



07 April 2017

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Water Corporation
PO Box 100
Leederville WA 6902

Our ref: 61/34862
160652
Your ref:

Dear Carol

Vasse Diversion Drain Fauna and Vegetation Assessment - Additional Survey Area

1 Background

The Water Corporation (the Corporation) is proposing to upgrade the Vasse Diversion Drain within the City of Busselton. The Vasse Diversion Drain is located approximately 220 km south of Perth on the shores of Geographe Bay. The Corporation has commissioned biological surveys to understand the key flora, vegetation and fauna values, specifically the presence of Black Cockatoos and Western Ringtail Possum habitat within the drain areas proposed for upgrading.

GHD Pty Ltd (GHD) completed a flora and fauna survey for the proposed upgrade to the Vasse Diversion Drain on 28 and 29 September 2016 (GHD 2017). This survey assessed an area that covered 31.9 hectares (ha). Following the survey, an assessment of potential environmental impacts associated with the proposed upgrade was completed based on the findings of the biological assessment. This assessment identified potential triggers for referral under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Corporation has subsequently identified the need to expand the footprint area to accommodate the construction works and ultimate project design. Additional vegetation and fauna assessment was required for the revised development area.

2 Scope of Work

GHD was engaged by the Corporation to complete an assessment for the additional development areas, through a targeted vegetation and fauna survey and mapping extrapolation. This letter provides the results and mapping for the total revised development area.

2.1.1 Additional Survey

The scope of works for the vegetation and fauna assessment at the eastern extent of the revised development area was to identify key biological constraints with a focus on native vegetation and habitat for:

- Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) – listed as Endangered under the EPBC Act and the *Wildlife Conservation Act 1950* (WC Act)
- Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) – listed as Vulnerable under the EPBC Act and Endangered under the WC Act
- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) – listed as Vulnerable under the EPBC Act and the WC Act

- Western Ringtail Possum (*Pseudocheirus occidentalis*) – listed as Endangered under the EPBC Act and Critically Endangered under the WC Act).

2.1.2 Extrapolation of field results

The footprint along the drainage line has been widened in certain areas from one to several meters and GHD was required to extrapolated existing field results to update vegetation type and quality mapping.

2.1.3 Assumption and limitations

The assumptions and limitations stated in the previous flora and fauna survey (GHD 2017) for the proposed upgrade to the Vasse Diversion Drain, also apply to the results and discussion presented in this letter report.

3 Methods

3.1 Additional Survey

GHD ecologist Glen Gaikhorst undertook a one-day field survey on 8 March 2017. The survey area was traversed on foot to identify native vegetation, fauna habitats, fauna evidence and environmental features for threatened fauna.

3.1.1 Vegetation assessment

A vegetation assessment of the survey area was undertaken to identify and describe the dominant vegetation units and assess vegetation condition. Vegetation mapping was conducted in the field with vegetation boundaries drawn over aerial photography. The classification of vegetation types within the survey area was based on structure, dominant taxa and cover characteristics as defined by field observations. Vegetation types were aligned with previously described types (e.g. GHD 2017) where possible.

The vegetation condition of the survey area was assessed and mapped in accordance with the vegetation condition rating scale published by EPA (2016). The scale consists of six rating levels and recognises the intactness of vegetation, level of disturbance and weeds and the inherent ability of the remnant to be returned to a natural state without intensive intervention.

3.1.2 Fauna assessment

Black Cockatoos

A targeted habitat assessment for the Carnaby's Black Cockatoo, Baudin's Black Cockatoo and Forest Red-tailed Black Cockatoo was undertaken. The aim of the habitat assessment was to assess the presence, quality and extent of habitat for Black Cockatoos within the survey area. The assessment involved visual and aural assessment of the survey area identifying breeding habitat (presence/absence of actual and potential breeding trees), foraging habitat, roosting areas, current activity and any other signs of use by Black Cockatoos. For the purpose of this assessment, the DSEWPac (2012) Black Cockatoo referral guidelines were used to define breeding, foraging and night roosting habitat.

Information collected during the field survey included:

- Foraging habitat – the location and extent of suitable Black Cockatoo foraging habitat was identified for the survey area, based on the vegetation associations and presence/absence of known foraging species. During the field surveys, any direct or indirect evidence of foraging by Black Cockatoos was recorded via GPS.

- Breeding habitat – suitable breeding habitat for Black Cockatoo is defined by DSEWPaC (2012) as trees of species known to support breeding within the range of the species, which either have a suitable nest hollow or are of a suitable diameter at breast height (DBH) to develop a nest hollow. For most tree species, suitable DBH is 500 millimetres (mm). Breeding habitat was identified and recorded via GPS, and mapped according to the presence of suitable breeding trees (including the presence and size of tree hollows). On average, Black Cockatoos are known to nest in hollows with an entrance diameter greater than 20-30 centimetres (cm) (Johnstone and Storr 1998; Groom 2011). Therefore, during the field survey a suitable nesting hollow currently able to support breeding was defined as a tree hollow with an entrance diameter greater than 20 cm (or a large hollow). All trees with hollows with an entrance diameter less than 20 cm were also recorded and graded as either small (5-10 cm) or medium (10-20 cm).
- Night roosting habitat – suitable roosting habitat is defined by DSEWPaC (2012). Suitable roosting habitat was identified based on the presence of suitable tall trees, proximity of known roosting sites and the presence of evidence that suggests roosting i.e. droppings, feathers, branch clips or observed.

Western Ringtail Possum

In addition to the targeted Black Cockatoo searches, a Western Ringtail Possum assessment was also undertaken. This assessment involved looking through all habitats for scats, dreys and/or live possums or any other sign of Western Ringtail Possum presence.

3.2 Mapping

Mapping of the original survey area was updated to include the results of the additional survey area and extrapolated footprint areas; the mapping included in this report is for the total revised development area.

3.3 Survey limitations

This survey was undertaken outside of the spring period and outside of the breeding period for Black Cockatoos. Therefore, no actual breeding event would have been recorded for Black Cockatoo, however breeding can be inferred based on hollow size, positioning in the environment and chews present on the hollow rim.

No other limitations were encountered.

4 Results

4.1 Vegetation

4.1.1 Vegetation types

The additional survey area comprised three vegetation types, Marri and Flooded Gum woodland (VT1), Melaleuca shrubland (VT5) and Marri woodland (VT7), as well as highly disturbed areas. Marri woodland (VT7) is newly described for the revised development area with more detail provided in Table 1. A description of the previously defined vegetation types are provided in the 2016 flora and fauna survey report (GHD 2017).

A summary of the vegetation types recorded in the total development area is provided in Table 2 with updated mapping provided in Figure 1.

Table 1 Marri Woodland within the additional survey area


Vegetation Type	Comment	Photograph
Marri woodland (VT7)	<p>This vegetation type was dominated by <i>Corymbia calophylla</i> open woodland over <i>Avena fatua</i> and <i>Ehrharta longifolia</i> tussock grassland over <i>Oxalis pes-caprae</i> herbland.</p> <p>This vegetation type occurred on plains, but in upland locations, restricted to road side areas.</p> <p>The vegetation type did not align with any known Threatened or Priority Ecological Communities (TECs or PECs).</p>	

Table 2 Vegetation types within the total development area area

Vegetation type	Previously surveyed area (GHD 2017) (ha)	Change in area (ha)	Total development area (ha)
VT1 – Marri and Flooded Gum woodland	2.41	1.16	3.57
VT2 – Peppermint woodland	0.47	0.22	0.69
VT3 and VT4 – <i>Acacia</i> and Peppermint shrubland	1.22	2.22	3.44
VT5 – <i>Melaleuca</i> shrubland	0.74	0	0.74
VT6 – Peppermint woodland over sedgeland	1.57	-1.46	0.11
VT7 – Marri woodland	-	-	0.06
RA – Rehabilitated areas	0.04	-	-
Vasse Drain	9.60	-3.26	6.34
Highly disturbed	15.83	8.82	24.65
Total area	31.9	7.7	39.6

4.1.2 Conservation significant ecological communities

No TECs were recorded within the revised development area during this assessment. The previously surveyed area (GHD 2017) and the additional survey area comprised Marri and Flooded Gum woodland (VT1), which aligns with the DPaw Priority 1 listed PEC, *Eucalyptus rudis* (flooded gum), *Corymbia calophylla*, *Agonis flexuosa* Closed Low Forest (near Busselton). There was 4.26 ha of this vegetation type recorded within the revised development area.

4.1.3 Vegetation condition

The vegetation condition within the additional survey area was rated from Degraded to Completely Degraded. The vegetation structure was severely impacted by disturbance such as historical clearing and weed invasion. A summary of the vegetation condition ratings mapped within the total revised development area is provided in Table 3 with updated mapping provided in Figure 2.

Table 3 Vegetation conditions ratings within the total development area

Vegetation condition rating	Previously surveyed area (GHD 2017) (ha)	Change in area (ha)	Total development area (ha)
Very Good	0.05	-	-
Very Good to Good	0.66	-0.4	0.26
Good to Degraded	0.53	0	0.53
Degraded	0.80	0.97	1.77
Degraded to Completely Degraded	1.25	0.91	2.16
Completely Degraded	19.00	9.53	28.53
Watercourse/Vasse Drain	9.60	-3.26	6.34
Total area	31.9	7.7	39.6

4.1.4 Other significant vegetation

No other significant vegetation was recorded within the additional survey area.

4.2 Fauna

4.2.1 Fauna habitats

The additional survey area comprised three fauna habitat types, Marri and Flooded Gum woodland (VT1, VT7), Peppermint woodland (VT2, VT3, VT4, VT6), as well as highly disturbed areas.

In total, the revised development area includes five habitat types, which are closely aligned with the different vegetation types described in section 4.1.1. A description of the habitat types are provided in the 2016 flora and fauna survey report (GHD 2017).

The habitat type extents for the revised development area are provided in Table 4 and mapped in Figure 3.

Overall, while large sections of the survey area have previously been disturbed, where native vegetation remains it retains some structure and provides habitat for fauna. Anthropogenic disturbances include past clearing for infrastructure (roads, tracks and building), other agricultural practices and weed encroachment.

Table 4 Fauna habitat types within the total development area

Habitat type	Previously surveyed area (ha) (GHD 2017)	Change in area (ha)	Total development area (ha)
Marri and Flooded Gum woodland (VT1, VT7)	2.41	1.22	3.64
Peppermint woodland (VT2, VT3, VT4, VT6)	3.26	0.98	4.24
Tall Melaleuca shrubland (VT5)	0.74	-	0.74
Rehabilitated Areas (RA)	0.04	-	-
Vasse Drain – Water body	9.6	-3.26	6.34
Highly Disturbed Areas	15.83	8.82	24.65
Total area	31.9	7.7	39.6

4.2.2 Conservation Significant Fauna

Black Cockatoo Assessment

Three Black Cockatoo species are likely to occur within the additional survey area, with habitat present for these species. A description of the extent of habitat for these species within the total revised development area is summarised in Table 5 and mapped in Figure 3.

Foraging – Approximately 7.88 ha of suitable foraging habitat for Black Cockatoos within the development area, comprising mixed woodlands and shrubs. Marri and Flooded Gum woodlands provide high value foraging habitat and Peppermint woodlands provide low value foraging habitat for the species. The Black Cockatoos may opportunistically forage within the development area. No evidence of foraging was observed during the field survey.

Potential Breeding – The habitat assessment identified 74 potential breeding trees with a suitable DBH throughout the development area (greater than 500 mm DBH, (DSEWPaC 2012)). These trees occur within the Marri and Flooded Gum woodland habitat. Of these trees, three contained large hollows with possible chews, two trees contained medium hollows and six trees contained numerous small hollows that could provide suitable breeding habitat in the future. A breakdown of trees and hollows is provided below. An example of a tree with large hollows is presented in Plate 1.

Roosting – No roosting sites were recorded during the field survey. 3.64 ha of roosting habitat was recorded within the development area in the form of Marri and Flooded Gum woodland, which was located in the road reserve, paddock and adjacent to the drain.

Table 5 Summary of Black Cockatoo assessment

Habitat type	Previously surveyed area (GHD 2017) (ha)	Change in Black Cockatoo habitat (ha)	Total development area (ha)
Foraging habitat	Approximately 5.67 ha of suitable foraging habitat was recorded	2.22 ha of foraging habitat was recorded within the additional area. No evidence of foraging by Black Cockatoos was recorded.	7.88 ha of foraging habitat was recorded in the total survey area. No evidence of foraging by Black Cockatoos was recorded.
Actual breeding habitat	No breeding events were recorded by any species of Black Cockatoo.	No breeding events were recorded by any species of Black Cockatoo.	No breeding events were recorded by any species of Black Cockatoo.
Potential breeding habitat	The habitat assessment recorded 37 potential breeding trees with a suitable DBH within the survey area. One tree contains one medium hollow and two trees contain three small hollows that could provide suitable breeding habitat in the future	37 potential breeding habitat trees with DBH \geq 500 mm including:	74 potential breeding habitat trees (29 <i>Corymbia calophylla</i> and 45 <i>Eucalyptus rudis</i>) with DBH \geq 500 mm. Of these trees three contained large hollows, two trees contained medium hollows and six trees contained numerous small hollows that could provide suitable breeding habitat in the future.
Roosting habitat	No roosting sites were recorded during the field survey. 2.41 ha of roosting habitat was recorded within the survey in the form of Marri and Flooded Gum woodland.	No roosting sites were recorded as being used by Black Cockatoos. 1.22 ha of suitable roosting habitat occurs throughout the additional survey area and consists of woodlands of tall mature trees.	No roosting sites were recorded as being used by Black Cockatoos. 3.64 ha of suitable roosting habitat occurs throughout the total survey area and consists of woodlands of tall mature trees.



Plate 1 Flooded Gum with numerous medium and large hollows present

Western Ringtail Assessment

The Western Ringtail Possum was recorded within the survey area in 2016 (GHD 2017) and during this additional survey. Scats were recorded throughout the development area in the Peppermint woodland (VT2, VT3, VT4, VT6) and Marri and Flooded Gum woodland (VT1, VT7). Evidence of this species has been mapped in Figure 3, which is a combination of 2016 results (GHD 2017) and this survey.

Habitat – Approximately 7.88 ha of primary corridor and supportive habitat (DEWHA 2009) for the Western Ringtail Possum occurs within the development area (Table 6). Five records of Western Ringtail Possum scats were recorded throughout the development area. An image of scats can be seen below in Plate 2.

Dreys – The habitat assessment identified six dreys within the revised development area. The Peppermint woodland within and adjacent to the development area provides high value breeding habitat for the species.

Table 6 Western Ringtail Possum Habitat within the total development area

Habitat Type	Previously surveyed area (GHD 2017) (ha)	Change in area (ha)	Total development area (ha)
Primary corridor and supportive habitat	5.67	2.22	7.88



Plate 2 Western Ringtail Possum Scats (and one Common Brushtail Possum) under a Marri

5 Conclusions

5.1 Vegetation

The additional survey area comprised three vegetation types as well as highly disturbed areas. These vegetation types align with previously described vegetation types (GHD 2017), with the exception of Marri woodland (VT7), which is newly described for the total revised development area. The vegetation condition within the revised development area was rated from *Very Good to Good to Completely Degraded*.

The revised development area comprised Marri and Flooded Gum woodland (VT1) and Peppermint woodland (VT2), which aligns with the DPaW Priority 1 listed PEC, *Eucalyptus rudis*, *Corymbia calophylla*, *Agonis flexuosa* Closed Low Forest (near Busselton). No other significant vegetation was identified within the revised development area.

5.2 Fauna

Evidence of both Black Cockatoo and Western Ringtail Possum habitat is present in the revised development area. There is 74 potential breeding habitat trees (DBH \geq 500 mm) for Black Cockatoo. Of these trees, three have large hollows suitable for Black Cockatoo breeding. At least one of these hollows had chews present that potentially could be from Black Cockatoos, but could not be verified. Foraging habitat was present in all woodland types with Marri being preferred foraging species. No actual breeding or roosting areas were recorded in the revised development area.

Evidence of Western Ringtail Possum was recorded via scats and dreys. Dreys were recorded in Marri and Flooded Gum woodland while scats were recorded under Marri, Flooded Gum and Peppermint trees. The habitats present in the revised development area are not contiguous in the landscape but are of sufficient size to maintain small numbers of the species. It is likely that these satellite individuals or small groups provide a supportive population role rather than make up the core of a population. In any case, these individuals may be important in population dynamics.

Kind regards



pp **Glen Gaikhorst**

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References

Department of the Environment, Water, Heritage and the Arts (DEWHA) 2009, *EPBC Act Policy Statement 3.10: Significant impact guidelines for the vulnerable western ringtail possum (Pseudocheirus occidentalis) in the southern Swan Coastal Plain, Western Australia*, retrieved October 2016, from <http://www.environment.gov.au/system/files/resources/12125dcb-7a21-42b7-8491-a404f4bbfc07/files/western-ringtail-possum.pdf>

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2012, *Environment Protection and Biodiversity Act 1999 referral guidelines for three threatened black cockatoo species: Carnaby's Black Cockatoo (endangered) Calyptorhynchus latirostris, Baudin's Black Cockatoo (vulnerable) Calyptorhynchus baudinii and Forest red-tailed Black Cockatoo (vulnerable) Calyptorhynchus banksia naso*, Australian Government Canberra.

Environmental Protection Authority (EPA) 2004a, *Guidance Statement No. 51: Vegetation and Flora Surveys for Environmental Impact Assessment in Western Australia*, Perth, Environmental Protection Authority.

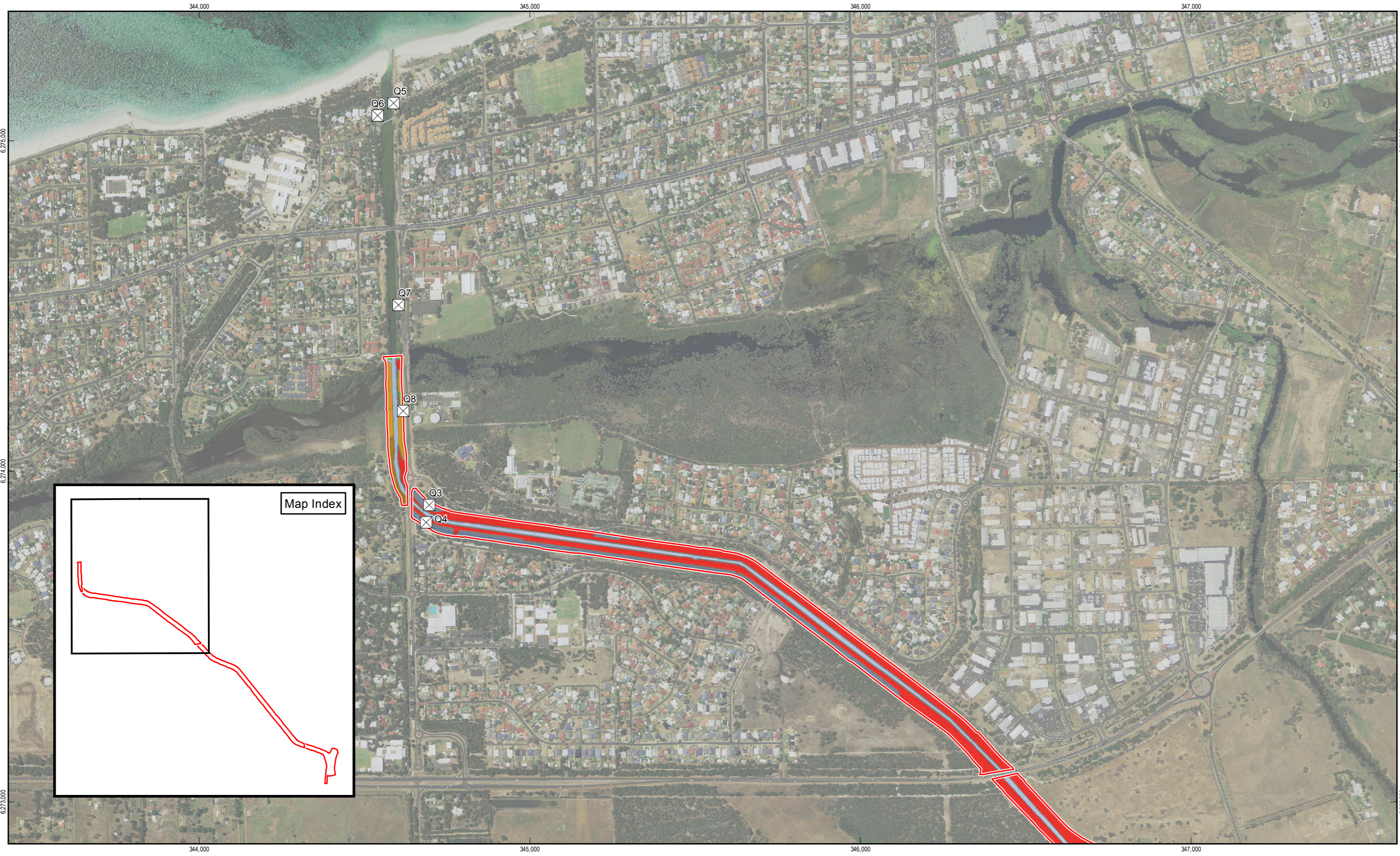
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Environmental Protection Authority (EPA) 2016, *Technical Guidance, Flora and Vegetation Surveys for Environmental Impact Assessment*, Perth, Environmental Protection Authority.

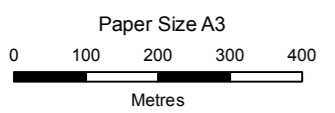
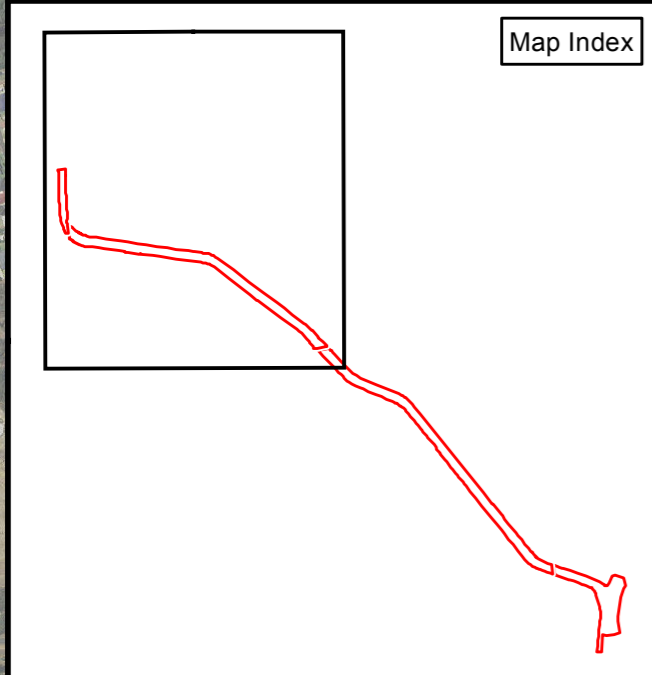
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Groom, C 2011, *Plants Used by Carnaby's Black Cockatoo*, Perth, Department of Environment and Conservation.

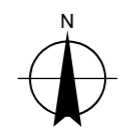
Johnstone, RE and Storr, GM 1998, *Handbook of Western Australian Birds, vol 1: Non-passerines (Emu to Dollarbird)*, Perth, West Australian Museum.



Map Index



Map Projection: Transverse Mercator
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LEGEND

- ⊗ Quadrat
- ▭ Development Area

Vegetation Type

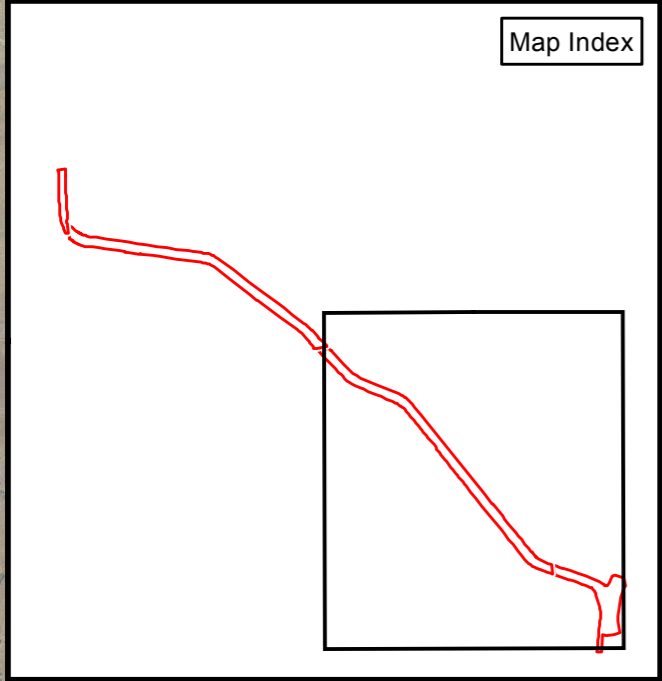
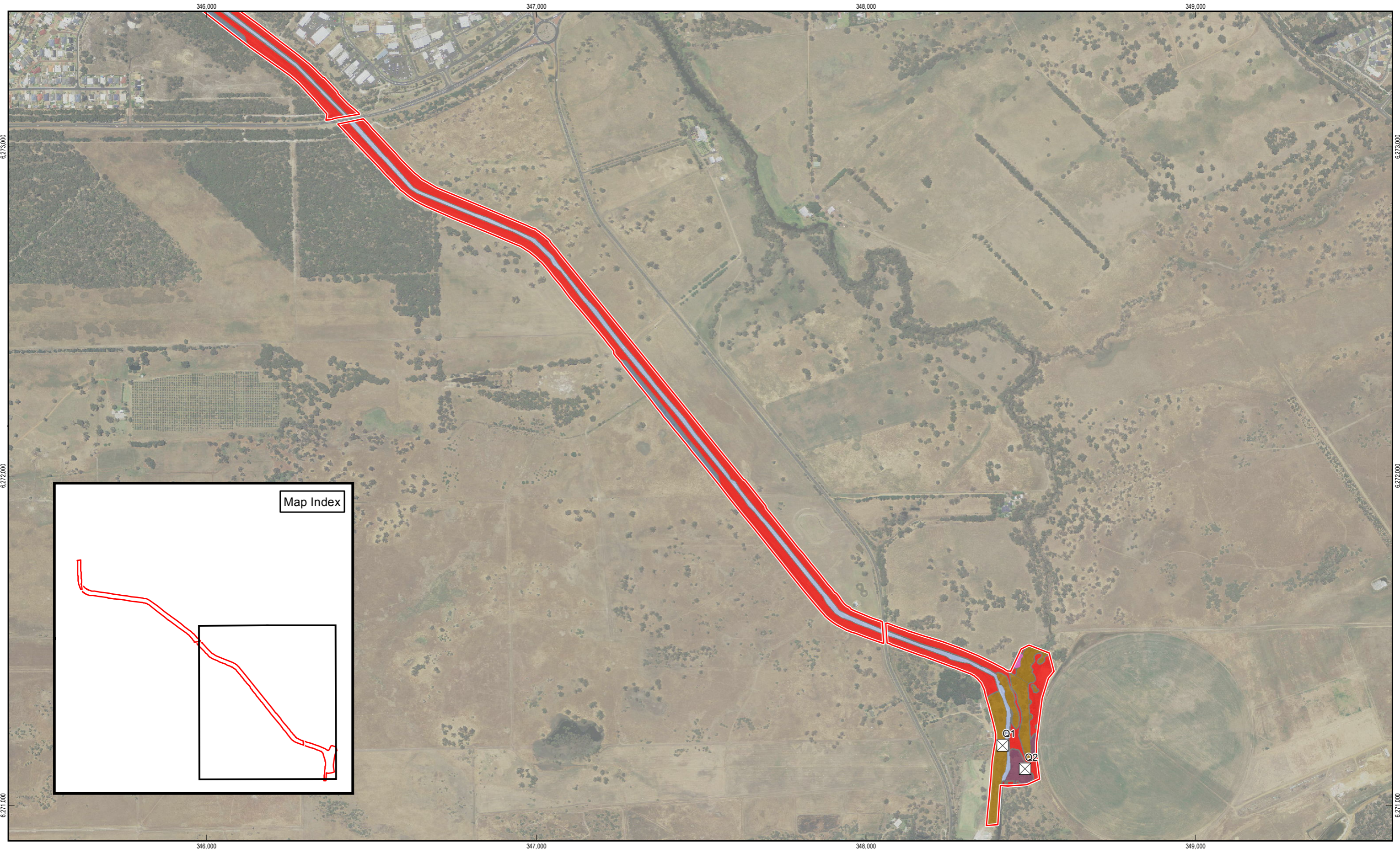
- ▭ Acacia and Peppermint shrubland
- ▭ Highly disturbed
- ▭ Marri and Flooded Gum woodland
- ▭ Peppermint woodland over sedgeland
- ▭ Tall *Melaleuca* shrubland
- ▭ Watercourse



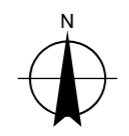
Water Corporation
Vasse Diversion Drain Upgrade

Vegetation Units, Sample Locations
and Significant Flora Locations

Job Number | 61-34862
Revision | 0
Date | 05 Apr 2017



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LEGEND
 ☒ Quadrat
 ☐ Development Area

Vegetation Type
 Acacia and Peppermint shrubland
 Highly disturbed
 Marri woodland

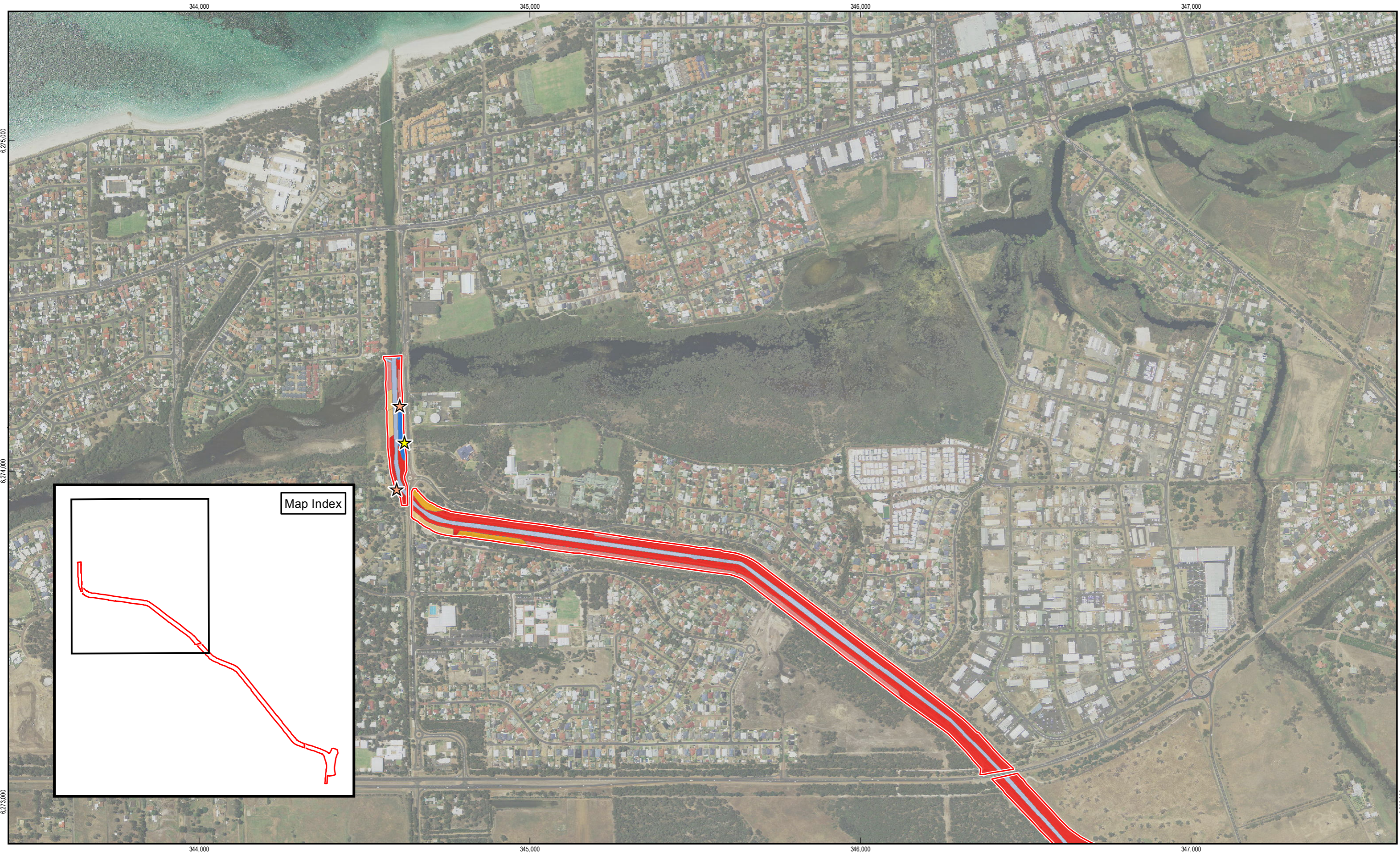
Marri and Flooded Gum woodland
 Peppermint woodland
 Watercourse



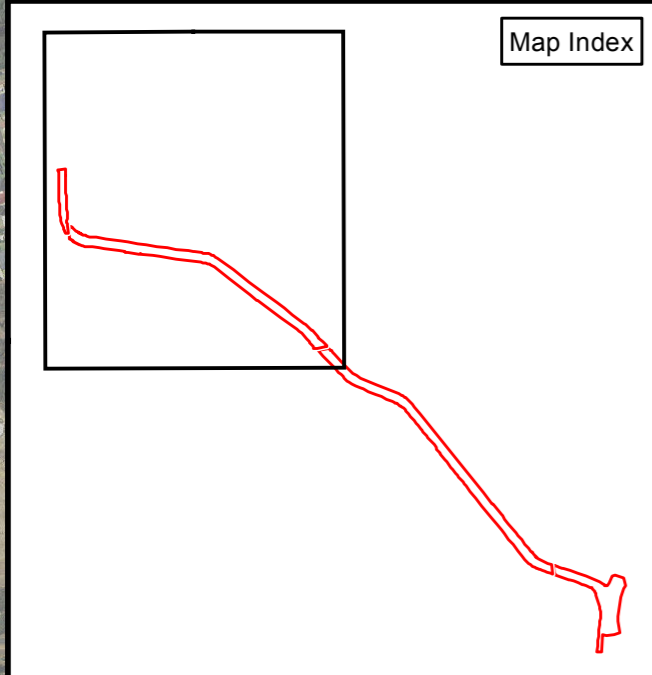
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**Vegetation Units, Sample Locations
 and Significant Flora Locations**

Job Number | 61-34862
 Revision | 0
 Date | 05 Apr 2017



Map Index



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LEGEND

Weed Species

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- ★ *Zantedeschia aethiopica* (Arum Lily)

Vegetation Condition (EPA and DPaW 2015)

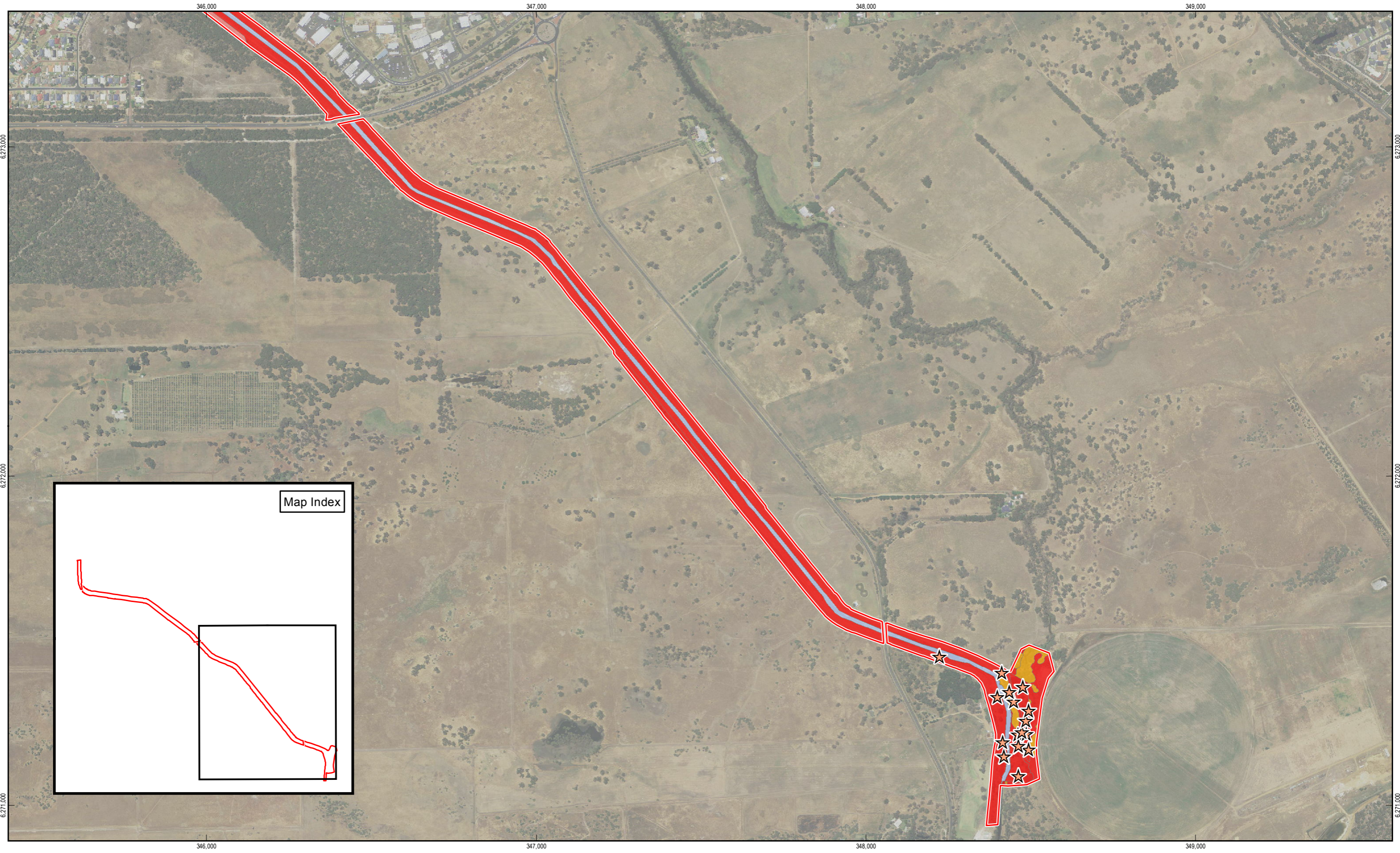
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- Degraded
- Degraded - Completely Degraded
- Completely Degraded
- Watercourse



Water Corporation
 Vasse Diversion Drain Upgrade

Vegetation Condition and Significant Weeds

Job Number | 61-34862
 Revision | 0
 Date | 31 Mar 2017



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LEGEND

Weed Species

- ★ *Asparagus asparagoides* (Bridal Creeper)
- ★ *Zantedeschia aethiopica* (Arum Lily)

Vegetation Condition (EPA and DPaW 2015)

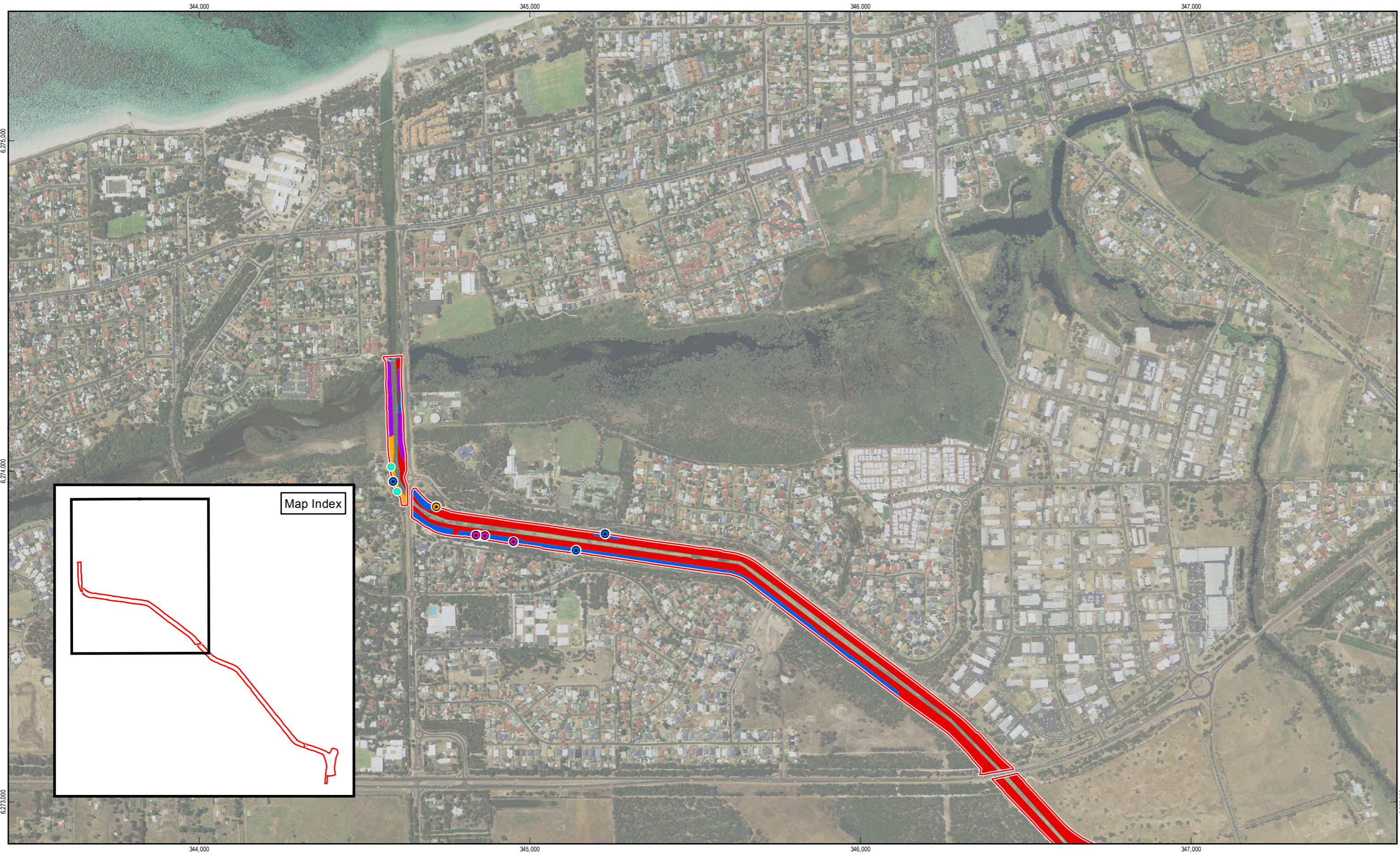
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- Completely Degraded
- Watercourse



Water Corporation
 Vasse Diversion Drain Upgrade

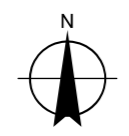
Vegetation Condition and Significant Weeds

Job Number | 61-34862
 Revision | 0
 Date | 31 Mar 2017



Map Index

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 Grid: GDA 1994 MGA Zone 50



LEGEND

- Carters Mussel (*Westralunia carteri*)
- Black Cockatoo hollows (large)
- Black Cockatoo trees with DBH > 500mm

- Western Ringtail Possum (*Pseudocheirus occidentalis*) Observation**
- Drey
 - Drey and scat
 - Scat

- Fauna Habitat**
- Flooded Gum and Marri woodland
 - *Agonis* woodland
 - *Melaleuca* over shrubland
 - Highly Disturbed



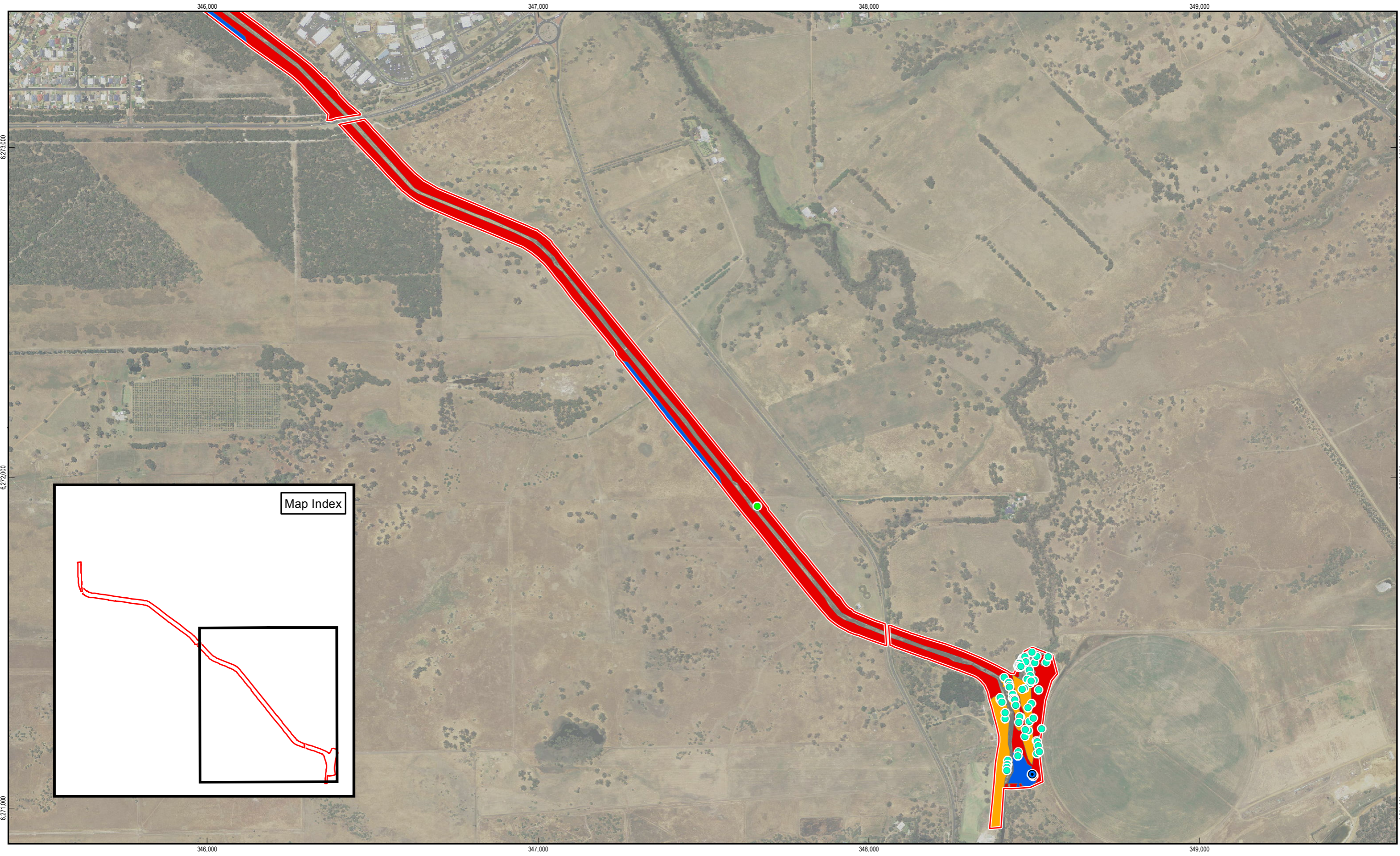
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Fauna Habitat Types

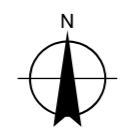
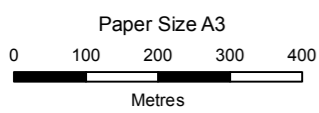
Job Number | 61-34862
 Revision | 1
 Date | 07 Apr 2017

Page 1 of 2

Figure 3



Map Index



LEGEND

- Carters Mussel (*Westralunio carteri*)
- Black Cockatoo hollows (large)
- Black Cockatoo trees with DBH > 500mm

Western Ringtail Possum (*Pseudocheirus occidentalis*) Observation

- Drey
- Drey and scat
- Scat

Development

- Fauna Habitat**
- Flooded Gum and Marri woodland
 - Agonis* woodland
 - Melaleuca* over shrubland
 - Highly Disturbed



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Vasse Diversion Drain Upgrade

Fauna Habitat Types

Job Number | 61-34862
Revision | 1
Date | 07 Apr 2017