Potential impacts	Assessment of impacts	Mitigation Hierarchy
Degradation of adjacent vegetated areas. Risk of spreading of weeds and dieback.	**Edge effects and Indirect Impacts** The development envelope lies within a highly altered urban landscape, with adjacent areas of vegetation already impacted by existing land use. One Bush Forever site is located adjacent to the Proposal's north-western extent of the development envelope. Bush Forever site 307 (Lightning Swamp and adjacent bushland, Noranda) covers an area of approximately 72.6 ha and is of the landform element of Bassendean Dunes. According to the National groundwater dependent ecosystem (GDE) atlas managed by the Bureau of Meteorology (BoM 2019), there are no known terrestrial or subterranean GDEs within the development envelope. An area of vegetation located immediately adjacent to the development envelope, east of Tonkin Highway between Reid Highway and Hepburn Avenue, has been previously mapped as being representative of 'Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region' Priority 3 PEC, with a portion meeting the criteria for the Banksia Woodlands of the Swan Coastal Plain TEC. This area may potentially be associated with local groundwater levels. As a precautionary approach PTA will treat this area of mapped PEC as a potential GDE for this Proposal, and will manage construction to not impact directly or indirectly on this area. The Proposal is unlikely to have direct or indirect impacts on the condition of vegetation outside the development envelope. Potential impacts of construction, such as dust, erosion, vegetation damage through human access and waste, can be adequately managed through the construction phase of the Proposal. **Dieback** The development envelope is likely to be described as "Unmappable" for Phytophthora dieback, due to the historic ground disturbance within the area. It is likely that dieback is present within the site, even if it is not detectable through dieback mapping due to the highly modified nature of the vegetation and lack of indicator species or protectable vegetation. Although no mapped occurrence has been made within the development envelope, a precautionary approach has been made to determine that there is a risk of spreading Dieback to adjacent areas of vegetation if not adequately managed. **Weeds** No Weeds of National Significance have been mapped within the development envelope. One species identified, *Zantedeschia aethiopica* is listed as Declared Pest and assigned a C3 (management) status under the *Biosecurity and Agriculture Management Act 2007* (BAM Act). The Proposal area has been heavily disturbed by urban development and road construction. It is possible that Declared Pest plants are or will be present within the Proposal area due to the close proximity to heavily modified areas and major road arteries.	**Avoid:** • Rail infrastructure will be within existing road reserve. • PTA will utilise cleared areas for laydown and temporary construction where practicable. • No dewatering or abstraction within the development envelope between Reid Highway and Hepburn Avenue, so as to avoid potential impacts to the adjacent vegetation. **Minimise:** A CEMP will be developed which will include the following measures to mitigate impacts to vegetation: • Provision of coordinates for clearing extents. • Clearing protocols including clear demarcation of clearing boundaries. • In field demarcation of clearing extents. • In field demarcation of Vegetation Retention Areas. • Weed and pathogen hygiene management. • Environmental inductions for all site staff and sub-contractors. • Access control measures to restrict access to environmentally sensitive areas. • Waste management protocols including regular inspections. • Procedures to manage risk of causing fire during construction. • Erosion and sedimentation control. • Dust prevention and control measures. • Plan for site access, wash down areas, parking areas, drainage and fencing. **Rehabilitate** As this Proposal is for the construction and operation of permanent linear rail infrastructure, there are limited opportunities for rehabilitation. The operational railway corridor will be managed by the PTA in perpetuity, in accordance with the PTA's Urban Rail Reserve Vegetation Management Plan (PTA 2016). Where practicable, landscaping around train stations will use local native species. The PTA will reinstate construction laydown areas commensurate with pre-construction conditions.

METRONET | Bayswater to Malaga Rail Works
Figure 9A **Vegetation Retention Areas**

Public Transport Authority

Legend

- Development Envelope (The Proposal)
- Proposed Railway Line

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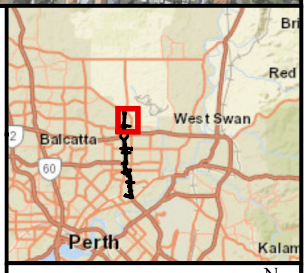

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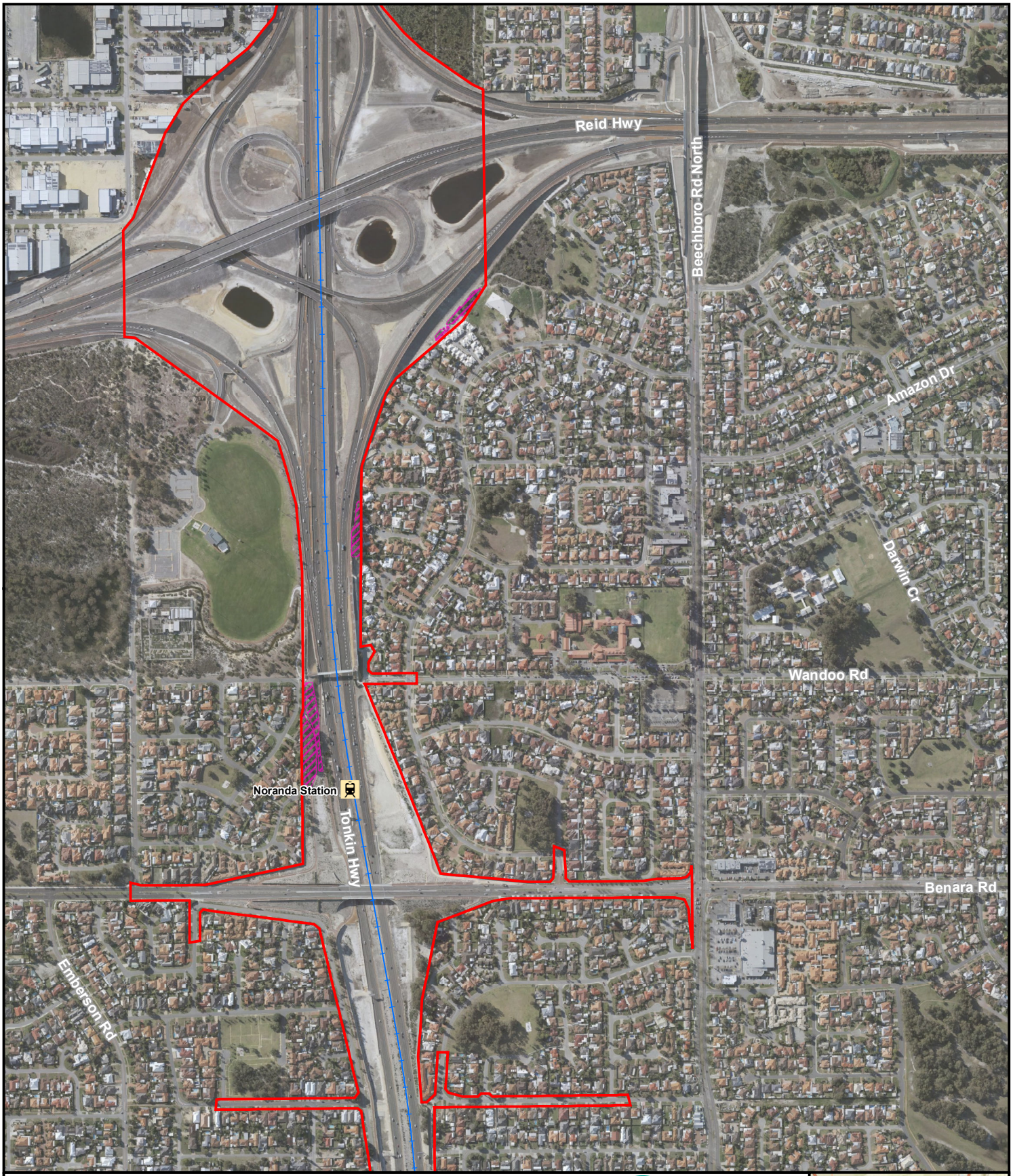

METRONET | Bayswater to Malaga Rail Works
Figure 9B **Vegetation Retention Areas**

Public Transport Authority

Legend

- Development Envelope (The Proposal)
- Vegetation Retention
- Proposed Railway Station
- Proposed Railway Line

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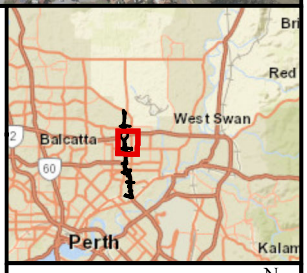

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METRONET | Bayswater to Malaga Rail Works
Figure 9C **Vegetation Retention Areas**

Public Transport Authority

Legend

- Development Envelope (The Proposal)
- Vegetation Retention Area
- Proposed Railway Station
- Proposed Railway Line

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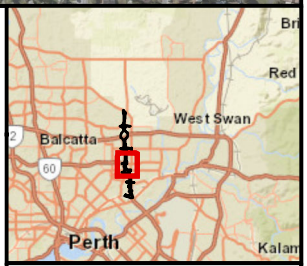

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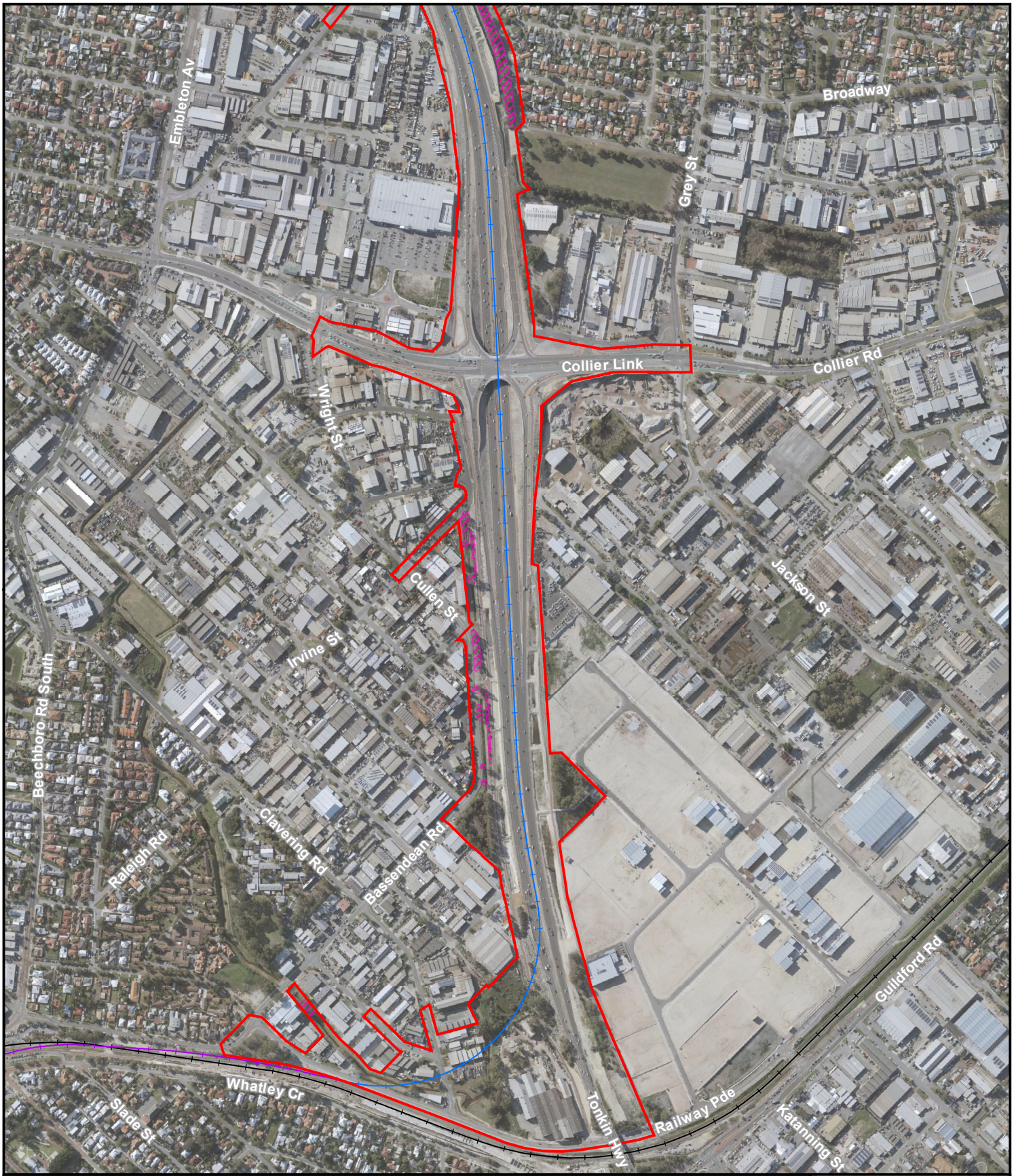

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Figure 9D **Vegetation Retention Areas**

Public Transport Authority

Legend

- Development Envelope (The Proposal)
- Existing Railway Line
- Proposed Railway Alignment within Existing Rail Reserve
- Proposed Railway Line
- Vegetation Retention Area

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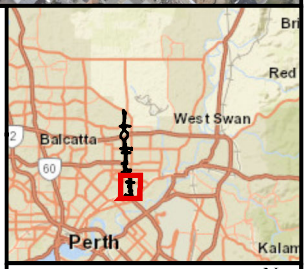

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5.6 Predicted outcome

The PTA has applied the mitigation hierarchy to avoid and minimise native vegetation clearing. The Proposal's development envelope is predominantly cleared of native vegetation and is highly disturbed by permanent roads and associated infrastructure.

The Proposal will result in the clearing of up to 0.66 ha of vegetation of Degraded or better condition.

No conservation significant flora species listed under the EPBC Act or BC Act occur within the development envelope. No Priority flora species recognised by DBCA occur within the development envelope.

The PTA considers that due to the highly disturbed development envelope and surrounding environment, and the degraded condition of the remaining vegetation that the proposed clearing is not significant. A small amount of clearing (up to 0.5 ha) of 'Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region' Priority 3 PEC in Very Good (0.13 ha), Degraded (0.07 ha) or Completely Degraded (0.30 ha) condition is required for the Proposal, however the implementation of management through the CEMP will ensure no impacts to areas of PEC adjacent to the development envelope.

An area of vegetation located immediately adjacent to the development envelope, east of Tonkin Highway between Reid Highway and Hepburn Avenue, has been previously mapped as being representative of 'Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region' Priority 3 PEC, with a portion meeting the criteria for the Banksia Woodlands of the Swan Coastal Plain TEC. This area may potentially be associated with local groundwater levels. As a precautionary approach PTA will treat this area of mapped PEC as a potential GDE for this Proposal, and will manage construction to not impact directly or indirectly on this area.

The Proposal is unlikely to have direct or indirect impacts on the condition of vegetation outside the development envelope. Potential impacts of construction, such as dust, erosion, vegetation damage through human access and waste, can be adequately managed through the construction phase of the Proposal.

The PTA believes that through the described mitigation and management measures (Table 12) and the implementation of the CEMP that this environmental value can be appropriately managed during the construction and operation of the Proposal, and that the EPA's objective for flora and vegetation will be met.

6. Terrestrial Fauna

6.1 EPA Objective

To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.

6.2 Policy and guidance

- Biodiversity Conservation Act 2016 (WA).
- Environmental Factor Guideline: Terrestrial Fauna (EPA 2016c).
- Technical Guidance: Sampling Methods for Terrestrial Vertebrate Fauna (EPA 2016e).
- Technical Guidance: Terrestrial Fauna Surveys (EPA 2016h).
- Technical Guidance: Sampling of short range endemic invertebrate fauna (EPA 2016f).
- Technical Guidance: Carnaby's Cockatoo in Environmental Impact Assessment in the Perth and Peel Region (EPA 2019).
- EPBC Act Referral Guidelines for three threatened Black Cockatoo species: Carnaby's cockatoo (endangered) *Calyptorhynchus latirostris*, Baudin's cockatoo (vulnerable) *Calyptorhynchus baudinii*, and Forest red-tailed Black Cockatoo (vulnerable) *Calyptorhynchus banksii naso* (DSEWPAC 2012).

6.3 Environmental Investigation

Table 14 lists the relevant environmental investigations used to assess the terrestrial fauna factor within the development envelope (Figure 10 and Figure 11).

Table 14: Summary of the Environmental Investigations relevant to terrestrial fauna

Title	Author	Year	Summary of Scope	Project
Morley-Ellenbrook Line Stage 1 – Vegetation and Black Cockatoo Habitat Assessment for the provided survey area (GHD 2019)	GHD	2019	A vegetation and Black Cockatoo habitat assessment for areas within the development envelope which had not been covered by previous surveys. The scope included description and mapping of the vegetation types and condition, and undertake a Black Cockatoo habitat assessment for the survey area,	Morley-Ellenbrook Line (PTA)
NorthLink WA Level 2 Targeted Fauna Assessment Perth-Darwin National Highway	Coffey	2015	Level 2 fauna assessment to identify and assess ecological values and significance, including fauna movement survey and a Black Cockatoo habitat assessment	PDNH (Main Roads)
Public Transport Authority Forrestfield Airport Link Environmental investigation	GHD	2014	Environmental investigation conducted for the Forrestfield Airport Link (FAL) and associated infrastructure. The scope included a desktop assessment and a two day Level 1 field survey to identify flora, vegetation and fauna constraints.	Forrestfield Airport Link (FAL)
Black-Cockatoo Assessment – Tonkin Highway	360 Environmental	2013	Black Cockatoo Habitat Assessment of foraging and breeding habitat.	Tonkin Grade Separation (Main Roads)

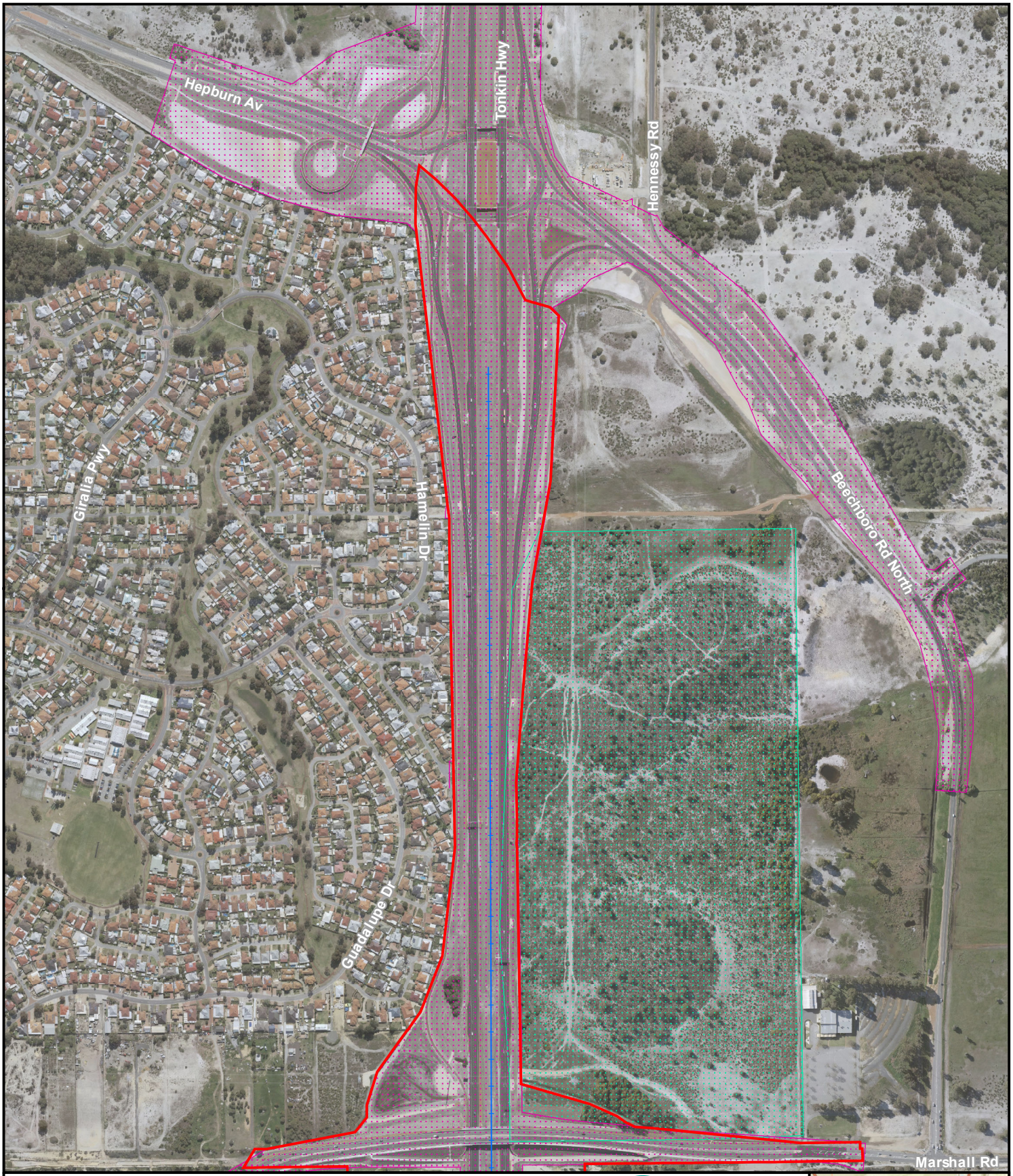

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Figure 10A **Terrestrial Fauna Survey Type and Coverage**

Public Transport Authority

Legend

- Development Envelope (The Proposal)
- Proposed Railway Line

Survey

- Level 2 Targeted Fauna Assessment (Coffey 2015)
- Level 1 Fauna assessment (Terrestrial Ecosystems 2018)

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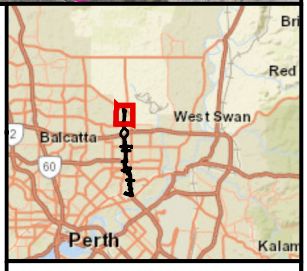

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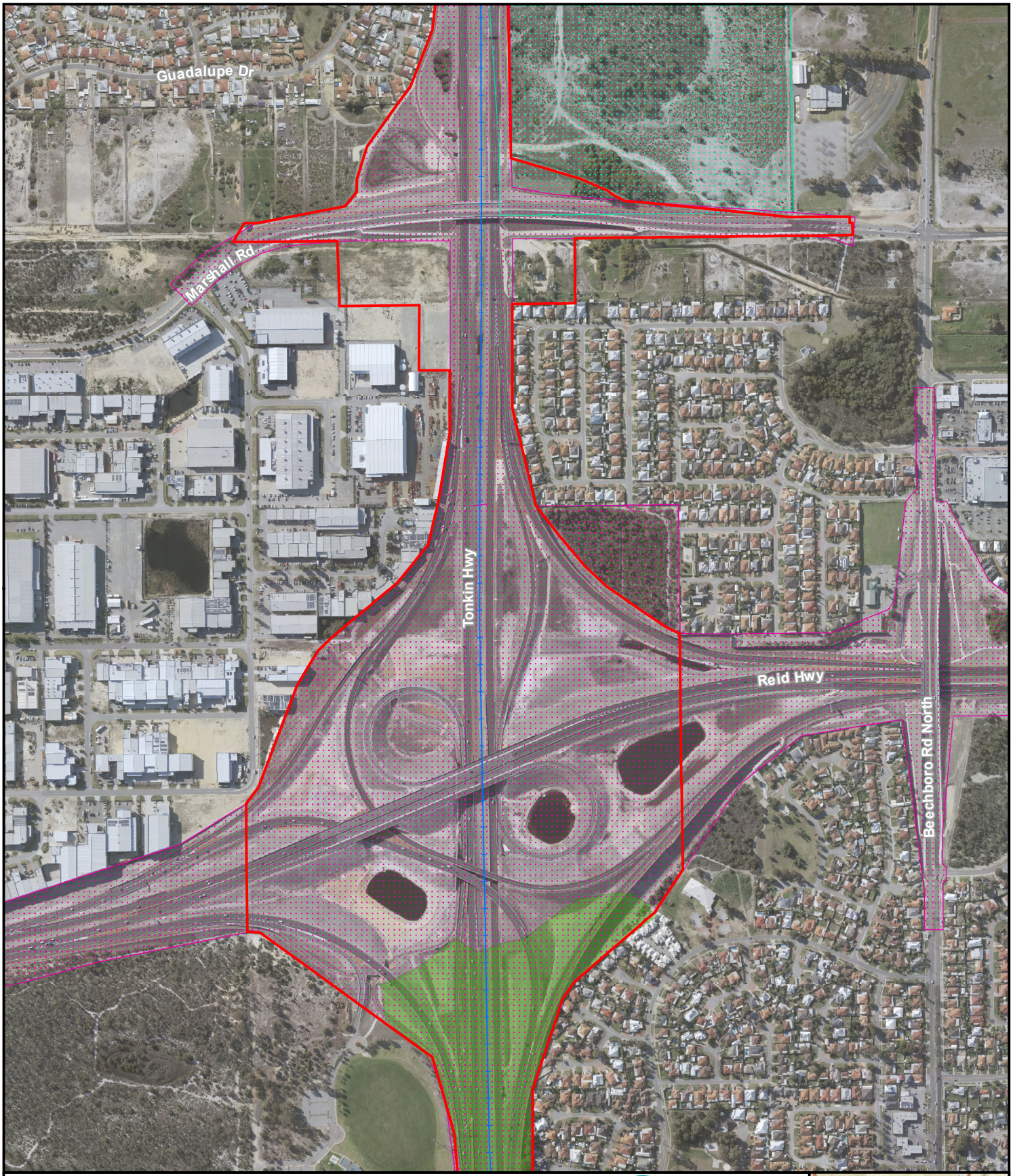

METRONET | Bayswater to Malaga Rail Works
Figure 10B **Terrestrial Fauna Survey Type and Coverage**

Public Transport Authority

Legend

- Development Envelope (The Proposal)
- Proposed Railway Line

Survey

- Level 2 Targeted Fauna Assessment (Coffey 2015)
- Level 1 Fauna assessment (Terrestrial Ecosystems 2018)
- Level 1 Flora, Vegetation and Fauna Survey (360 Environmental 2014)

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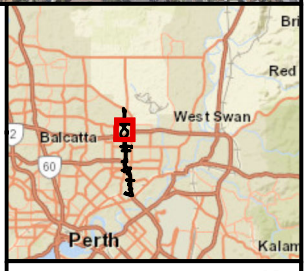

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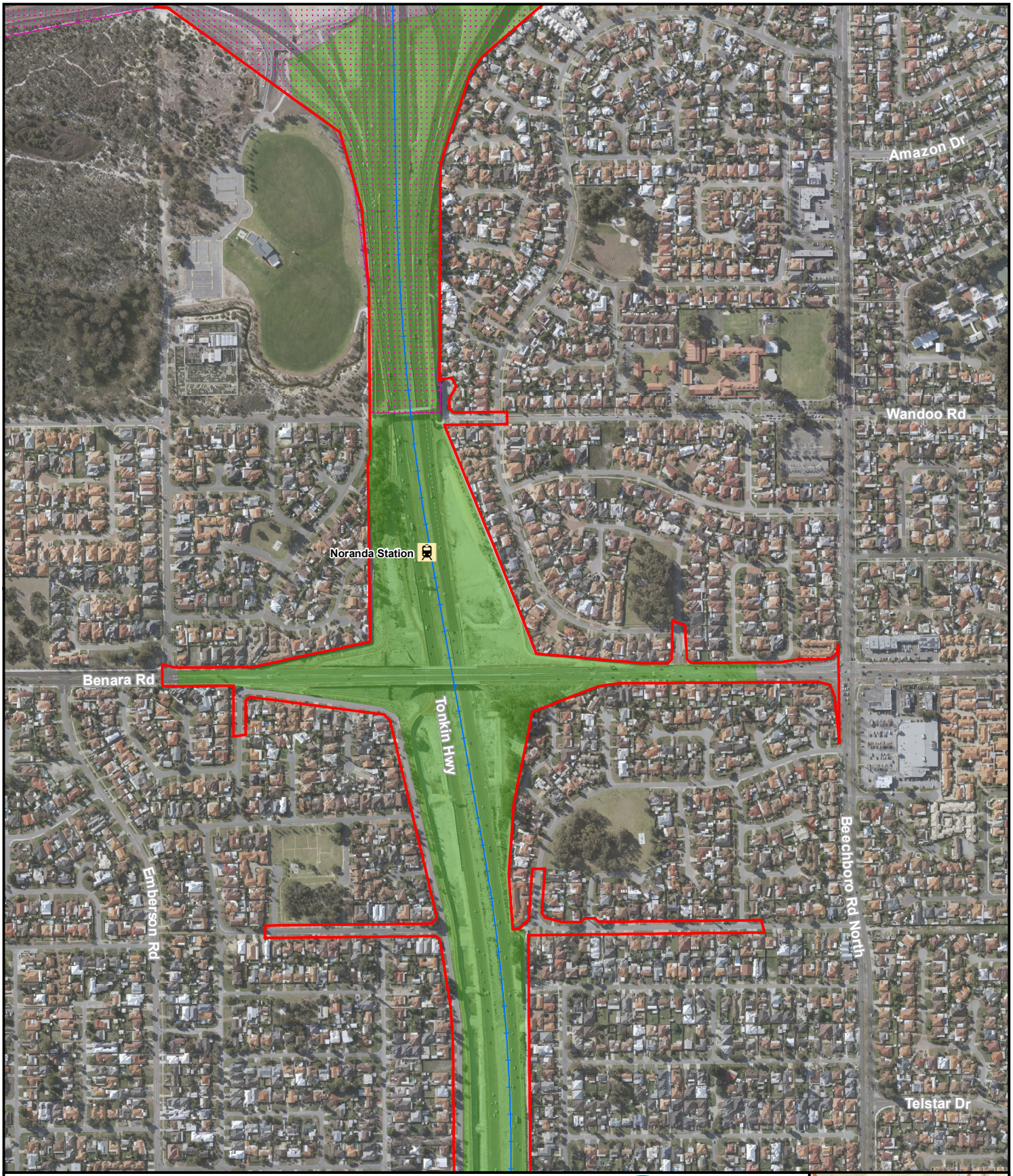

METRONET | Bayswater to Malaga Rail Works

Figure 10C **Terrestrial Fauna Survey Type and Coverage**

Public Transport Authority

Legend

- Development Envelope (The Proposal)
- Proposed Railway Station
- Proposed Railway Line

Survey

- Level 2 Targeted Fauna Assessment (Coffey 2015)
- Level 1 Flora, Vegetation and Fauna Survey (360 Environmental 2014)

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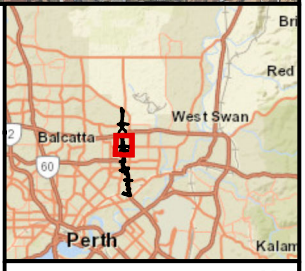

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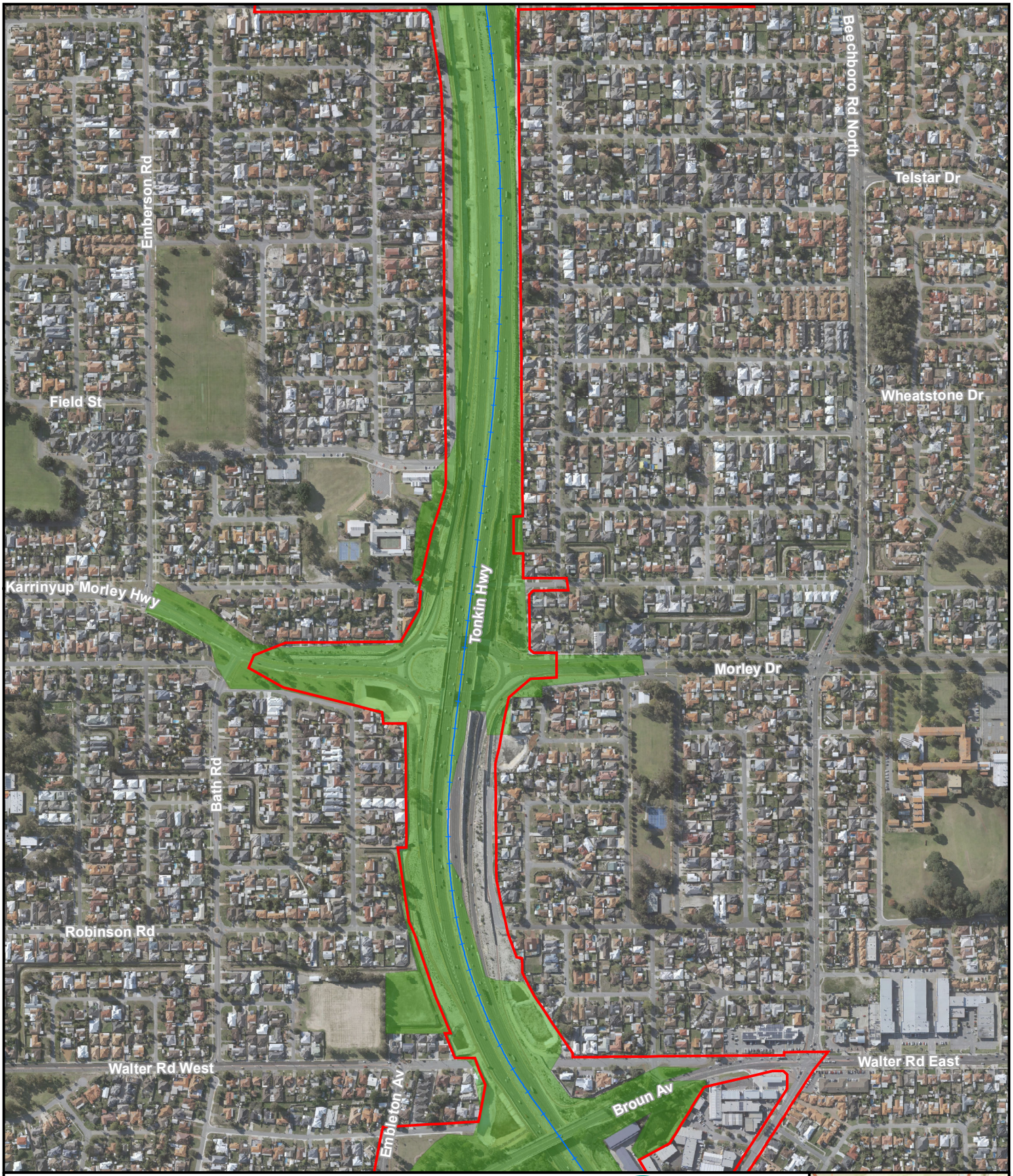

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Figure 10D **Terrestrial Fauna Survey Type and Coverage**

Public Transport Authority

Legend

- Development Envelope (The Proposal)
- Proposed Railway Line

Survey

- Level 1 Flora, Vegetation and Fauna Survey (360 Environmental 2014)

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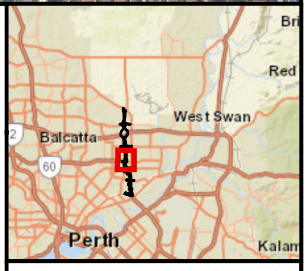

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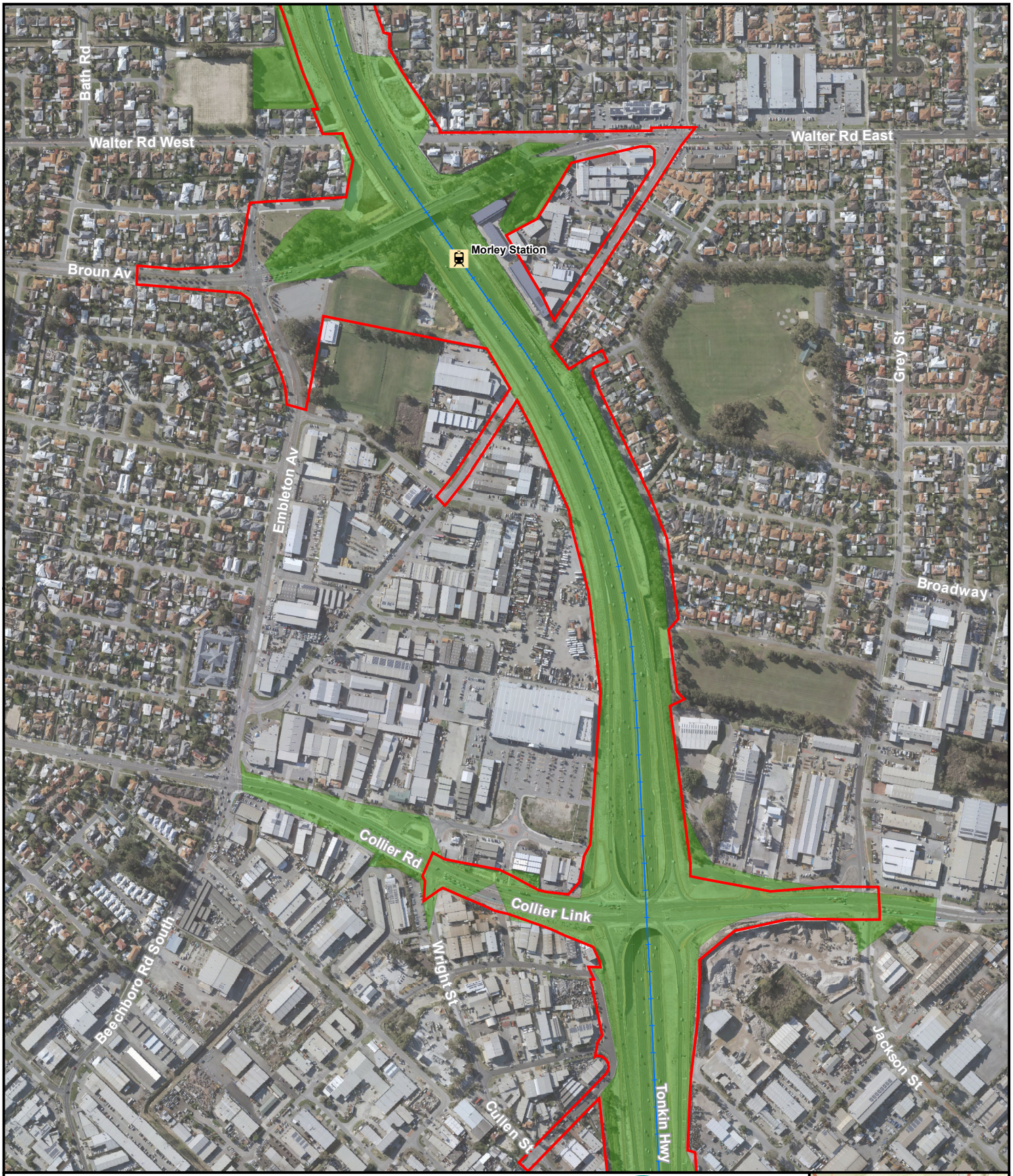

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Figure 10E **Terrestrial Fauna Survey Type and Coverage**

Public Transport Authority

Legend

- Development Envelope (The Proposal)
- Proposed Railway Station
- Proposed Railway Line

Survey

- Level 1 Flora, Vegetation and Fauna Survey (360 Environmental 2014)

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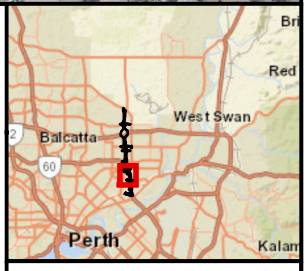

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METRONET | Bayswater to Malaga Rail Works

Figure 10F **Terrestrial Fauna Survey Type and Coverage**

Public Transport Authority

Legend

- Development Envelope (The Proposal)
- Existing Railway Line
- Proposed Railway Alignment within Existing Rail Reserve
- Proposed Railway Line

Survey

- Level 1 Fauna Assessment (GHD 2014)
- Level 1 Flora, Vegetation and Fauna Survey (360 Environmental 2014)

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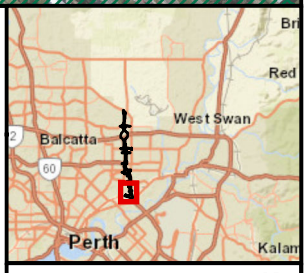

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6.4 Receiving environment

6.4.1 Fauna habitats

Given the extensive prior disturbance and development within and in the vicinity of the development envelope, the majority of fauna habitats consist of small linear patches along the edge of the highly disturbed and modified Tonkin Highway road reserve. The quality and value of this remnant habitat to native fauna has been historically impacted due to pressure from road infrastructure and surrounding development.

Five broad fauna habitats have been mapped within the development envelope as presented within Table 15 (Coffey 2015b; 360 Environmental 2014a). The mapped fauna habitat comprises approximately 2.63 ha of the development envelope and may provide limited value to terrestrial fauna, mainly birds and reptiles.

The fauna habitats within the development envelope are mostly degraded and have a high level of disturbance from weeds, introduced animals, rubbish and existing infrastructure such as roads, railway lines and powerlines (360 Environmental 2014a).

Of the five habitats, the Scattered Trees/Shrubs, Eucalyptus/Banksia woodland, and Shrubland habitats are of higher value for fauna as they provide suitable potential foraging and/or potential breeding habitat for Black Cockatoos (refer to Section 6.4.3).

Table 15: Fauna habitats within development envelope

Fauna habitat type*	Fauna habitat description
Dampland	This habitat consists of vegetation associated with wetter areas. Typical vegetation includes *Melaleuca preissiana*, *Kunzea glabrescens* and *Hypocalymma angustifolium* over weeds.
Eucalyptus / Banksia woodland	The Eucalypts and Banksia woodland includes *E. marginata, E. todtiana* and *C. calophylla* woodland over Banksia spp. low woodland over *Adenanthos cygnorum* and *Xanthorrhoea preissii* shrublands over *Hibbertia* spp. scattered low shrubs to low open shrubland. May provide value to fauna, particularly Black Cockatoos.
Scattered trees / shrubs	This habitat includes non-native Eucalyptus species and natives such as *Eucalyptus marginata* (Jarrah), *Corymbia calophylla* (Marri), *Banksia* spp., *Melaleuca* spp. and *Acacia* spp. over weeds. This habitat type generally comprises degraded vegetation and isolated trees or shrubs. Despite it being degraded it may provide value to fauna, particularly for Black Cockatoos.
Shrubland	The shrubland habitat consists of a mixture of natural and non-endemic species including *Kunzea glabrescens*, *Acacia* spp., *A. cygnorum*, *Chamelaucium uncinatum*, *Melaleuca huegelii* and *M. nesophila* over weeds. Occasional non-endemic Eucalypt species are also present. Provides value to fauna, particularly Black Cockatoos.

*Data sourced from Coffey (2015b) and 360 Environmental (2014a).

6.4.2 Species diversity

Surveys conducted by 360 Environmental (2014a), GHD 2014) and Coffey (2015b), prior to clearing for the PDNH and Tonkin Highway upgrade, recorded a total of 24 native vertebrate fauna species including three reptiles, one mammal and 20 birds within the development envelope. Three introduced fauna species were also recorded within the development envelope.

The fauna recorded during these surveys are generally common and widespread throughout the region and are not dependent upon the fauna habitats present within the development envelope (360 Environmental 2014a).

6.4.3 Conservation significant fauna

Two conservation significant fauna species have previously been recorded within the development envelope:

- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) – listed as Vulnerable under the BC Act & EPBC Act; and
- Southern Brown Bandicoot (*Isoodon fusciventer*) – listed as Priority 4 by DBCA.

In addition to these two species, the Carnaby's Cockatoo (*Calyptorhynchus latirostris*), listed as Endangered under the BC Act, has previously been recorded in proximity to the development envelope (Coffey 2015b and GHD 2014).

Southern Brown Bandicoot

As a result of the extensive clearing of the development envelope completed for previous infrastructure projects and the existing use as a major highway corridor for Tonkin Highway, sufficient suitable habitat for the Southern Brown Bandicoot is no longer present within the development envelope. While this species was previously recorded, it is now considered unlikely to occur given the lack of suitable habitat.

Black Cockatoos – Potential Foraging Habitat

During the 360 Environmental survey, Forest Red-tailed Black Cockatoos were recorded foraging within introduced Cape lilac trees, centred on the Tonkin Highway road reserve within the development envelope (360 Environmental 2014a). In addition, a record of Carnaby's Cockatoo was previously made within close proximity to the development envelope, as well as observed flying south along Tonkin Highway by GHD (2014). Both species have also been observed flying over the development envelope at various locations during previous surveys (360 Environmental 2014a and GHD 2014).

Potential foraging habitat for Black Cockatoo species is present within the fragmented stands of Eucalyptus/Banksia Woodland, Scattered trees/shrubs and Shrubland habitats within the development envelope. No evidence of foraging was recorded within the development envelope during the 360 Environmental survey (360 Environmental 2014a). Species suitable for foraging include marri, jarrah, coastal blackbutt, river redgum, *Banksia menziesii* and *Banksia attenuata* (360 Environmental 2014a).

There is approximately 4.8 ha of Black Cockatoo foraging habitat remaining within the development envelope, comprising 0.6 ha of high value, 2.9 ha of moderate value and 1.31 ha of low value foraging habitat. The foraging habitat present within the development envelope predominantly occurs within small linear patches and is located within a highly developed urban landscape, with the immediate surrounds cleared for major infrastructure projects. The lack of consolidated intact native vegetation and proximity to a major highway is likely to reduce the value of the potential foraging habitat for the Black Cockatoo species.

Feeding evidence was observed under one *Corymbia calophylla* tree, with no other evidence of foraging in the form of chewed banksia cones or marri nuts observed within the remainder of the development envelope (360 Environmental 2014a, Coffey 2015b and (GHD 2019). It is unlikely that Carnaby's Cockatoo or the Forest Red-tailed Black Cockatoo relies on the potential foraging habitats in the development envelope for its survival (360 Environmental 2014a, Coffey 2015b and GHD 2014).

Black Cockatoos – Potential Breeding Trees

Potential Black Cockatoo breeding trees are those that have a diameter at breast height of at least 500 mm as they have the potential to develop hollows suitable for nesting Black Cockatoos in the future (DSEWPaC 2012). A total of 93 potential Black Cockatoo breeding trees remain within the development envelope, comprising 45 *Corymbia calophylla* (marri), 9 *Eucalyptus gomphocephala* (tuart), 22 *Eucalyptus camaldulensis* (red gum) and 5 *Eucalyptus rudis* (flooded gum) and 12 unidentified species (Figure 12; 360 Environmental 2014a and GHD 2019).

None of the 93 potential Black Cockatoo breeding trees were found to contain hollows suitable for nesting Black Cockatoos (360 Environmental 2014a; GHD 2019). Three (3) of the potential breeding trees within the development envelope contain one or more small hollows, including a dead stag *Corymbia calophylla*. Four (4) of the potential breeding trees contain artificial nest boxes, one of which has been occupied by bees and is not suitable for use by Black Cockatoos (GHD 2019).

No records of Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo breeding have been made within the development envelope. No indirect evidence of breeding (i.e. chew marks around hollows, feathers or droppings) has been observed (360 Environmental 2014a, GHD 2014). The potential Black Cockatoo breeding trees are not located within consolidated intact native vegetation and are in proximity to a major highway, which is likely to reduce the value of the potential Black Cockatoo breeding trees to the species.

Black Cockatoos - Roosting

Large trees within the development envelope may provide suitable roosting habitat for Black Cockatoos, however there have been no records of either Carnaby's Cockatoo or Forest Red-tailed Black Cockatoo's roosting within the development envelope. The proximity of these trees to existing major infrastructure reduces the likelihood of use by Black Cockatoo species for roosting.

A desktop search for known roost sites was completed for the surrounding area in 2015 using data from the Great Cocky Count (Coffee 2015). No known roost sites occur in the immediate vicinity of the development envelope. Three major roost site locations have been recorded in the Pine Plantations to the west, in the Gnangara region. All sites are within 10 km of the study area and have between 64 and 542 Carnaby's Cockatoos using these roost locations (Burnham et al., 2010).

Short range endemic invertebrate fauna

The majority of the development envelope has been cleared for other major developments (i.e. Tonkin Highway upgrade and the PDNH), and as such the degraded patches of vegetation are expected to have limited value for short range endemic (SRE) invertebrate fauna (Invertebrate Solutions 2019). On this basis, SREs are considered to have a low probability of occurring due to a lack of suitable habitat.

METRONET | Bayswater to Malaga Rail Works
Figure 11A **Black Cockatoo Survey Coverage**

Public Transport Authority

Legend

- Development Envelope (The Proposal)
- Proposed Railway Line
- Level 2 Targeted Fauna Assessment (Coffey 2015)
- Level 1 Flora, Vegetation and Fauna Survey (GHD 2019)

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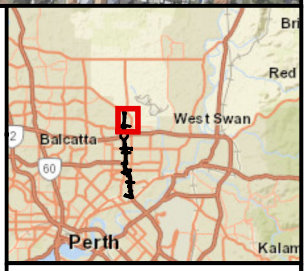

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Created By: S. Rafei/R.McGregor
Approved by: M.Erskine

Scale: 1:10,000 @ A4
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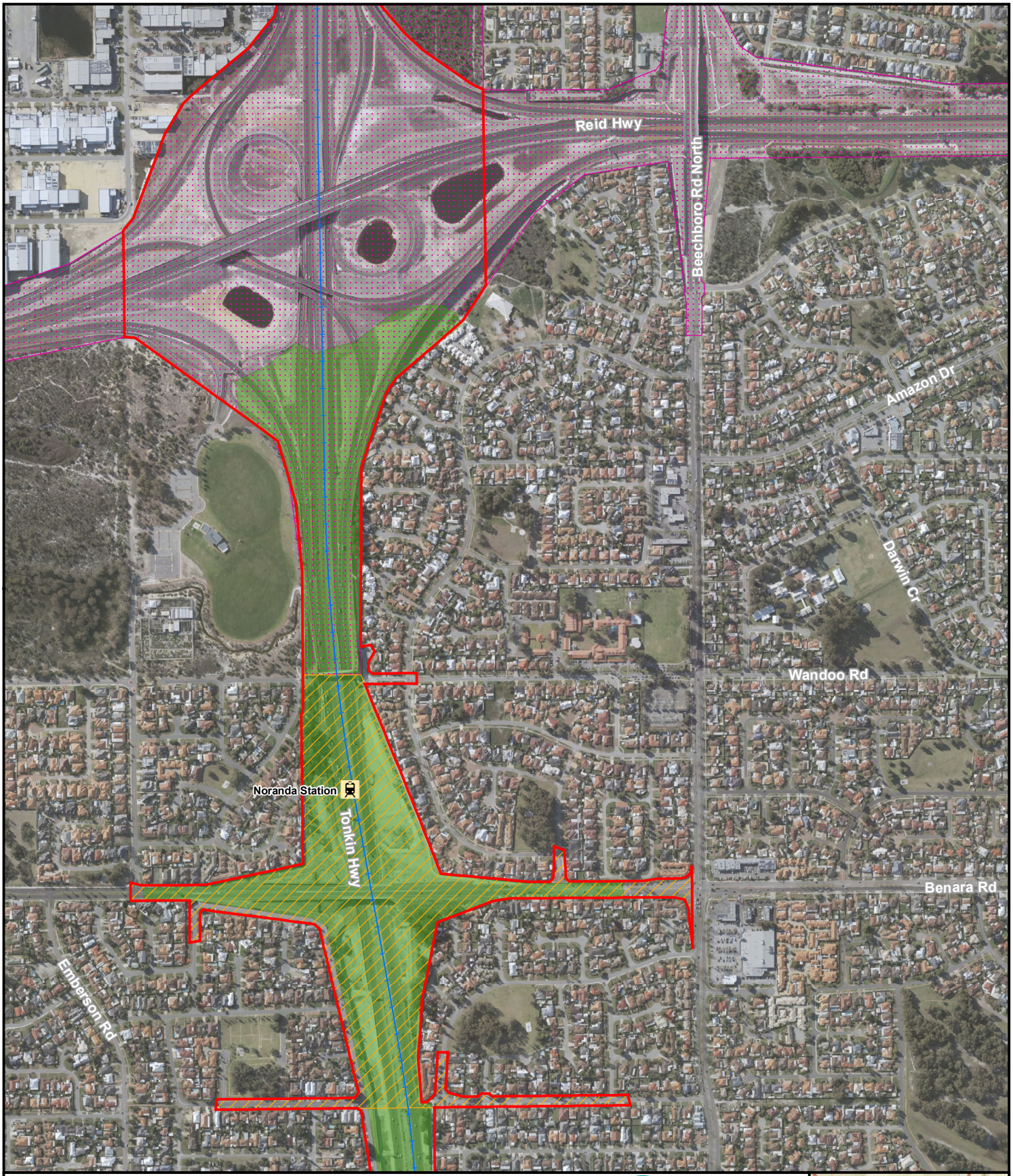

METRONET | Bayswater to Malaga Rail Works
Figure 11B **Black Cockatoo Survey Coverage**

Public Transport Authority

Legend

- Development Envelope (The Proposal)
- Proposed Railway Station
- Proposed Railway Line
- Level 2 Targeted Fauna Assessment (Coffey 2015)
- Level 1 Flora, Vegetation and Fauna Survey (360 Environmental 2014)
- Level 1 Flora, Vegetation and Fauna Survey (GHD 2019)

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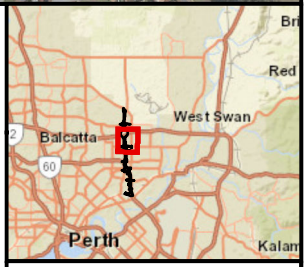

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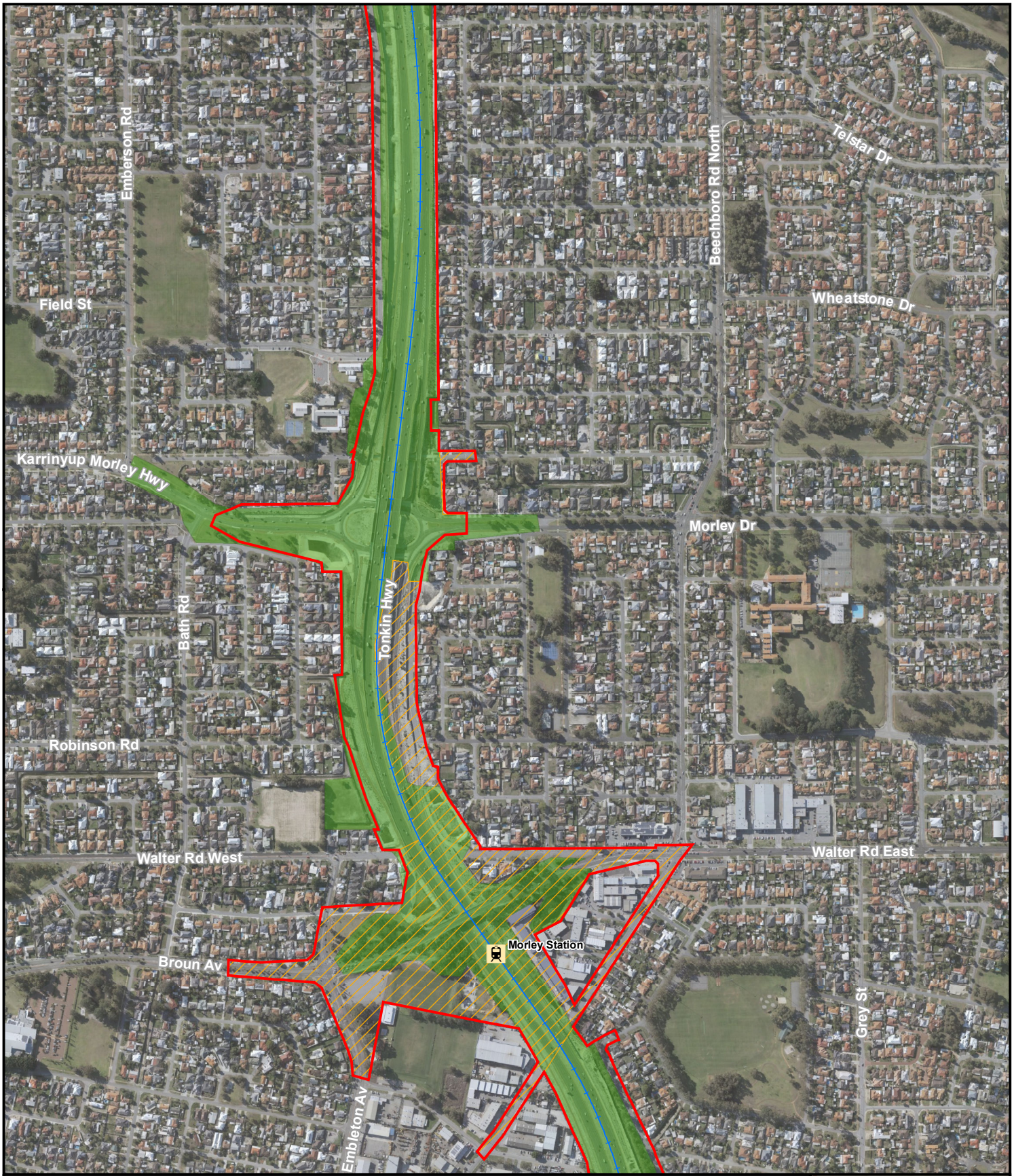

METRONET | Bayswater to Malaga Rail Works
Figure 11C **Black Cockatoo Survey Coverage**

Public Transport Authority

Legend

- Development Envelope (The Proposal)
- Proposed Railway Station
- Proposed Railway Line
- Level 1 Flora, Vegetation and Fauna Survey (360 Environmental 2014)
- Level 1 Flora, Vegetation and Fauna Survey (GHD 2019)

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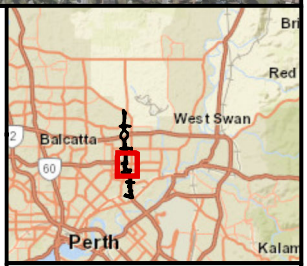

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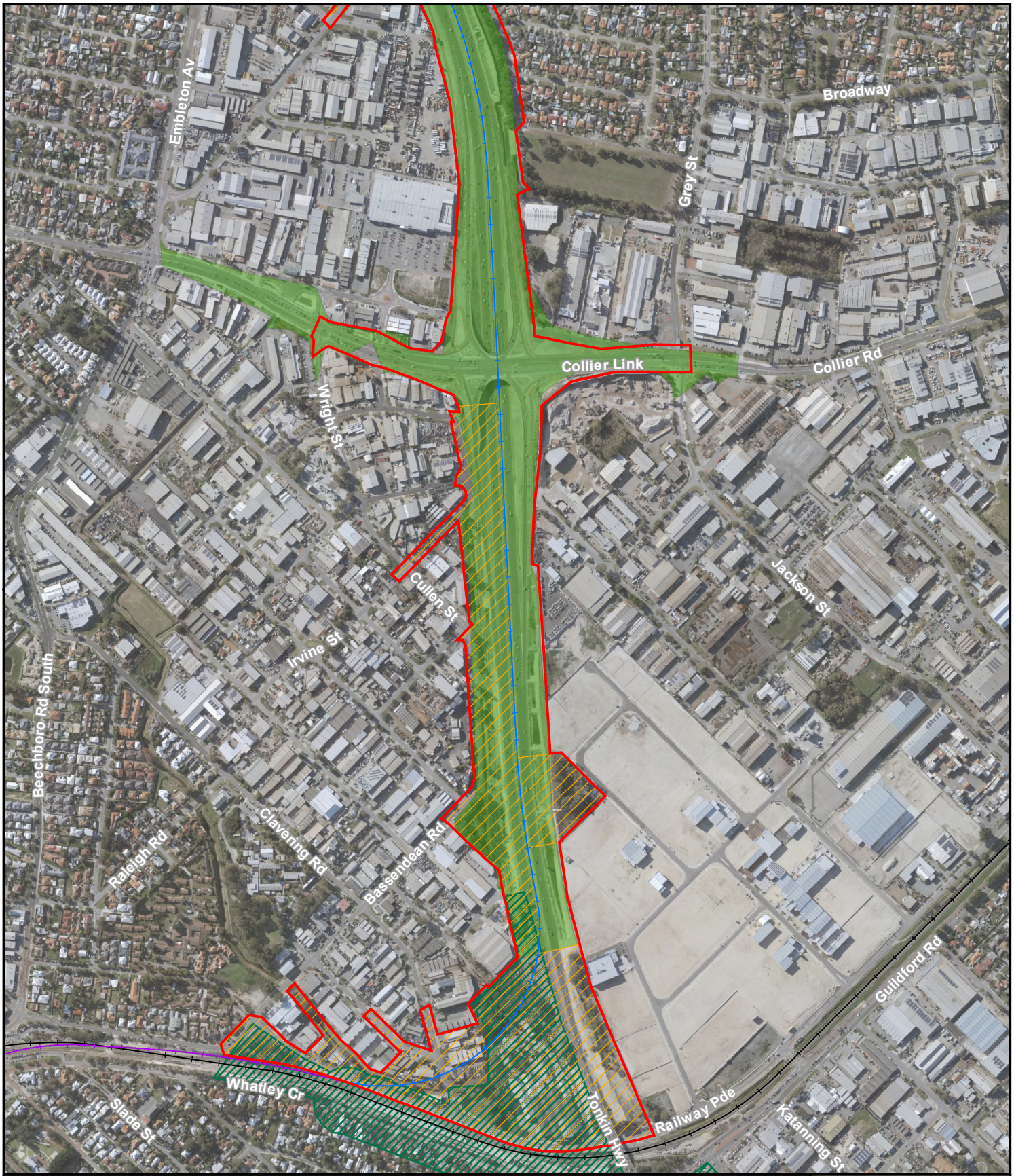

METRONET | Bayswater to Malaga Rail Works

Figure 11D **Black Cockatoo Survey Coverage**

Public Transport Authority

Legend

- Development Envelope (The Proposal)
- Existing Railway Line
- Proposed Railway Alignment within Existing Rail Reserve
- Proposed Railway Line
- Level 1 Fauna Assessment, Forrestfield Airport Link Environmental Investigation (GHD 2014)
- Level 1 Flora, Vegetation and Fauna Survey (360 Environmental 2014)
- Level 1 Flora, Vegetation and Fauna Survey (GHD 2019)

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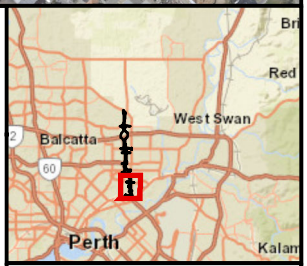

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METRONET | Bayswater to Malaga Rail Works
Figure 12A **Black Cockatoo Habitat**

Public Transport Authority

Legend

- Development Envelope (The Proposal)
- Proposed Railway Line
- Vegetation Boundary

Black Cockatoo Habitat Mapping

- Low value habitat: Contains limited foraging and/or roosting habitat

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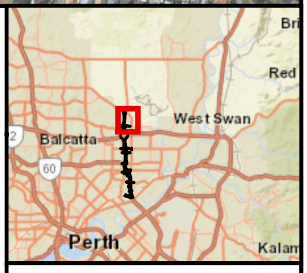

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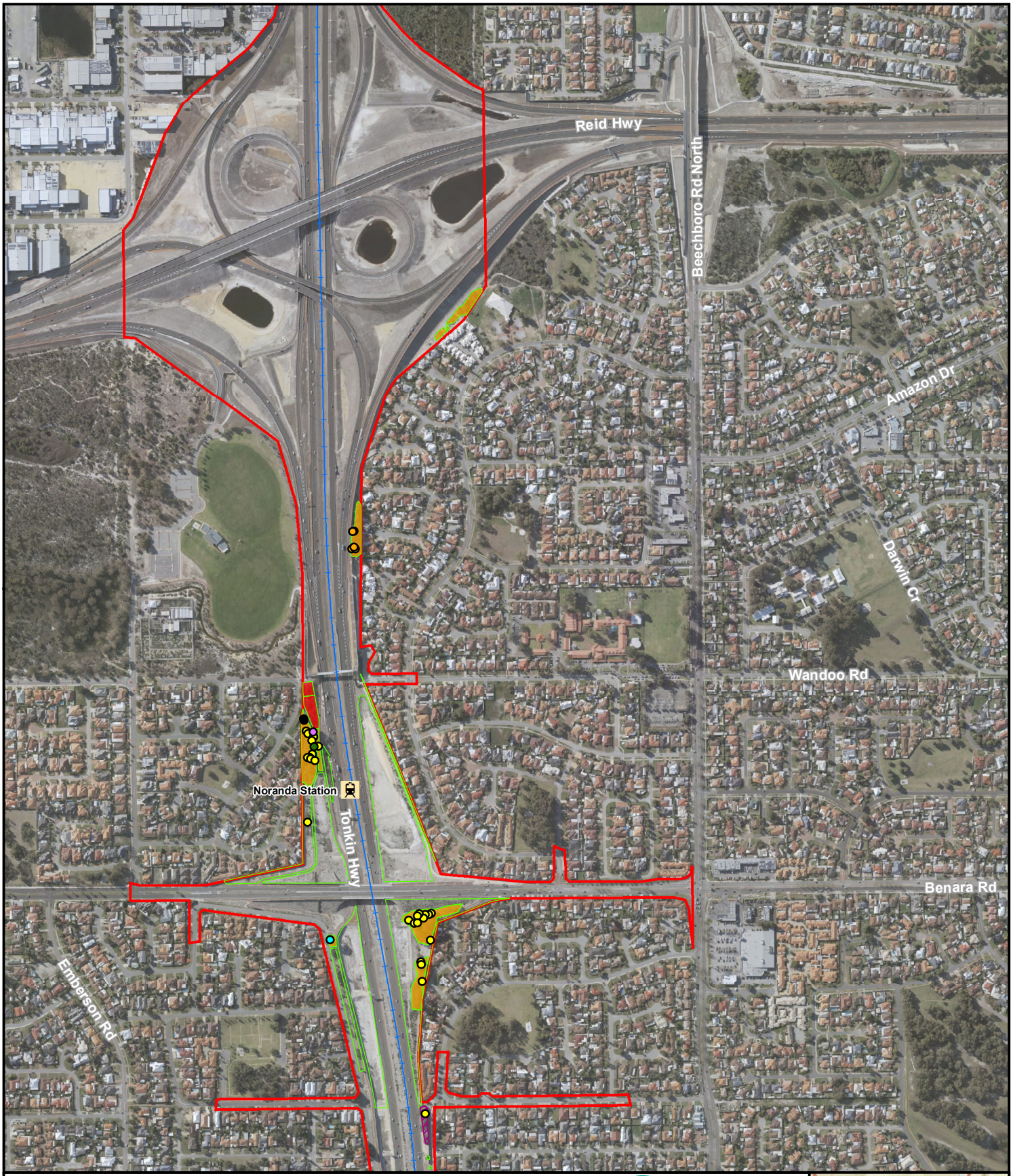

METRONET | Bayswater to Malaga Rail Works
Figure 12B **Black Cockatoo Habitat**

Public Transport Authority

Legend

- Development Envelope (The Proposal)
- Proposed Railway Station
- Proposed Railway Line
- Vegetation Boundary
- Potential Black Cockatoo Foraging Habitat

Black Cockatoo Habitat Mapping

- High value habitat: Contains foraging, roosting and breeding habitat for Black Cockatoos
- Moderate value habitat: Contains quality foraging and/or roosting habitat

Potential Black Cockatoo Breeding Trees

- *Corymbia calophylla (Marri)*
- *Eucalyptus gomphocephala (Tuart)*
- *Eucalyptus rudis*
- *Corymbia calophylla (Marri)* with a small hollow
- *Corymbia calophylla (Marri)* with small hollows
- Dead Stag with small hollows

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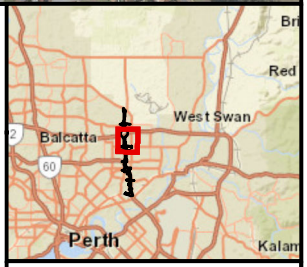

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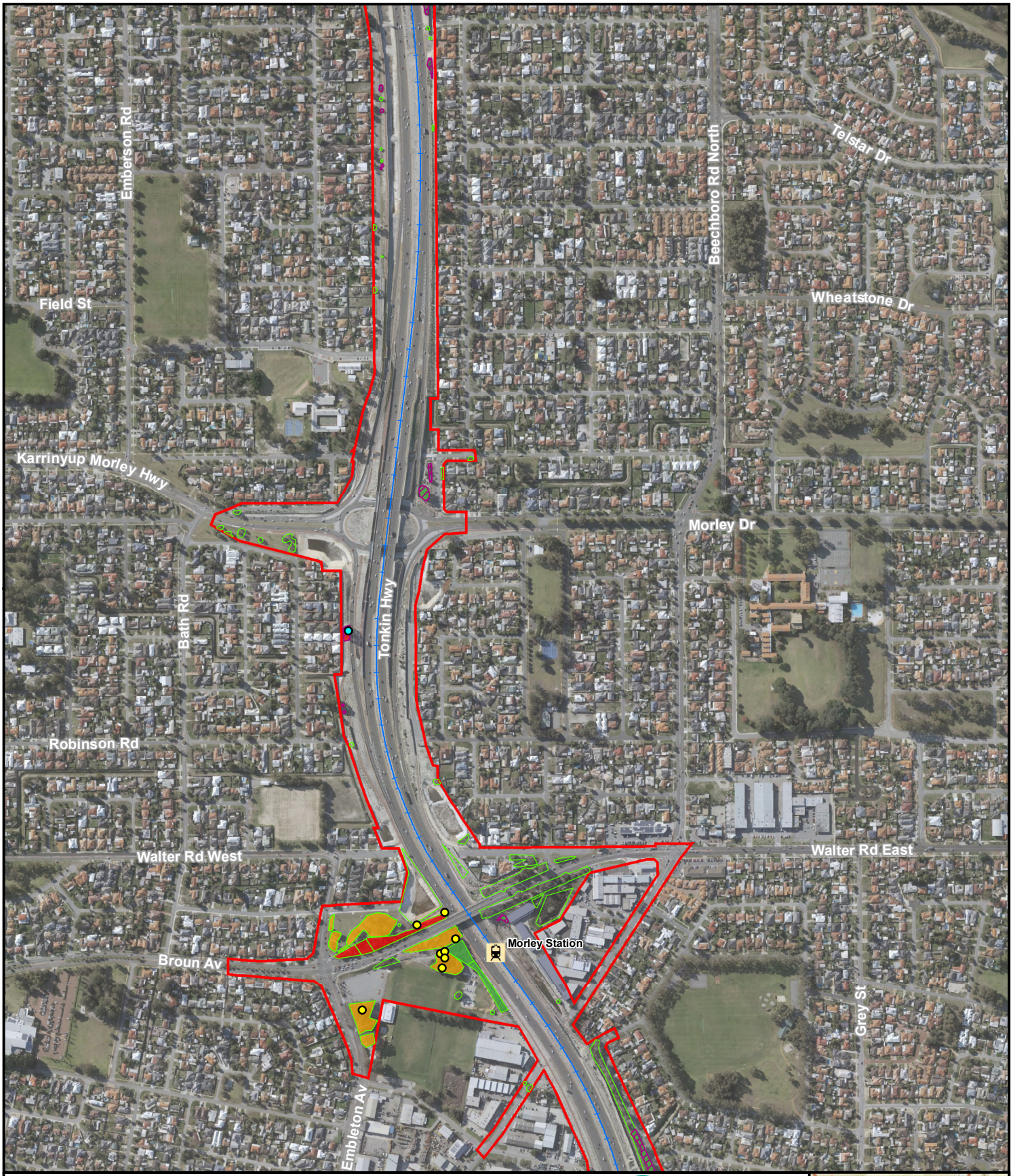

METRONET | Bayswater to Malaga Rail Works
Figure 12C **Black Cockatoo Habitat**

Public Transport Authority

Legend

- Development Envelope (The Proposal)
- Proposed Railway Station
- Proposed Railway Line
- Vegetation Boundary
- Potential Black Cockatoo Foraging Habitat

Black Cockatoo Habitat Mapping

- High value habitat: Contains foraging, roosting and breeding habitat for Black Cockatoos
- Moderate value habitat: Contains quality foraging and/or roosting habitat
- Low value habitat: Contains limited foraging and/or roosting habitat

Potential Black Cockatoo Breeding Trees

- *Corymbia calophylla (Marri)*
- *Eucalyptus gomphocephala (Tuart)*

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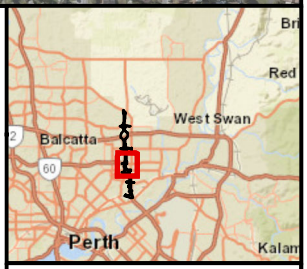

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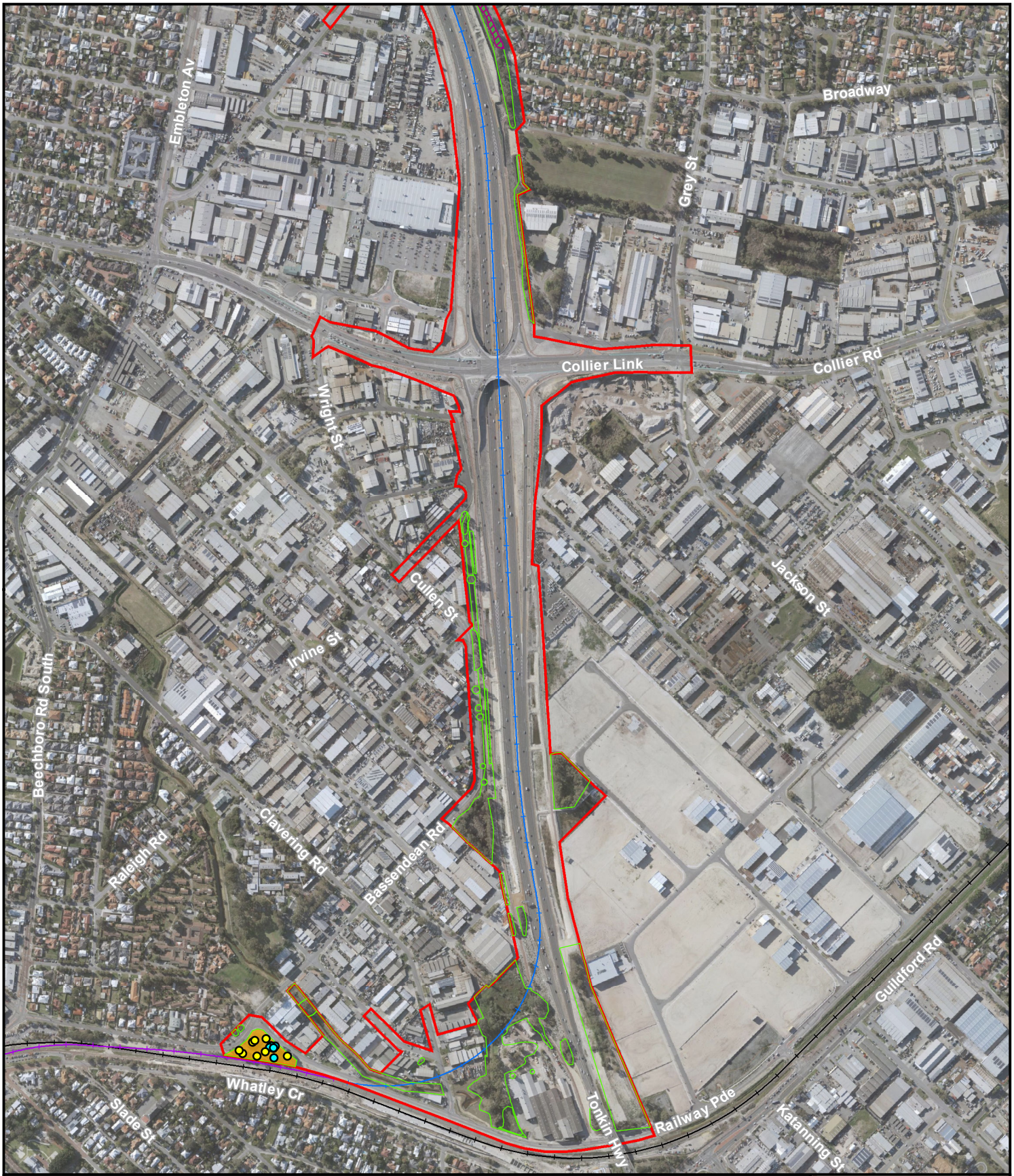

METRONET | Bayswater to Malaga Rail Works
Figure 12D **Black Cockatoo Habitat**

Public Transport Authority

Legend

- Development Envelope (The Proposal)
- Existing Railway Line
- Proposed Railway Alignment within Existing Rail Reserve
- Proposed Railway Line
- Vegetation Boundary
- Potential Black Cockatoo Foraging Habitat

Black Cockatoo Habitat Mapping

- Moderate value habitat: Contains quality foraging and/or roosting habitat
- Low value habitat: Contains limited foraging and/or roosting habitat

Potential Black Cockatoo Breeding Trees

- *Corymbia calophylla (Marri)*
- *Eucalyptus gomphocephala (Tuart)*

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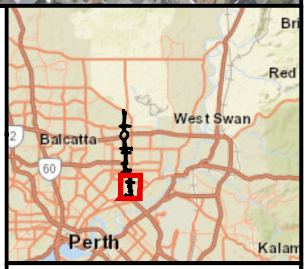

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6.5 Assessment of impacts to Terrestrial Fauna

Table 16 provides an evaluation of the potential impacts that the Proposal may have on terrestrial fauna and the mitigation that the PTA will apply.

Table 16: Assessment of impacts to Terrestrial Fauna

Potential Impact	Assessment of impacts	Mitigation Hierarchy
Clearing of up to 17.8 ha of fauna habitat	The majority of the development envelope has already been cleared for urban development and roads. A few isolated patches of moderate to high value habitat remain in the around the proposed locations for Morley and Noranda stations. The vegetation mapped within the development envelope has not been investigated in terms of general fauna habitat, however this is presumed to contain similar values to the other vegetation mapped within the development envelope. There are five broad fauna habitats mapped within small linear patches along the Tonkin Highway. The vegetation within these habitats is mostly degraded, with a high level of disturbance from weeds, introduced animals, rubbish and infrastructure such as roads, railway lines and powerlines. There are no conservation significant fauna or associated habitats that are likely to occur within the development envelope, excluding Black Cockatoos which are discussed separately. Up to 17.8 ha of fauna habitat may be cleared for the Proposal out of 20.6 ha within the development envelope. Given the degraded and highly disturbed nature of the fauna habitats present, its proximity to a major highway and adjacent development, impacts to fauna are expected to be minimal.	**Avoid:** • Approximately 2.83 ha of fauna habitat will be retained within the Vegetation Retention Areas. • Rail infrastructure will be within existing road reserve. • PTA will utilise cleared areas for laydown and temporary construction where practicable. • The PTA is committed to further investigate avoiding areas of vegetation where practicable. **Minimise:** Within the Proposal's development envelope, the clearing of fauna habitats will be minimised as far as practical in the final Proposal design. A CEMP will be developed and implemented during construction including the following mitigation measures: - Clearing of vegetation, particularly potential Black Cockatoo breeding trees, will be avoided or minimised where practicable. - Clearing is demarcated in the field and will be restricted specifically to the development envelope. - Indirect impacts to surrounding native fauna habitat are appropriately managed. - Vegetation to be cleared will be searched by a fauna specialist prior to clearing and any fauna species found will be relocated. - Fauna mortality from construction activities or vehicle strike will be documented during construction and reported to DBCA. **Rehabilitate**: • Due to the operational and safety requirements within the railway corridor, rehabilitation cannot not be implemented. Potential revegetation opportunities surrounding stations will be investigated.
Clearing of up to 3.38 ha of potential Black Cockatoo foraging habitat	Suitable foraging habitat for Black Cockatoos occurs in the Eucalyptus/Banksia woodland, Scattered trees/shrubs and Shrubland fauna habitats located within the development envelope. Up to 3.38 ha of potential Black Cockatoo foraging habitat may be cleared for the Proposal out of 4.80 ha mapped within the development envelope. The foraging habitat to be cleared includes up to: • 0.59 ha of high quality. • 2.90 ha of moderate quality. • 1.31 ha of low quality. Feeding evidence was observed under one *Corymbia calophylla* tree (GHD 2019), with no other evidence of foraging in the form of chewed banksia cones or marri nuts has been observed during previous surveys. The foraging habitat to be cleared is within a highly altered environment and not comprised of consolidated intact native vegetation. It is unlikely that the impacts associated with clearing of potential Black Cockatoo foraging habitat will adversely affect habitat critical to the survival of the species, or decrease the availability or quality of habitat to the extent that the Black Cockatoo species will decline.	**Avoid:** • Approximately 1.42 ha of potential Black Cockatoo foraging habitat will be avoided through the inclusion of Vegetation Retention Areas. • The PTA is committed to further investigate avoiding areas of vegetation where practicable. **Minimise:** Clearing of fauna habitats will be minimised as far as practical. A CEMP will be developed and implemented during construction to ensure that: • Clearing is demarcated in the field and will be restricted specifically to the development envelope. • Where avoidance is not possible, the PTA will minimise the clearing of Black Cockatoo foraging habitat where practicable. **Rehabilitate** • Due to the operational and safety requirements within the railway corridor, rehabilitation cannot not be implemented. Potential revegetation opportunities will be investigated surrounding stations.

Clearing of up to 53 potential Black Cockatoo breeding trees, including four (4) containing artificial nesting boxes	Up to 53 potential Black Cockatoo breeding trees suitable for Black Cockatoos, comprising marri, tuart, red gum and flooded gum, may be cleared as part of the Proposal. None of the potential breeding trees contain hollows suitable for nesting Black Cockatoos. Three (3) of the potential breeding trees within the development envelope contain one or more small hollows, including a dead stag Corymbia calophylla. All of these trees occur within Vegetation Retention Areas and will not be removed for the Proposal. Four (4) trees within the development envelope were found to have nesting boxes installed, one of which has been occupied by bees and is not suitable for use by Black Cockatoos. All four trees containing nesting boxes may be removed for construction. The potential Black Cockatoo breeding trees are not located within consolidated intact native vegetation and are in proximity to a major highway, which is likely to reduce the value of the potential Black Cockatoo breeding trees to the species. It is unlikely that the clearing of potential Black Cockatoo breeding habitat for the Proposal will adversely affect habitat critical to the survival of the species, disrupt the breeding cycle of a population, or decrease the availability or quality of habitat to the extent that the Black Cockatoo species will decline.	**Avoid:** • Forty (40) potential Black Cockatoo breeding trees will be avoided through the inclusion of Vegetation Retention Areas. This includes retaining three potential Black Cockatoo breeding trees containing one or more small hollows. • The PTA is committed to further investigate avoiding areas of vegetation where practicable. **Minimise:** • Where avoidance is not possible, the PTA will minimise the clearing of potential Black Cockatoo breeding trees where practicable. A CEMP will be developed and implemented during construction to ensure that: • Clearing is demarcated in the field and will be restricted specifically to the development envelope. **Rehabilitate:** • Due to the operational and safety requirements within the railway corridor, rehabilitation cannot not be implemented. Potential revegetation opportunities will be investigated surrounding stations. Should any of the four trees with artificial nesting boxes be removed for construction the PTA commits to relocating or replacing the nesting boxes to an appropriate location as agreed with the local government and DBCA.
Clearing of potential Black Cockatoo roosting habitat	Large trees within the development envelope may provide suitable roosting habitat for Black Cockatoos, however there have been no records of either Carnaby's Cockatoo or Forest Red-tailed Black Cockatoo's roosting within the development envelope. The proximity of these trees to existing major infrastructure reduces the likelihood of use by Black Cockatoo species for roosting.	**Avoid:** • The PTA has avoided disturbance to potential Black Cockatoo roosting habitat through the establishment of Vegetation Retention Areas. • The PTA is committed to further investigate avoiding areas of vegetation where practicable. **Minimise:** • Where avoidance is not possible, the PTA will minimise the clearing of potential Black Cockatoo roosting habitat where practicable. • A CEMP will be developed and implemented during construction to ensure that: - Clearing is demarcated in the field and will be restricted specifically to the development envelope. **Rehabilitate:** • Due to the operational and safety requirements within the railway corridor, rehabilitation cannot not be implemented. Potential revegetation opportunities will be investigated surrounding stations.
Injury or mortality of conservation significant fauna during construction and operation of the Proposal.	Conservation significant fauna could potentially be injured or killed during construction or vegetation clearing activities, from being trapped in trenches and/or from road kill/vehicle strike. However, given that the fauna habitats present within the development envelope are highly degraded, they are unlikely to support conservation significant fauna species, other than Black Cockatoos.	**Minimise:** Impacts to conservation significant fauna from vehicle strike or construction/clearing activities will be minimised as far as practical through the implementation of the CEMP during construction which will include: • Regular inspections of the development envelope will be undertaken for trapped fauna (e.g. in excavation equipment) during construction works. • Vehicle speed limits will be in place during construction. Fauna mortality from construction activities or vehicle strike will be documented during construction and reported to DBCA.

6.6 Predicted Outcome

The Proposal will result in clearing up to 17.8 ha of fauna habitat, most of which are predominantly Completely degraded and highly disturbed from impacts associated with existing infrastructure and surrounding urbanisation. Up to 3.38 ha of potential Black Cockatoo foraging habitat and up to 53 potential breeding trees will be cleared as part of the Proposal.

The PTA has avoided and minimised potential impacts to terrestrial fauna through designing a development envelope that primarily covers the highly disturbed Tonkin Highway road reserve. In addition, the PTA has further minimised potential impacts by applying Vegetation Retention Areas within the development envelope, where 2.83 ha of fauna habitat will be retained and not subject to clearing, 1.42 ha of which is described as potential Black Cockatoo foraging habitat and retains 40 potential Black Cockatoo breeding trees.

Fauna habitats within the development envelope provide limited value to terrestrial fauna, and are unlikely to support conservation significant fauna, excluding potential value for Black Cockatoos. Given the location of the vegetated patches within a highly altered urban landscape and proximity to a major highway, these areas are considered unlikely to provide high quality foraging or breeding value for Black Cockatoos.

It is unlikely that the minor impacts associated with clearing of potential Black Cockatoo foraging habitat for the Proposal will adversely affect habitat critical to the survival of the species, disrupt the breeding cycle of a population, or decrease the availability or quality of habitat to the extent that the Black Cockatoo species will decline.

The PTA considers that through the implementation of the Proposal's mitigation measures and the management measures in the CEMP that the Terrestrial fauna environmental value can be appropriately managed during the construction and operation of the Proposal and the EPA's objective will be met.

7. Terrestrial Environmental Quality

7.1 EPA Objective

To maintain the quality of land and soils so that environmental values are protected.

7.2 Policy and Guidance

The following policies and guidance are relevant to the terrestrial environmental quality factor:

- Environmental Factor Guideline: Terrestrial Environmental Quality (EPA 2016b).
- *Contaminated Sites Act 2003*.
- Assessment and Management of Contaminated Sites (DWER 2014).
- Identification and Investigation of Acid Sulfate Soils and Acidic Landscapes (DWER 2015a).
- Treatment and Management of Soils and Water in Acid Sulfate Soil Landscapes (DWER 2015b).
- Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (DoH 2009).

7.3 Environmental Investigations

Table 17 lists the relevant environmental investigations used to assess the terrestrial environmental quality factor within the development envelope.

Table 17: Summary of the Environmental Investigations relevant to terrestrial environmental quality

Title	Author	Year	Summary of Scope	Project
Data Gap Analysis, Tonkin Gap Project	Senversa	2019	Senversa were engaged by Main Roads to undertake a contaminated sites data gap analysis for several parcels of land located within the Tonkin Highway road reserve. The objective of the data gap analysis was to establish an updated understanding of contaminated site issues, identification of conceptual site model data gaps, and the recommended approach to resolving such data gaps. Senversa recommended that a Sampling and Analysis Quality Plan (SAQP) be prepared to further characterise the distribution of cinder deposits on-site.	Tonkin Gap (Main Roads)
Sampling and Analysis Quality Plan, Tonkin Gap Project	Senversa	2019	The SAQP details the intrusive investigations required to update the understanding of the nature and extent (depth and distribution) of known cinder deposits located within the Tonkin Highway road reserve and in turn inform site management decisions. Upon completion of the SAQP, there will be an updated understanding of contaminated site issues including the conceptual site model demonstrating the current nature and extent of cinder deposits within the Tonkin Highway road reserve.	Tonkin Gap (Main Roads)

MEL Options – Environment and Heritage Assessment, Morley to Ellenbrook Route Protection Study	Jacobs	2018	The purpose of this report is a high level understanding of the environmental and heritage constraints associated with the proposed development envelope. The assessment of the environmental and heritage constraints was undertaken via a desktop assessment, using numerous available datasets.	Morley-Ellenbrook Line (PTA)
Preliminary ASS Investigation. Perth-Darwin National Highway, NorthLink	Coffey	2015	A detailed PSI into the potential for ASS within the boundary of the PDNH including consideration of construction methodology, potential impacts, sensitive receptors and risk assessment comprising: • Risk of acid sulfate soil occurrence. • Risk of acid generation. • Dewatering risk.	Northlink WA (Main Roads)
PSI Perth–Darwin National Highway, NorthLink	Coffey	2015	A PSI into the potential sources of contamination that may be encountered within the boundary of the PDNH. Included reporting of site observations, potential receptors, conceptual site models, ASS risk mapping, Contaminated Sites Database search, DWER records search and previous investigations.	Northlink WA (Main Roads)
PSI on Contamination, Tonkin Grade Separation Project	360 Environmental	2014	A PSI into the potential sources of contamination that may be encountered within the boundary of the Tonkin Grade Separation Project. Included review of and exposure pathways for the following contaminated sites: • Tonkin Highway Reserve. • Former Cresco/CSBP Site Bayswater. • Former Metal Recycling Facility. • Former Service Station – 335 Collier Road Bassendean. • Former CSBP Site Bassendean. • Former Motor Vehicle Workshop – Jackson Street Bassendean. • Former Pest Control Depot – 20 Bassendean Road Bayswater.	Tonkin Grade Separation (Main Roads)
Perth Airport Rail Link PSI	GHD	2013	A PSI into potentially contaminating land uses and sources, probable nature of contaminants and likely presence of ASS within the Airport link alignment.	Forrestfield Airport Link (PTA)
Interim Mandatory Auditors Report, 2–4 (Lot 10) Railway Parade and Lot 7	Environmental Auditors – C. Barber	2013	The document presents the findings of a Contaminated Sites Audit undertaken by DER, formerly Department of Environment and Conservation (DEC) accredited Contaminated Sites Auditor (No. MR0017-1212-24), Mr Charles Barber. The audit was conducted in	Former Cresco Facility (Wesfarmers)