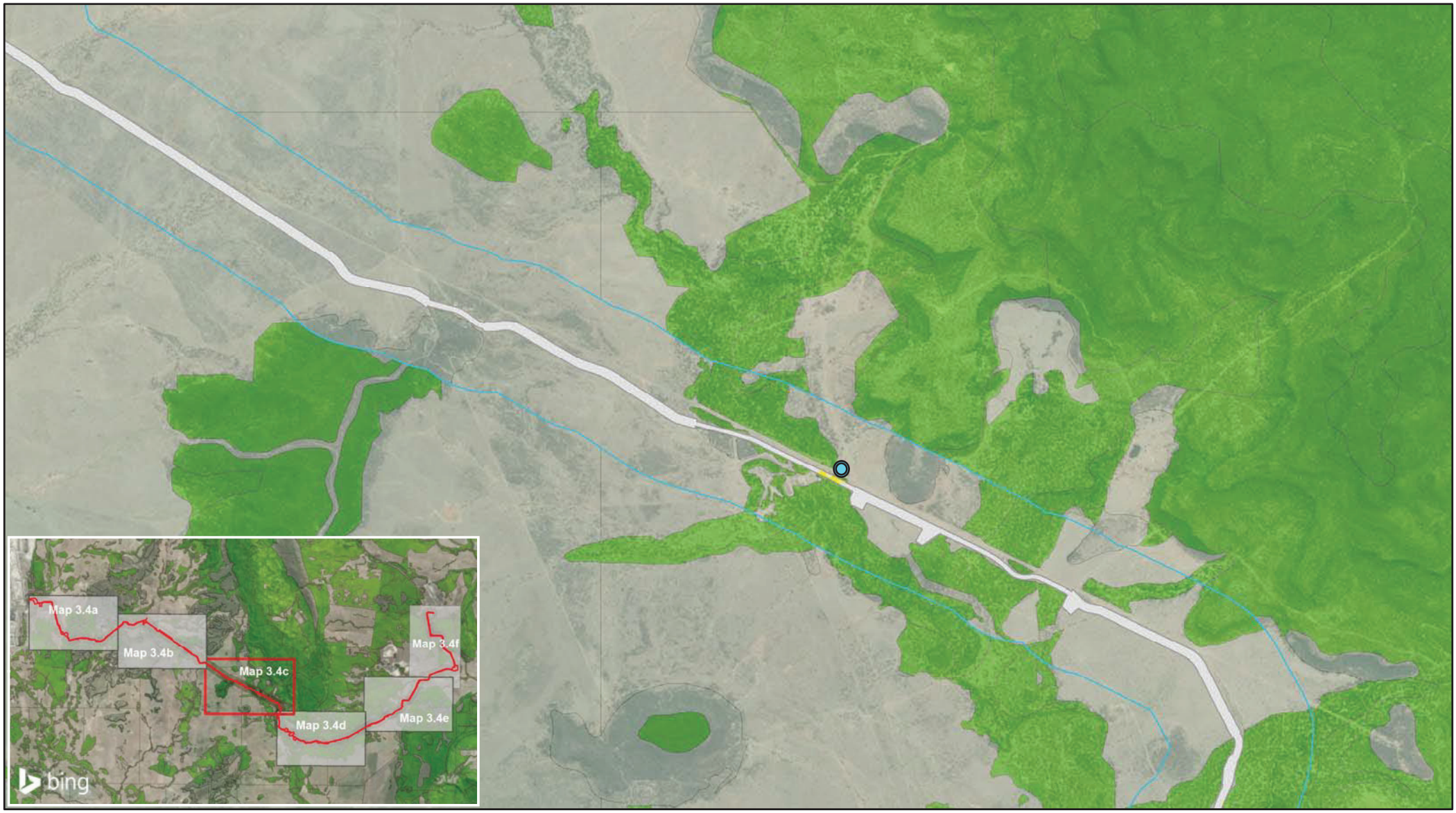
Regional Koala Habitat
- No
- Yes

- Dragline Move Route
- 500m Corridor
- Riparian habitat on Stream order 4 or greater

Drawn By: MG Reviewed by: AC Date: 02-Dec-16

Figure:	3.4b
Title:	Modelled and ground-truthed Koala habitat within the Dragline Route
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

BAAM ECOLOGICAL CONSULTANTS



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Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

N

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Koala Habitat
- Essential Habitat
- Unlikely Habitat

Regional Koala Habitat
- No
- Yes

- Dragline Move Route
- 500m Corridor
- Riparian habitat on Stream order 4 or greater

Drawn By: MG Reviewed by: AC Date: 02-Dec-16

Figure:	3.4c
Title:	Modelled and ground-truthed Koala habitat within the Dragline Route
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

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Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Landscape_series2_Dragline.mxdDate: 02-Dec-16 7:25:42 AM

148°20'E

148°20'E

Notes:

Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

- Temporary Shutdown Areas

Koala Habitat

- Essential Habitat
- Unlikely Habitat

Regional Koala Habitat

- No
- Yes

- Dragline Move Route
- 500m Corridor

Drawn By: MG Reviewed by: AC Date: 02-Dec-16

Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Landscape_series2_Dragline.mxdDate: 02-Dec-16 7:25:42 AM

Figure: 3.4d
Title: Modelled and ground-truthed Koala habitat within the Dragline Route

Project: BMC Dragline Move Project
Terrestrial Ecology MNES Assessment

Client: Advisian

BAAM ECOLOGICAL CONSULTANTS

Notes:

Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

N

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Koala Habitat
- Essential Habitat
- Unlikely Habitat

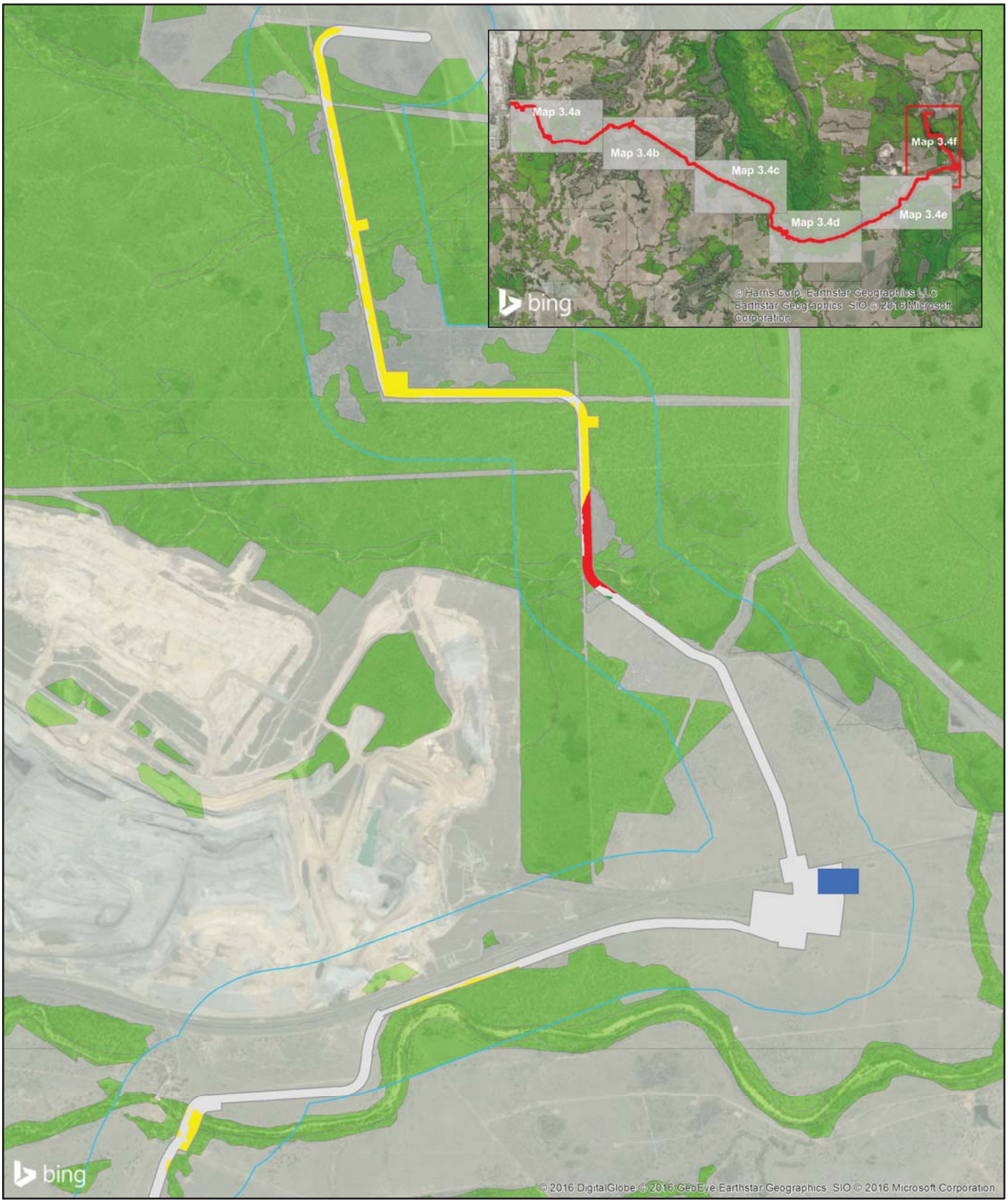
Regional Koala Habitat
- No
- Yes

- Dragline Move Route
- 500m Corridor
- Riparian habitat on Stream order 4 or greater

Drawn By: MG Reviewed by: AC Date: 02-Dec-16

Figure:	3.4e
Title:	Modelled and ground-truthed Koala habitat within the Dragline Route
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

BAAM ECOLOGICAL CONSULTANTS



Notes:

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

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0 0.15 0.3 0.6 0.9 1.2 Kilometers

Legend

Koala Habitat

- Core Habitat
- Essential Habitat
- General Habitat
- Unlikely Habitat

Regional Koala Habitat

- No
- Yes

- 500m Corridor
- Temporary Shutdown Areas
- Dragline Transport Route

Figure:	**3-4f**
Title:	Modelled and ground-truthed Koala habitat within the Dragline Route
Project:	**BMC Dragline Move Project Terrestrial Ecology MNES Assessment**
Client:	Advisian

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Drawn By: MG Reviewed by: AC Date: 02-Dec-16

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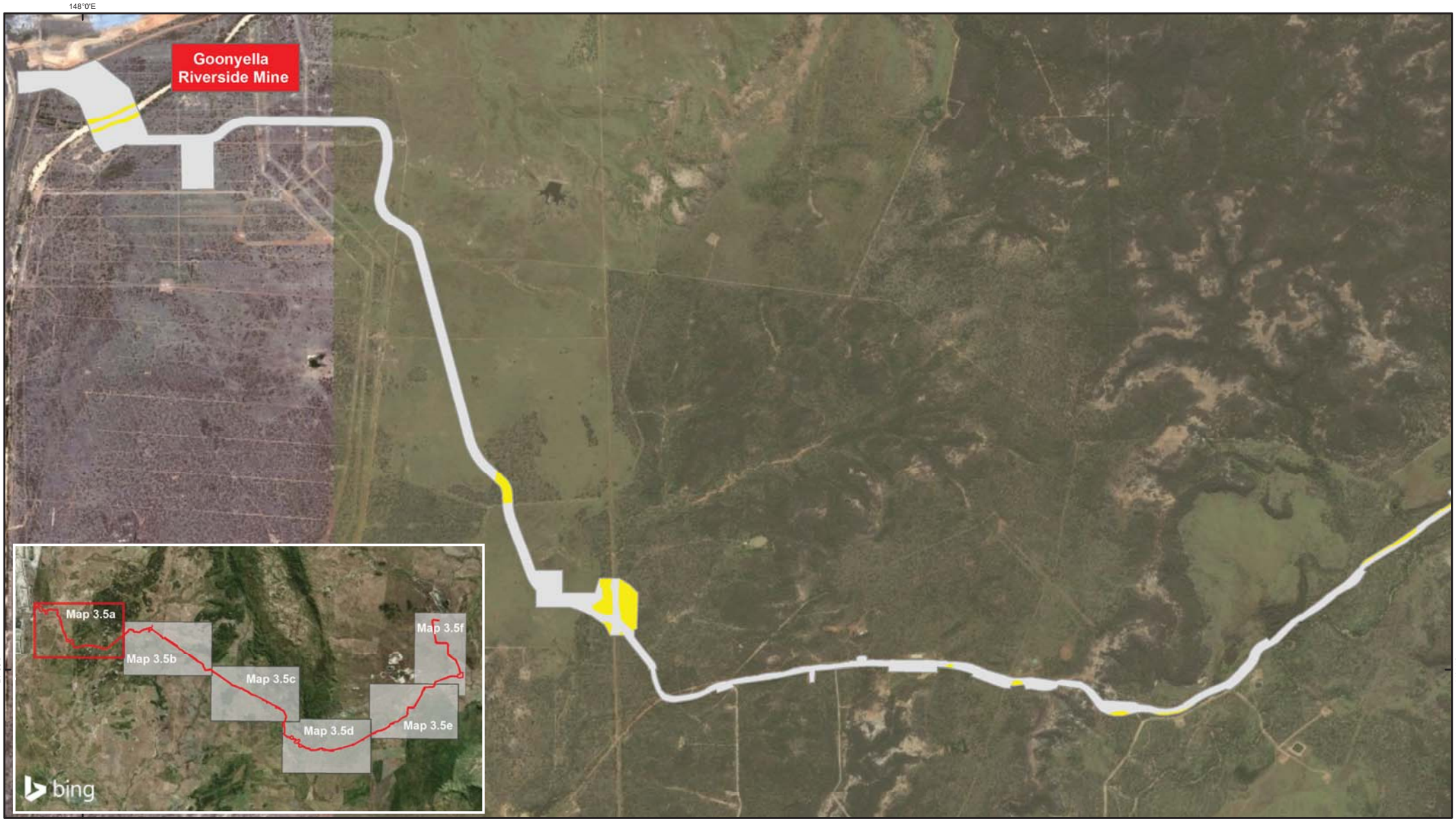

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Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Yakka Skink Habitat

- Essential Habitat
- Unlikely Habitat
- Dragline Move Route

Figure:	3.5a
Title:	Modelled and ground-truthed Yakka Skink habitat within the Dragline Move Route
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

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Drawn By: MG Reviewed by: AC Date: 01-Dec-16

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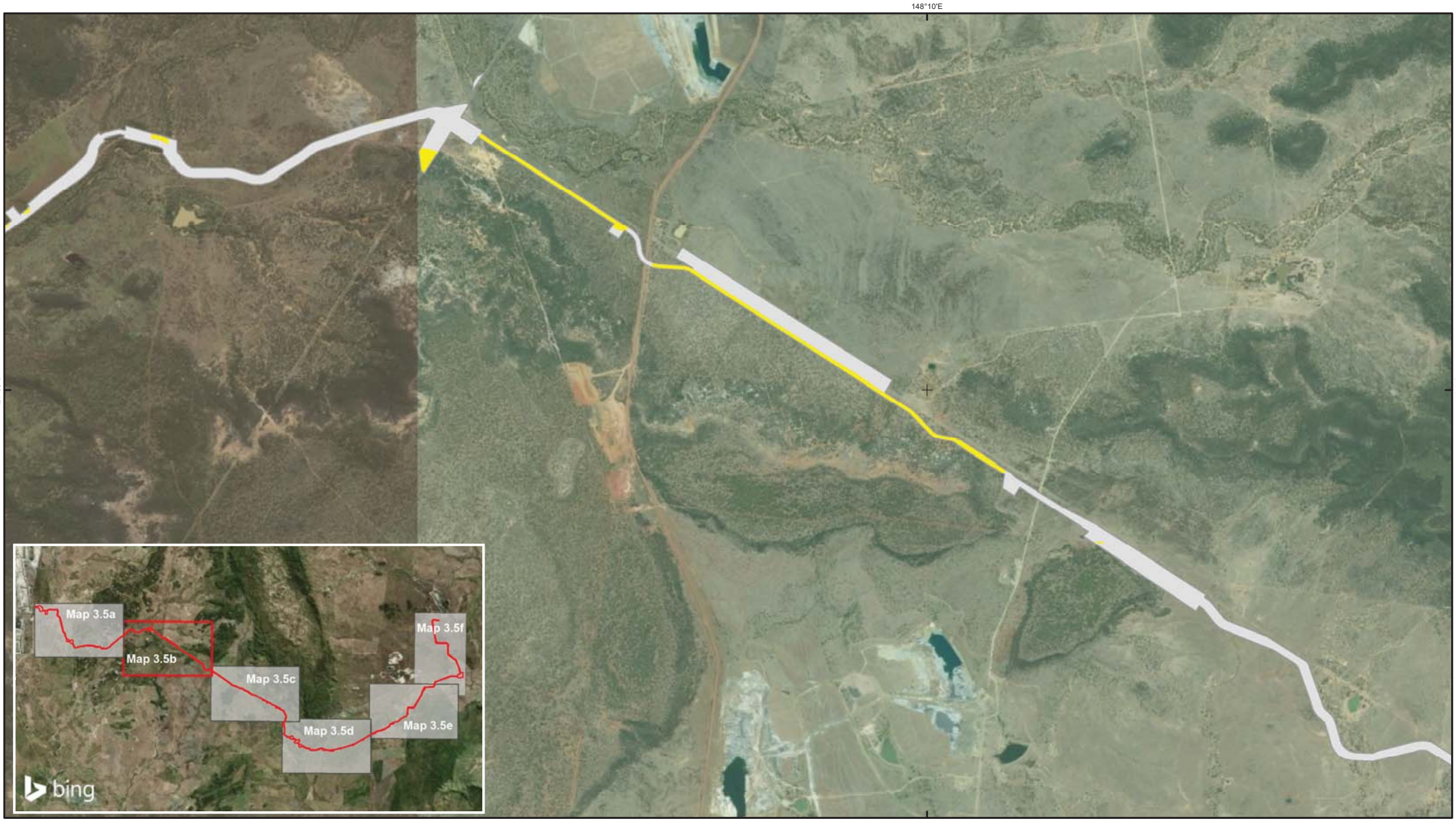

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Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Yakka Skink Habitat

- Essential Habitat
- Unlikely Habitat

Dragline Move Route

Figure:	3.5b
Title:	Modelled and ground-truthed Yakka Skink habitat within the Dragline Move Route
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

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Drawn By: MG Reviewed by: AC Date: 01-Dec-16

Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Landscape_series2_Dragline.mxdDate: 01-Dec-16 6:57:14 PM

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Yakka Skink Habitat

- Essential Habitat
- Unlikely Habitat

Dragline Move Route

Figure:	3.5c
Title:	Modelled and ground-truthed Yakka Skink habitat within the Dragline Move Route
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

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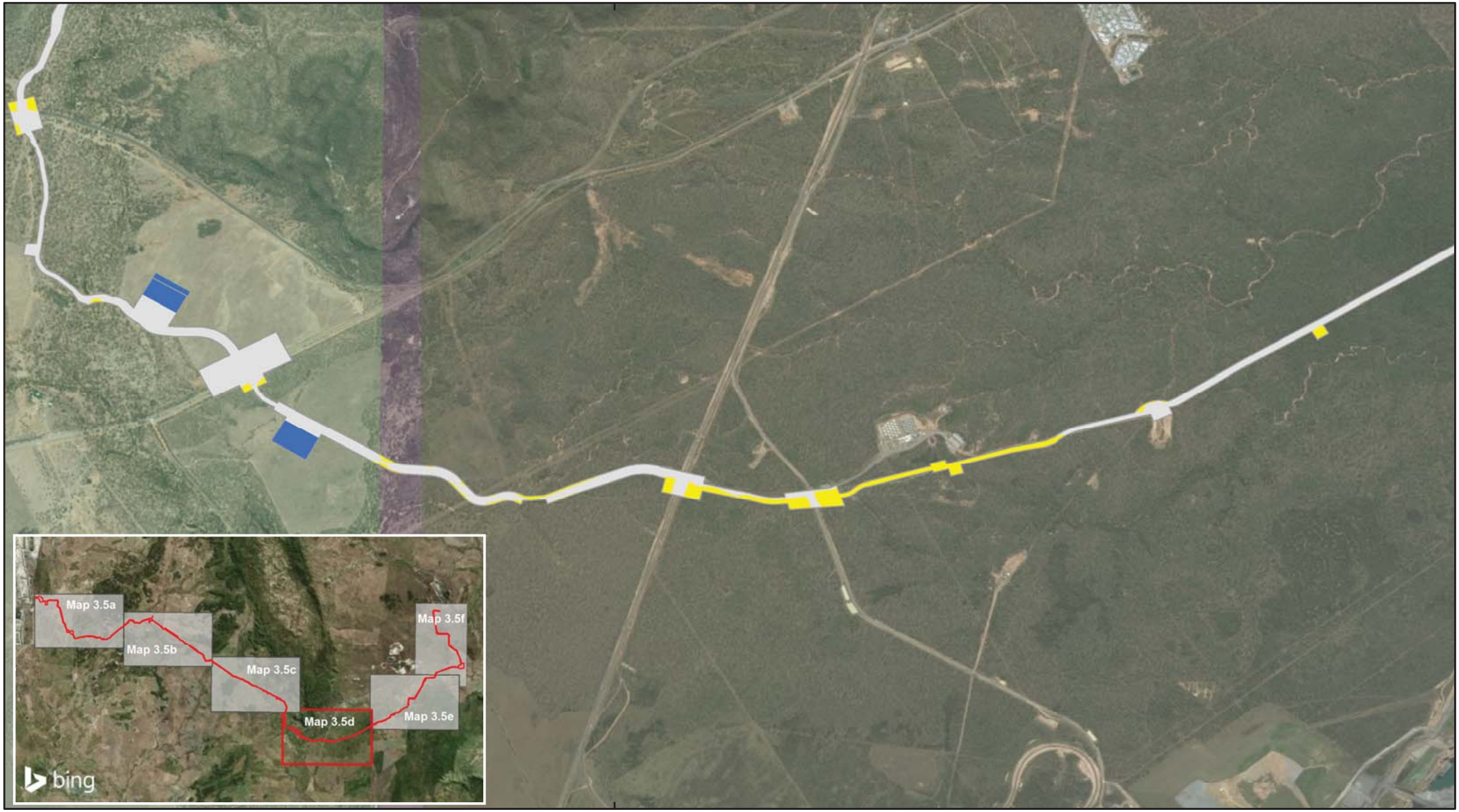
Drawn By: MG Reviewed by: AC Date: 01-Dec-16

Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Landscape_series2_Dragline.mxdDate: 01-Dec-16 6:57:14 PM

148°20'E



148°20'E

Notes:

Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Yakka Skink Habitat

- Essential Habitat
- General Habitat
- Unlikely Habitat

- Dragline Move Route
- Temporary Shutdown Areas

Drawn By: MG Reviewed by: AC Date: 01-Dec-16

Figure: 3.5d
Title: Modelled and ground-truthed Yakka Skink habitat within the Dragline Move Route

Project: BMC Dragline Move Project
Terrestrial Ecology MNES Assessment

Client: Advisian

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Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Landscape_series2_Dragline.mxdDate: 01-Dec-16 6:57:14 PM

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Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4
0 165 330 660 990 1,320 Meters

LEGEND

Yakka Skink Habitat

- Essential Habitat
- Unlikely Habitat
- Dragline Move Route

Drawn By: MG Reviewed by: AC Date: 01-Dec-16

Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Landscape_series2_Dragline.mxdDate: 01-Dec-16 10:31:09 PM

Figure:	3.5e
Title:	Modelled and ground-truthed Yakka Skink habitat within the Dragline Move Route
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

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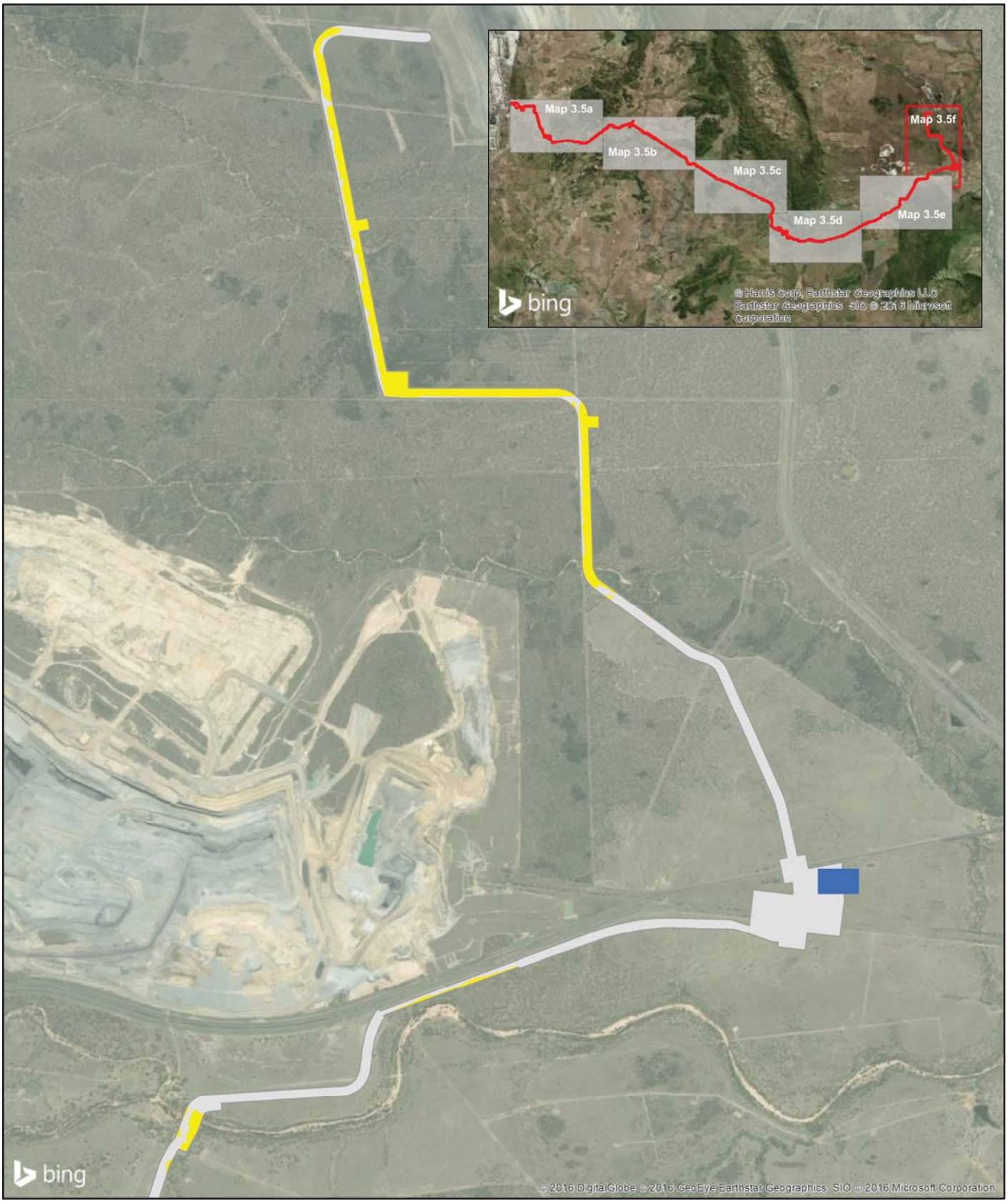

Notes:

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:30,000 at A4

0 0.15 0.3 0.6 0.9 1.2 Kilometers

Legend

Yakka Skink Habitat

- Essential Habitat
- General Habitat
- Unlikely Habitat
- Temporary Shutdown Areas
- Dragline Transport Route

Drawn By: MG Reviewed by: AC Date: 01-Dec-16

Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Portrait_dragline.mxdDate: 24-Nov-16 10:37:09 AM

Figure:	**3-5f**
Title:	Modelled and ground-truthed Yakka Skink habitat within the Dragline Route
Project:	**BMC Dragline Move Project Terrestrial Ecology MNES Assessment**
Client:	Advisian

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APPENDIX C

Koala Habitat Assessment Results

Table C1. Data recorded from Koala Habitat Assessment Sites (refer to Figure 4.2 for locations).

Site	General Habitat Description	Koala trees present	Survey type	Koala evidence?	Representative photographs
FA1 -21.80344 148.46555	**Vegetation:** Eucalypt woodland **Substrate:** Sandy Clay (land zone 5/4) **Water Bodies:** n/a **Connectivity:** Well connected to south and west with minor fragmentation. **Disturbance(s):** Moderate disturbance due to grazing and pipeline infrastructure.	*Eucalyptus populnea*	Active observation Spot Assessment Technique (30 trees inspected)	None	
FA2 -21.81099 148.46694	**Vegetation:** Eucalypt woodland **Substrate:** Clay Loam (land zone 5) **Water Bodies:** n/a **Connectivity:** Well connected in all directions, although powerline easement occurs to the west. **Disturbance(s):** Low disturbance due to grazing and pipeline infrastructure.	*Eucalyptus populnea*	Active observation Spot Assessment Technique (30 trees inspected)	None	

Site	General Habitat Description	Koala trees present	Survey type	Koala evidence?	Representative photographs
FA3 -21.81711 148.46825	**Vegetation:** Riparian, eucalypt woodland **Substrate:** Sand (land zone 3) **Water Bodies:** Creek **Connectivity:** Well connected. **Disturbance(s):** Low disturbance due to presence of road/track.	*Eucalyptus populnea* *Eucalyptus tereticornis*	Active observation Spot Assessment Technique (20 trees inspected)	None	
FA4 -21.82556 148.46984	**Vegetation:** Brigalow **Substrate:** Clay (land zone 4) **Water Bodies:** Swamp or gilgai. **Connectivity:** Well connected. **Disturbance(s):** Low disturbance.	None	Active observation	None	

Site	General Habitat Description	Koala trees present	Survey type	Koala evidence?	Representative photographs
FA5 -21.82682 148.47513	**Vegetation:** Eucalypt woodland **Substrate:** Clay Loam (land zone 5/4) **Water Bodies:** n/a **Connectivity:** Well connected in all directions. **Disturbance(s):** Low disturbance due to road/track.	*Eucalyptus populnea*, *Corymbia tessellaris*	Active observation Spot Assessment Technique (30 trees inspected)	None	
FA6 -21.83389 148.48423	**Vegetation:** Brigalow **Substrate:** Silty clay (land zone 4/5) **Water Bodies:** Gilgai. **Connectivity:** Connected in all directions, although fragmented by fenceline and track. **Disturbance(s):** Heavy disturbance from grazing.	*Eucalyptus populnea*	Active observation	None	

Site	General Habitat Description	Koala trees present	Survey type	Koala evidence?	Representative photographs
FA7 -21.83948 148.48427	**Vegetation:** Riparian, eucalypt woodland **Substrate:** Sand (land zone 3) **Water Bodies:** Creek **Connectivity:** Well connected. **Disturbance(s):** Low disturbance due to presence of road/track and fenceline.	*Eucalyptus tereticornis, Corymbia clarksoniana*, *Corymbia tessellaris*	Active observation Spot Assessment Technique (30 trees inspected)	None	
FA8 -21.87812 148.45685	**Vegetation:** Riparian, eucalypt woodland **Substrate:** Sand (land zone 3) **Water Bodies:** Creek **Connectivity:** Well connected along watercourse but poor connectivity to adjacent habitats. **Disturbance(s):** High disturbance due to erosion from livestock access.	*Eucalyptus tereticornis, Corymbia tessellaris*	Active observation Spot Assessment Technique (30 trees inspected)	None	

Site	General Habitat Description	Koala trees present	Survey type	Koala evidence?	Representative photographs
FA9 -21.87004 148.47259	**Vegetation:** Eucalypt woodland **Substrate:** Silty clay/loam (land zone 3) **Water Bodies:** Creek **Connectivity:** Well connected along watercourse. Highway to north creates barrier **Disturbance(s):** Moderate disturbance due to exotic grasses.	*Eucalyptus tereticornis, Eucalytpus playphylla*, *Corymbia clarksoniana*, *Corymbia tessellaris*	Active observation Spot Assessment Technique (30 trees inspected)	None	
FA10 -21.92151 148.41258	**Vegetation:** Brigalow/Belah forest **Substrate:** Silty clay (land zone 9) **Water Bodies:** Creek nearby **Connectivity:** Well connected other than paddocks and fences to the south. **Disturbance(s):** Some disturbance due to grazing and fences/tracks.	*Eucalyptus populnea*	Active observation Spot Assessment Technique (13 trees inspected)	None	

Site	General Habitat Description	Koala trees present	Survey type	Koala evidence?	Representative photographs
FA11 -21.90672 148.43626	**Vegetation:** Brigalow/Eucalypt woodland **Substrate:** Silty clay (land zone 9) **Water Bodies:** n/a **Connectivity:** Well connected in all directions – within continuous remnant patch. **Disturbance(s):** Moderate - high disturbance due to grazing, buffel grass and fences/tracks.	*Eucalyptus cambageana*	Active observation Spot Assessment Technique (15 trees inspected)	None	
FA12 -21.93876 148.30785	**Vegetation:** Eucalypt woodland **Substrate:** Loam (land zone 5) **Water Bodies:** n/a **Connectivity:** Surrounded by non-remnant areas and highway to the north represents a considerable barrier. **Disturbance(s):** Low disturbance due to grazing, weeds and track/fenceline.	*Eucalyptus populnea*	Active observation Spot Assessment Technique (30 trees inspected)	None	

Site	General Habitat Description	Koala trees present	Survey type	Koala evidence?	Representative photographs
FA13 -21.94603 148.33174	**Vegetation:** Eucalypt woodland (non-remnant) **Substrate:** Silty Loam (land zone 5) **Water Bodies:** n/a **Connectivity:** Well connected. **Disturbance(s):** Low disturbance.	*Eucalyptus populnea*	Active observation	None	
FA14 -21.945 148.321678	**Vegetation:** Eucalypt woodland (non-remnant) **Substrate:** Sandy Clay (land zone 5) **Water Bodies:** Gilgai **Connectivity:** Limited. **Disturbance(s):** High disturbance due to exotic pasture grasses.	*Eucalyptus populnea*	Active observation	None	

Site	General Habitat Description	Koala trees present	Survey type	Koala evidence?	Representative photographs
FA15 -21.93112 148.39169	**Vegetation:** Eucalypt woodland **Substrate:** Loam Sand (land zone 5) **Water Bodies:** n/a **Connectivity:** Well connected – within continuous band of forest. **Disturbance(s):** Low disturbance due to previous clearing and road/track infrastructure.	*Eucalyptus populnea, Eucalyptus cambageana*	Active observation Spot Assessment Technique (30 trees inspected)	None	
FA16 -21.94714 148.34909	**Vegetation:** Eucalypt woodland **Substrate:** Silty Loam **Water Bodies:** n/a **Connectivity:** Well connected in all directions. **Disturbance(s):** Low disturbance due to history of grazing and recent fire.	*Eucalyptus populnea*	Active observation Spot Assessment Technique (30 trees inspected)	None	

Site	General Habitat Description	Koala trees present	Survey type	Koala evidence?	Representative photographs
FA17 -21.83341 148.083648	**Vegetation:** Eucalypt woodland (non-remnant) **Substrate:** Loam **Water Bodies:** n/a **Connectivity:** Connected, although mixture of woodland and pasture. **Disturbance(s):** High disturbance due to clearing for grazing.	*Eucalyptus crebra, Corymbia clarksoniana, Corymbia tessellaris*	Active observation Spot Assessment Technique (5 trees inspected)	None	
FA18 -21.88835 148.25758	**Vegetation:** Brigalow open forest **Substrate:** Clay Loam (land zone 9) **Water Bodies:** n/a **Connectivity:** Loosely connected to remnant habitat further north - exposed paddocks in all directions. **Disturbance(s):** Moderate disturbance due to grazing, exotic grass/weeds and fences/tracks.	*Eucalyptus populnea*	Active observation Spot Assessment Technique (10 trees inspected)	None	

Site	General Habitat Description	Koala trees present	Survey type	Koala evidence?	Representative photographs
FA19 -21.83006 148.0877	**Vegetation:** Eucalypt woodland **Substrate:** Sandy Loam (land zone 3) **Water Bodies:** Creek/swamp. **Connectivity:** Well connected along watercourse. **Disturbance(s):** Moderate disturbance due to grazing and road/fence infrastructure.	*Eucalyptus tereticornis*, *Corymbia tessellaris*	Active observation Spot Assessment Technique (30 trees inspected)	None	
FA20 -21.83476 148.06827	**Vegetation:** Acacia woodland **Substrate:** Sandy Loam (land zone 7) **Water Bodies:** n/a. **Connectivity:** Moderate – fragmented by paddock. **Disturbance(s):** Some disturbance due to grazing and road/fence infrastructure.	*Eucalyptus exserta*	Active observation Spot Assessment Technique (10 trees inspected)	None	

Site	General Habitat Description	Koala trees present	Survey type	Koala evidence?	Representative photographs
FA21 -21.8344 148.07333	**Vegetation:** Acacia woodland **Substrate:** Silty Loam (land zone 7) **Water Bodies:** n/a. **Connectivity:** Well connected in all directions. **Disturbance(s):** Some disturbance due to grazing and road/fence infrastructure.	*Eucalyptus exserta*	Active observation	None	
FA22 -21.83631 148.04233	**Vegetation:** Eucalypt woodland **Substrate:** Loam Sand (land zone 5) **Water Bodies:** Creek **Connectivity:** Well connected to surrounding patches of remnant habitat. **Disturbance(s):** Some disturbance due to grazing and road/fence infrastructure.	*Eucalyptus crebra*, *Corymbia tessellaris*	Active observation Spot Assessment Technique (30 trees inspected)	None	

Site	General Habitat Description	Koala trees present	Survey type	Koala evidence?	Representative photographs
FA23 -21.826975 148.153253	**Vegetation:** Eucalypt woodland **Substrate:** Sandy Loam (land zone 5) **Water Bodies:** Drainage line (gullied) **Connectivity:** Edge of large patch of remnant habitat. **Disturbance(s):** Some disturbance due to grazing and road/fence infrastructure.	*Eucalyptus crebra, Eucalyptus populnea*	Active observation	None	
FA24 -21.829741 148.156669	**Vegetation:** Eucalypt woodland **Substrate:** Sandy Loam (land zone 5) **Water Bodies:** Minor sandy drainage line **Connectivity:** Edge of large patch of remnant habitat. **Disturbance(s):** Some disturbance due to grazing and road/fence infrastructure.	*Eucalyptus crebra, Eucalyptus populnea*	Active observation	None	

Site	General Habitat Description	Koala trees present	Survey type	Koala evidence?	Representative photographs
FA25 -21.836931 148.167653	**Vegetation:** Eucalypt woodland **Substrate:** Loam Sand (land zone 5) **Water Bodies:** Minor sandy drainage line **Connectivity:** Well connected to surrounding patches of remnant habitat. **Disturbance(s):** Some disturbance due to grazing and road/fence infrastructure.	*Eucalyptus crebra*	Active observation	None	
FA26 -21.838838 148.170806	**Vegetation:** Eucalypt woodland/Acacia woodland ecotone **Substrate:** Silty Loam (land zone 7) **Water Bodies:** Creek **Connectivity:** Well connected to surrounding patches of remnant habitat. **Disturbance(s):** Some disturbance due to grazing and road/fence infrastructure.	*Eucalyptus crebra*	Active observation	None	

Site	General Habitat Description	Koala trees present	Survey type	Koala evidence?	Representative photographs
FA27 -21.846984 148.184843	**Vegetation:** Non-remnant **Substrate:** Ironstone jump-up (land zone 7) **Water Bodies:** n/a **Connectivity:** Adjacent to large patch of remnant habitat. **Disturbance(s):** Disturbance due to grazing and road/fence infrastructure.	None	Active observation	None	
FA28 -21.855269 148.195437	**Vegetation:** Riparian woodland (non-remnant) **Substrate:** Sandy Loam (land zone 3) **Water Bodies:** Minor sandy drainage line, with small farm dam nearby. **Connectivity:** Very limited – thin strip of riparian woodland in cleared landscape. **Disturbance(s):** Extensive disturbance due to grazing, stock watering point and road/fence infrastructure.	*Eucalyptus tereticornis* *Eucalyptus populnea*	Active observation	None	

Site	General Habitat Description	Koala trees present	Survey type	Koala evidence?	Representative photographs
FA29 -21.862941 148.207717	**Vegetation:** Riparian woodland (non-remnant) **Substrate:** Sandy Loam (land zone 3) **Water Bodies:** Minor sandy drainage line. **Connectivity:** Very limited – thin strip of riparian woodland in cleared landscape. **Disturbance(s):** Extensive disturbance due to grazing, stock watering point and road/fence infrastructure.	*Eucalyptus populnea*	Active observation	None	
FA30 -21.873287 148.223822	**Vegetation:** Brigalow regrowth (non-remnant) **Substrate:** Loamy clay with surface rocks (land zone 3) **Water Bodies:** Minor sandy drainage line. **Connectivity:** Very limited – thin strip of riparian woodland in cleared landscape. **Disturbance(s):** Extensive disturbance due to grazing, stock watering point and road/fence infrastructure.	None	Active observation	None