Appendix J

NRA – Supplementary Ecological Surveys

Environmental Approval & Compliance Solutions

Haughton Pipeline Duplication Project: Supplementary Ecological Surveys (August 2018)

GHD on behalf of Townsville City Council

Document Control Summary

NRA Environmental Consultants

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Report Summary	
Key Words	Haughton Pipeline Duplication Project, HPDP, Townsville City Council, TCC, weeds, T&NT flora, threatened, near threatened, fauna breeding places.
Abstract	Townsville City Council plans to construct a water pipeline from the Haughton Upper Irrigation Canal to the Ross Dam near an existing pipeline. This report presents the results of targeted surveys in August 2018 for weeds, State and Commonwealth-listed threatened and near threated flora, and fauna breeding places.

Citation
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Quality Assurance					
Author	**Technical Review**	**Editor**	**Document Version**	**Approved for Issue by QA Manager**	
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1. Introduction

Townsville City Council (TCC) is progressing plans for the Haughton Pipeline Duplication Project (HPDP; the Project) to accommodate regional growth and increased water demand amid potential prolonged drought conditions. Construction is planned to commence in 2018.

The Project Environmental Analysis Report (NRA 2018a) and Construction Environmental Management Plan (NRA 2018b) identified a number of tasks that need to occur prior to construction. Consistent with advice contained in these documents, NRA Environmental Consultants (NRA) was commissioned by GHD, on behalf of TCC, to undertake targeted surveys in the Project area (**Figure 1**) to assess and map the presence of the following.

- Weeds.
  - Recommendation 19 in NRA (2018a) states: *Conduct a formal weed survey prior to construction to confirm weed presence along the pipeline alignment and ancillary areas.*
- Threatened and near threatened (T&NT) flora species as listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) and Queensland *Nature Conservation Act* 1992 (NC Act).
  - Recommendation 16 in NRA (2018a) states: *Conduct a flora survey prior to construction to confirm presence of T&NT flora species and determine if further approvals or permits are required.*
- Fauna breeding places.
  - Recommendation 23 in NRA (2018a) states: *Wherever possible, large trees with hollows should not be removed as these trees provide nesting and roosting sites for birds and mammals.* To assist with the implementation of this advice a pre-clearance survey for fauna breeding places is necessary.
  - A Species Management Program is required (NRA 2018b). The results from the survey for fauna breeding places will inform the preparation of a Species Management Program.

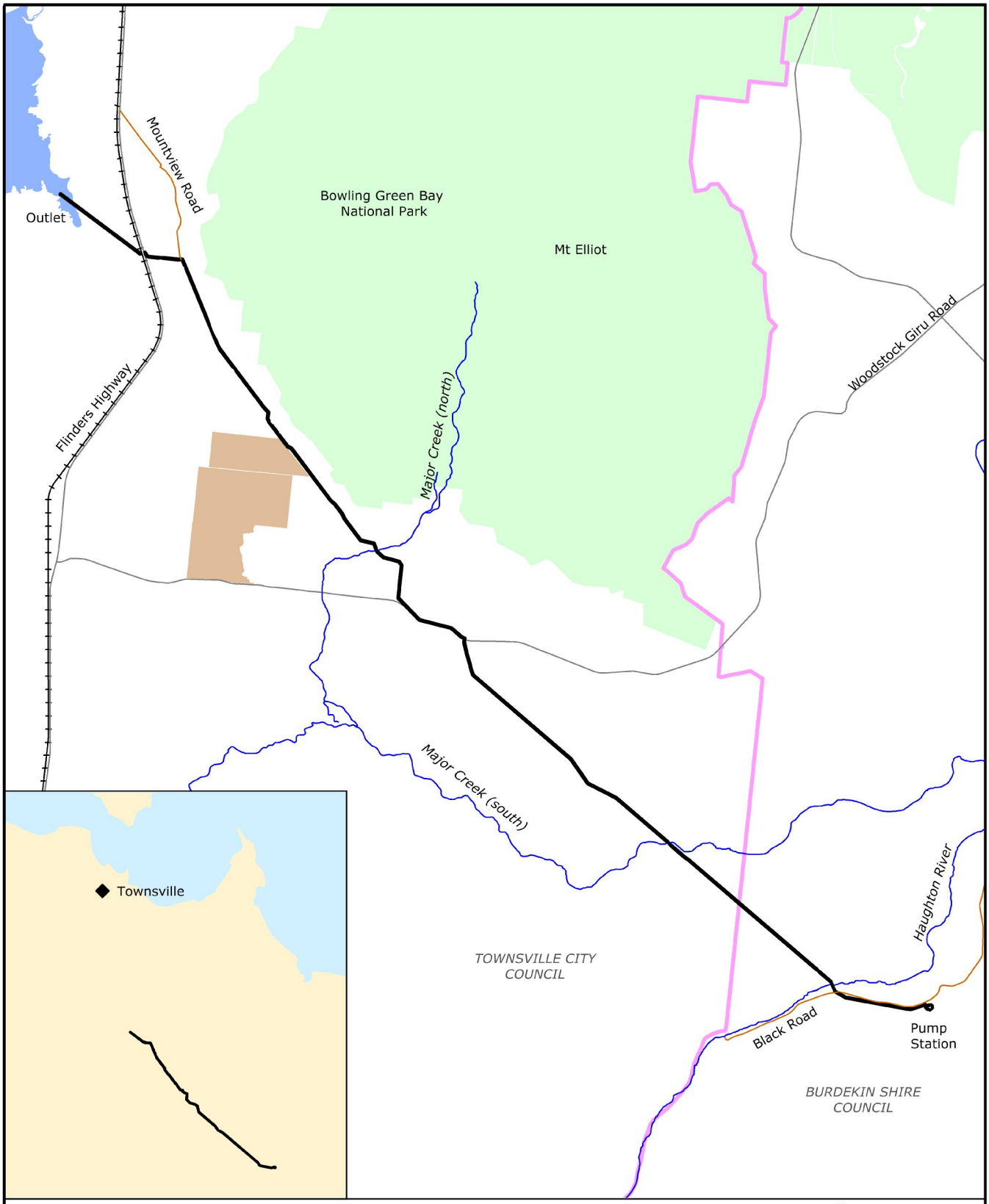

Figure 1: Location of the HPDP Project

Project: Haughton Pipeline Duplication Project: Supplementary Ecological Surveys (August 2018)

- Proposed HPDP alignment (July 2018)
- Local government area
- Protected area
- Serpentine Nature Refuge
- Ross Dam
- Drainage
- Main road
- Minor road
- Great Northern Line

N

0 5

Kilometres

Source:
© State of Queensland (Department of Environment and Science) 2018, © State of Queensland (Department of Natural Resources, Mines and Energy) 2018. Updated data available at http://qldspatial.information.qld.gov.au/catalogue//, GHD

NRA Ref: 135035
Date: August 2018

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2. Methods

Surveys were undertaken on 8, 15 and 16 August 2018 by NRA's Peter Buosi and Rhiannon Williams. Surveys were undertaken from a vehicle and on foot, within or directly adjacent to the proposed clearing footprint. The clearing footprint is as supplied to NRA by GHD on 27 July 2018.

For the purpose of this report, 'weeds' refer to non-native plant species.

2.1 Weed survey

An inventory of weed species encountered within the Project area was maintained. Abundance data was collected for species of management concern, which comprise the following.

- Weeds of National Significance (WoNS).
- 'Prohibited Matter' or 'Restricted Matter' under the Queensland *Biosecurity Act* 2014.
- High priority species listed under local government biosecurity plans and regional pest management plans (TCC 2017, BSC 2016, NQ Dry Tropics 2014).

Abundance was recorded with reference to the Braun-Blanquet cover-abundance scale (Hnatiuk *et al*. 2009). To assist with presentation, the DAFOR[1] scale was applied to the cover/abundance categories (**Table 1**).

Table 1: The Braun-Blanquet cover-abundance scale for estimating species quantities

DAFOR scale[B]	Braun-Blanquet cover-abundance scale[A]		
	Category	Description	Crown cover percentage
D	5	Any number of plants covering more than ¾ of the sample site	>75%
A	4	Any number of plants covering ½ to ¾ of the sample site	50-75%
F	3	Any number of plants covering ¼ to ½ of the sample site	25-50%
O	2	Any number of plants covering from $^1/_{20}$ to ¼ of the sample site	5-25%
R	1	Many individuals that cover $<^1/_{20}$ of the sample site, or scattered with cover up to $^1/_{20}$ of the sample site	<5%

A: Hnatiuk *et al*. (2009).

B: dominant (D), abundant (A), frequent (F), occasional (O) and rare (R).

2.2 Threatened and near threatened flora species survey

Two species of T&NT flora were identified as being likely to occur within the Project area (NRA 2018a):

- Black Ironbox (*Eucalyptus raveretiana*), listed as vulnerable under the EPBC Act
- *Lobelia membranacea*, listed as near threatened under the NC Act.

Flora surveys were conducted in areas of suitable habitat for these species, primarily along the Haughton River and other watercourses in the Project area.

[1] DAFOR: D = dominant, A = abundant, F = frequent, O = occasional, R = rare.

2.3 Fauna breeding place survey

A search for fauna breeding places occurred. Priority was afforded to bird nest locations and mammal breeding places. The locations of trees with hollow-bearing limbs (with hollows >7 cm in diameter) were also recorded. Hollow-bearing trees are a potential roosting/nesting resource for a variety of fauna, including T&NT fauna that are known or predicted to occur in and near the Project area (NRA 2018a).

3. Results

3.1 Weed survey

Sixty-three weed species were identified during the 2018 survey. A consolidated list of weed species observed in the Project area during 2018 and 2015 surveys (NRA 2018a) is provided in **Appendix A**.

Eleven weed species of management concern were recorded within the Project area. These species and their status are presented in **Table 2**. The locations and abundance of each species of management concern within the Project area are presented on **Figures 2a-g**. In addition, Giants Rat's Tail Grass (*Sporobolus pyramidalis*/*natalensis*) is known to have occurred near the Project area, adjacent to Mountview Drive (*pers. comm.* Melissa Green, TCC, Technical Officer, email dated 27 August 2018). Giants Rat's Tail Grass is listed as Category 3 Restricted Matter under the Queensland *Biosecurity Act* 2014 and as high priority under local government biosecurity plans and regional pest management plans.

The Siam Weed (*Chromolaena odorata*) occurrence requires specific mention. This species poses a threat to environmental, agricultural and social values. A single plant was recorded within the Project area, on the northern bank of Major Creek (**Figure 2g**) (-19.591961, 146.925321; GDA94). It is uncommon in areas immediately adjacent to the Project area. The plant contained fertile material (flowers and seed). Specific and immediate management intervention is recommended (see **Section 4**).

Table 2: Weed species of management concern, observed in the Project area during the 2018 weed survey, that are listed under National, State and Local Government legislation and policies, and their status

Species	Common Name	Status				
		WoNS[1]	Biosecurity Act[2]	BDT RPMS[3]	TCC Biosecurity Plan[4]	BSC Biosecurity Plan[5]
Azadirachta indica	Neem Tree	-	-	-	High	Medium
Chromolaena odorata	Siam Weed	-	Category 3	Priority	High	High
Cryptostegia grandiflora	Rubber Vine	X	Category 3	Priority	High	Medium
Hyparrhenia rufa	Thatch Grass	-	-	-	High	-
Lantana camara	Lantana	X	Category 3	Priority	High	-
Leucaena leucocephala	Leucaena	-	-	Priority	Medium	Medium
Senna obtusifolia	Sicklepod	-	-	Priority	High	High
Themeda quadrivalvis	Grader Grass	-	-	-	High	High
Vachellia farnensiana	Mimosa Bush	-	-	Priority	-	-
Xanthium pungens	Noogoora Burr	-	-	Priority	-	-
Ziziphus mauritiana	Chinee Apple	-	Category 3	Priority	High	Medium

[1] WoNS = Weeds of National Significance; 'X' indicates species listed as WoNS.

[2] Biosecurity Act = Queensland *Biosecurity Act* 2014 (restricted matter categories comprise: Category 1, Category 2, Category 3, Category 4, Category 5, and Category 6).

[3] BDT RPMS = Burdekin Dry Tropics Regional Pest Management Strategy 2014 - 2019 (NQ Dry Tropics 2014) (categories comprise: Priority and Alert).

[4] TCC Biosecurity Plan = Townsville Local Government Area Biosecurity Plan 2017 – 2021 (TCC 2017, Draft) (categories comprise: Low, Medium, High, Critical and Alert).

[5] BSC Biosecurity Plan = Burdekin Shire Council Biosecurity Plan 2016-2019 V2.1 (categories comprise: High and Medium).

3.2 Threatened and near threatened flora species survey

It is likely that a single Black Ironbox is present on the northern bank of the Haughton River, within the Project area (**Figure 3**). The tree is mature and appeared to be unhealthy (crown was defoliating). Fruit is needed for definitive identification, and at the time of the survey, access was prohibited to the land upon which the tree occurs. Black Ironbox flowers from December to March, and fruits may be found between March and September (Halford 1997). The fruits are very small (2 mm x 2 mm) (Brooker & Kleinig 2004) and do not persist for long once they have fallen from the tree.

The approximate location of Black Ironbox within the Project area is shown in **Figure 3**. This location was estimated using Google Earth imagery and was not field verified with a GPS; therefore, the location is not precise.

No other T&NT plant species were recorded.

3.3 Fauna breeding place survey

Potential fauna breeding places confirmed during the field survey are described in **Table 3** and shown on **Figure 4**. The purpose of **Figure 4** is to provide a general indication of where potential breeding places occur. Information on individual data points can be obtained from the raw data (**Appendix B**) and GIS data (provided with this report). The breeding places included seven bird nests (raptor or crow nest, finch nests and other species nests), all of which were unattended at the time of the survey. The finch nests were inspected and did not contain eggs or adults. The other nests were too high in trees to permit inspection. The culvert beneath Flinders Highway, adjacent the Project area, was found to contain Fairy Martin (*Petrochelidon ariel*) nests, one of which was being used by a microbat as a roost.

One hundred and ninety-two hollow-bearing trees were recorded during the survey. These hollows are potential roosting/nesting resources for a variety of fauna, including the threatened (NC Act and EPBC Act) Bare-rumped Sheathtail Bat (*Saccolaimus saccolaimus nudicluniatus*), Greater Large-eared Horseshoe Bat (*Rhinolophus philippinensis*) and Black-throated Finch (*Poephila cincta cincta*), which have a 'probable' occurrence in the Project area (NRA 2018a). Each species will have specific tree-hollow preferences *ie* not every hollow will be suitable. Hollow preference is poorly known for the microbat species, though it is likely that these bats prefer large and deep hollows. The preferred hollow size for Black-throated Finches has not been quantified; however, based on observations around Townsville, they appear to prefer hollows that are approximately 7 cm in diameter and at least 15 cm deep (*pers. obs.* Peter Buosi, Principal Ecologist, NRA).

Within areas of suitable habitat for threatened bats (mapping from NRA 2018a), the highest densities of hollow-bearing trees were to the north and south of Major creek, along Mountview Drive, and at the southern-most point of the survey area, adjacent to Black Road (**Figure 4**). Both dead and live trees with hollows were present. Tree species with hollows included:

- Poplar Gum (*Eucalyptus platyphylla*)
- Narrow-leaved Ironbark (*Eucalyptus crebra*)
- Clarkson's Bloodwood (*Corymbia clarksoniana*)
- Dallachy's Gum (*Corymbia dallachiana*)
- Moreton Bay Ash (*Corymbia tessellaris*)
- Beefwood (*Grevillea striata*)
- Paperbark (*Melaleuca* sp.).

NRA (2018a) mapped areas within the Project area with a high and moderate probability of supporting nesting habitat for Black-throated Finch. The hollow-bearing tree data collected during the current study was overlaid onto the potential nesting habitat mapping. This revealed that hollow-bearing trees were not recorded in the areas of high potential nesting habitat, but were present within an area of moderate potential nesting habitat south of Major Creek, along Mountview Drive (**Figure 4**).

Table 3: Fauna nesting places recorded during the survey

ID	Type	Location	Description
N1	Finch nest	<10 m outside of Project area	Nest intact. Either Double-barred Finch (*Taeniopygia bichenovii*) or Zebra Finch (*Taeniopygia guttata)* nest. No eggs. 1.8 m high in Chinee Apple.
N2	Finch nest	Within Project area	Nest intact. Either Double-barred Finch or Zebra Finch nest. No eggs. 1.8 m high in Chinee Apple.
N3	Finch nest	Within Project area	Collapsed Finch nest. Not in use.
N4	Finch nest	Within Project area	Nest intact. Either Double-barred Finch or Black-throated Finch nest. No eggs. 1.8 m high in Chinee Apple.
N5	Crow/Raptor stick nest	Within Project area	Unattended but possibly in use. Fresh Cane Toad (*Rhinella marina*) prey below nest.
N6	Other nest	Within Project area	Two bowl shaped nests, grass/vine weave, built in mistletoe on a Poplar Gum.
N7	Other nest	Within Project area	Bowl shaped nest, grass/vine weave, built in mistletoe on Poplar Gum.

3.4 Survey limitations

The following limitations are relevant to the interpretation of information provided herein.

- The survey occurred during the dry season, following an extended period of little to no rainfall. During these conditions, many plants (including weeds) are inconspicuous and/or lack the necessary vegetative material for identification. The weeds species recorded during the survey reflect the conditions at the time and the effort afforded to the task.
- An estimated 3.5 km stretch of the Project area could not be surveyed due to land access constraints. The area is depicted on **Figures 2a-g** and **4**.
- Searches for tree-hollows and fauna roosting/nesting places occurred from the ground. Roosting/nesting places higher in trees are more difficult to find due to their height and the obscured line of sight caused by tree foliage. Therefore, the search technique is biased towards roosting/nesting places that are nearer to the ground. The locations of fauna breeding places can change over time; therefore, the roosting/nesting places recorded during this survey reflect the conditions at the time and the effort afforded to the task.

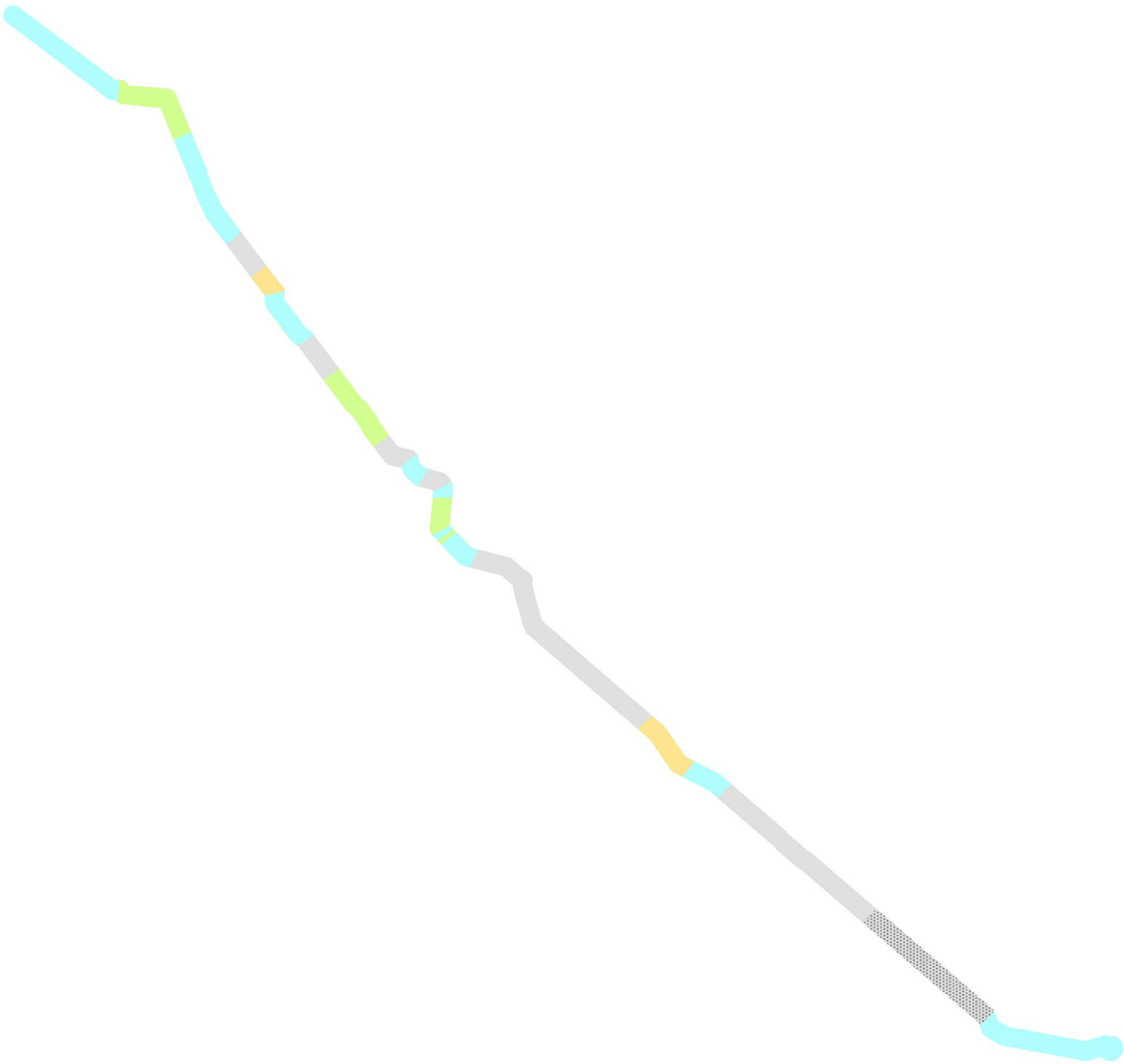

Figure 2a: Occurrence of *Lantana camara* in the Project area

Project: Haughton Pipeline Duplication Project: Supplementary Ecological Surveys (August 2018)

Abundance

- Dominant (>75% cover)
- Abundant (50-75% cover)
- Frequent (25-50% cover)
- Occasional (5-25% cover)
- Rare (<5% cover)
- Absent
- Not surveyed

N

0 6

kilometres

Source:
GHD, Townsville City Council, NRA

NRA Ref: 135035
Date: August 2018

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Recommended print size: A4

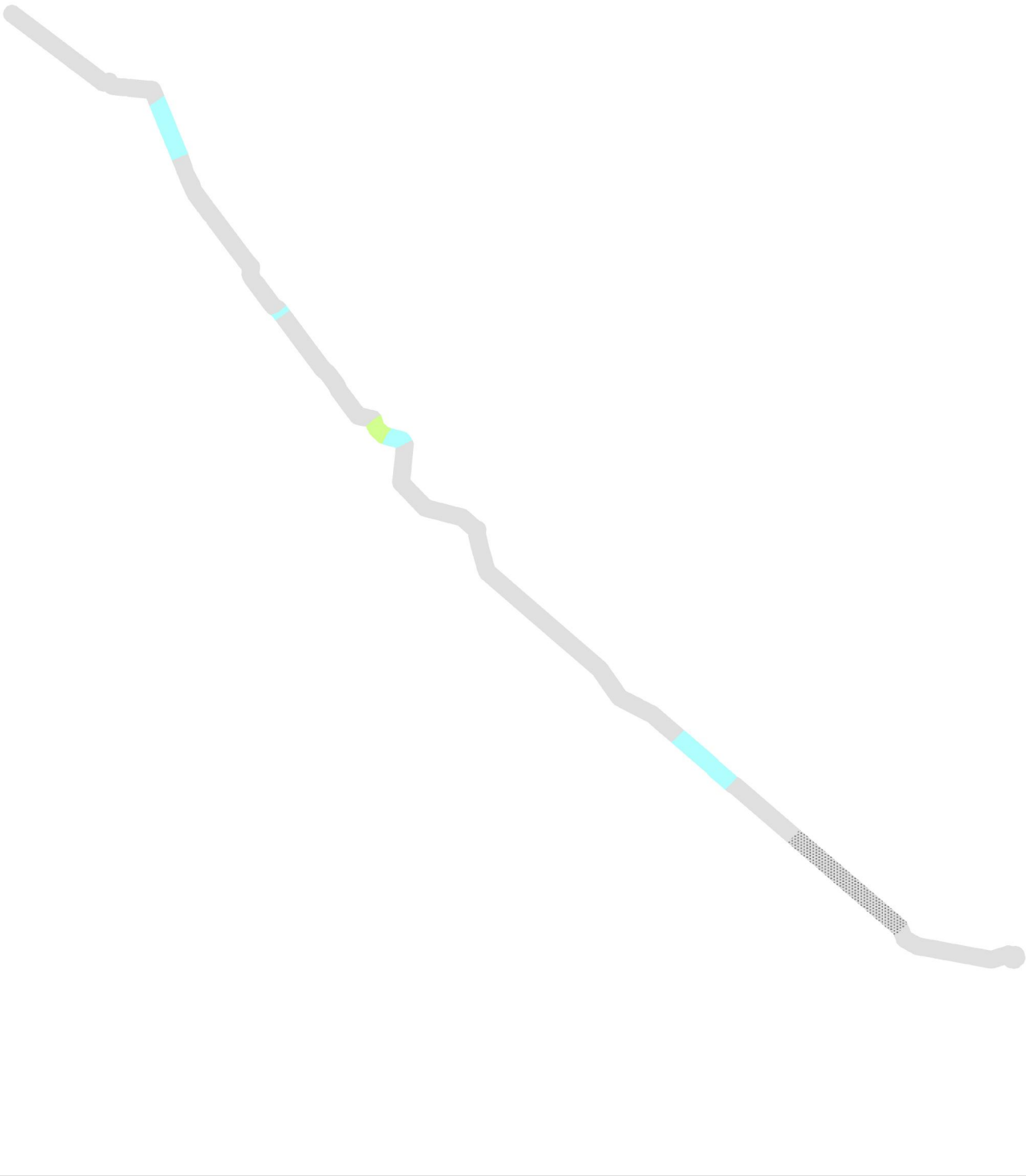

Figure 2b: Occurrence of *Leucaena leucocephala* in the Project area

Project: Haughton Pipeline Duplication Project: Supplementary Ecological Surveys (August 2018)

Abundance
- Dominant (>75% cover)
- Abundant (50-75% cover)
- Frequent (25-50% cover)
- Occasional (5-25% cover)
- Rare (<5% cover)
- Absent
- Not surveyed

N

0 6

kilometres

Source:
GHD, Townsville City Council, NRA

NRA Ref: 135035
Date: August 2018

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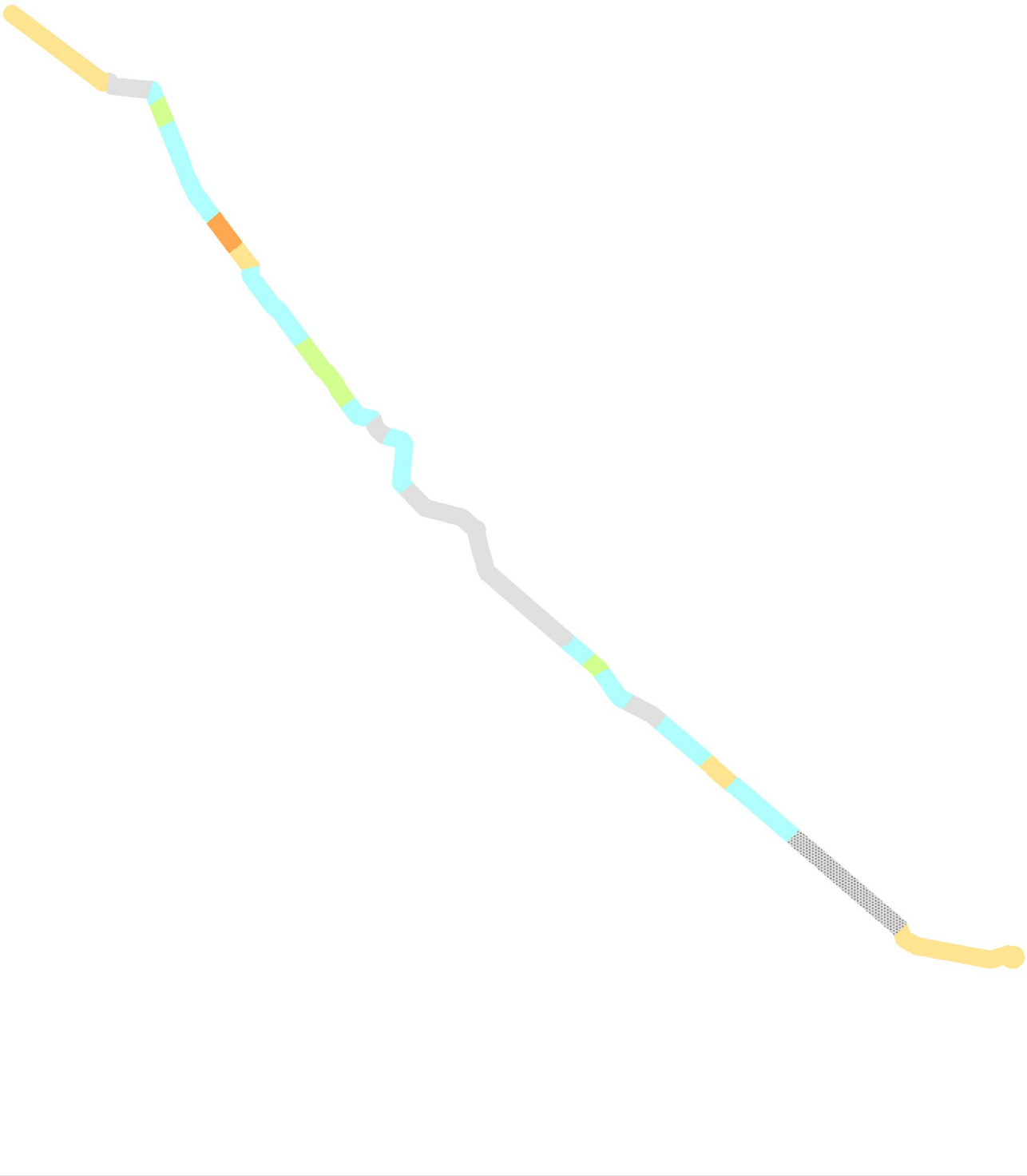

Figure 2c: Occurrence of *Ziziphus mauritiana* in the Project area

Project: Haughton Pipeline Duplication Project: Supplementary Ecological Surveys (August 2018)

Abundance
- Dominant (>75% cover)
- Abundant (50-75% cover)
- Frequent (25-50% cover)
- Occasional (5-25% cover)
- Rare (<5% cover)
- Absent
- Not surveyed

N

0 6

kilometres

Source:
GHD, Townsville City Council, NRA

NRA Ref: 135035
Date: August 2018

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Recommended print size: A4

Figure 2d: Occurrence of *Azadirachta indica* in the Project area

Project: Haughton Pipeline Duplication Project: Supplementary Ecological Surveys (August 2018)

Abundance
- Dominant (>75% cover)
- Abundant (50-75% cover)
- Frequent (25-50% cover)
- Occasional (5-25% cover)
- Rare (<5% cover)
- Absent
- Not surveyed

N

0 6

kilometres

Source:
GHD, Townsville City Council, NRA

NRA Ref: 135035
Date: August 2018

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Recommended print size: A4

Figure 2e: Occurrence of *Cryptostegia grandiflora* in the Project area

Project: Haughton Pipeline Duplication Project: Supplementary Ecological Surveys (August 2018)

Abundance
- Dominant (>75% cover)
- Abundant (50-75% cover)
- Frequent (25-50% cover)
- Occasional (5-25% cover)
- Rare (<5% cover)
- Absent
- Not surveyed

N

0 6

kilometres

Source:
GHD, Townsville City Council, NRA

NRA Ref: 135035
Date: August 2018

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Recommended print size: A4

Figure 2f: Occurrence of *Xanthium pungens* in the Project area

Project: Haughton Pipeline Duplication Project: Supplementary Ecological Surveys (August 2018)

Abundance
- Dominant (>75% cover)
- Abundant (50-75% cover)
- Frequent (25-50% cover)
- Occasional (5-25% cover)
- Rare (<5% cover)
- Absent
- Not surveyed

N

0 6

kilometres

Source:
GHD, Townsville City Council, NRA

NRA Ref: 135035
Date: August 2018

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Recommended print size: A4

Figure 2g: Occurence of other weeds in the Project area

Project: Haughton Pipeline Duplication Project: Supplementary Ecological Surveys (August 2018)

Abundance

- Dominant (>75% cover)
- Abundant (50-75% cover)
- Frequent (25-50% cover)
- Occasional (5-25% cover)
- Rare (<5% cover)
- Absent
- Not surveyed

N

0 6

kilometres

Source:
GHD, Townsville City Council, NRA

NRA Ref: 135035
Date: August 2018

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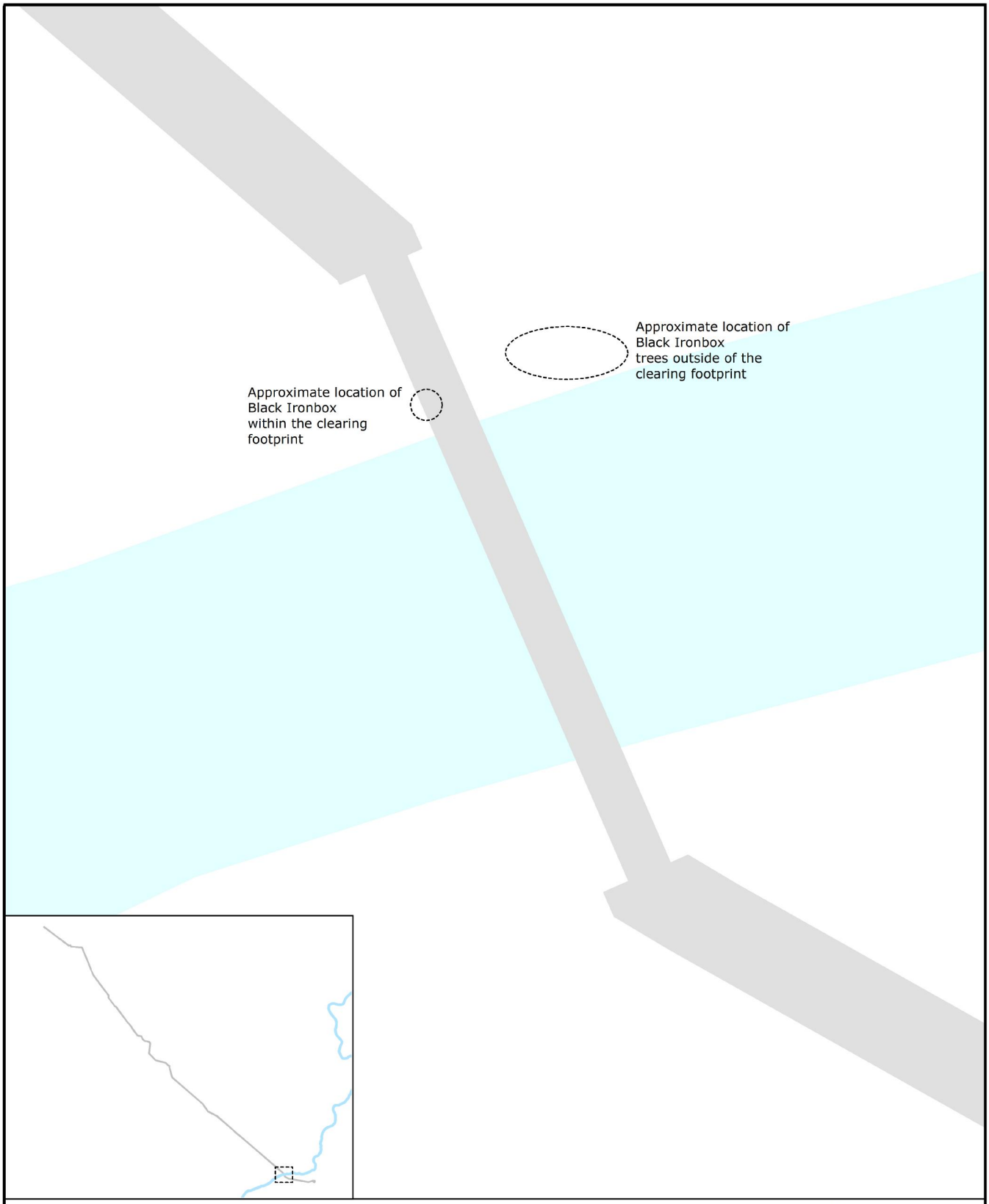

Figure 3: Approximate location of Black Ironbox within and adjacent to the Project area

Project: Haughton Pipeline Duplication Project: Supplementary Ecological Surveys (August 2018)

Proposed HPDP alignment (July 2018)

Haughton River

N

0 100

Metres

Source:
GHD, Townsville City Council, NRA

NRA Ref: 135035
Date: August 2018

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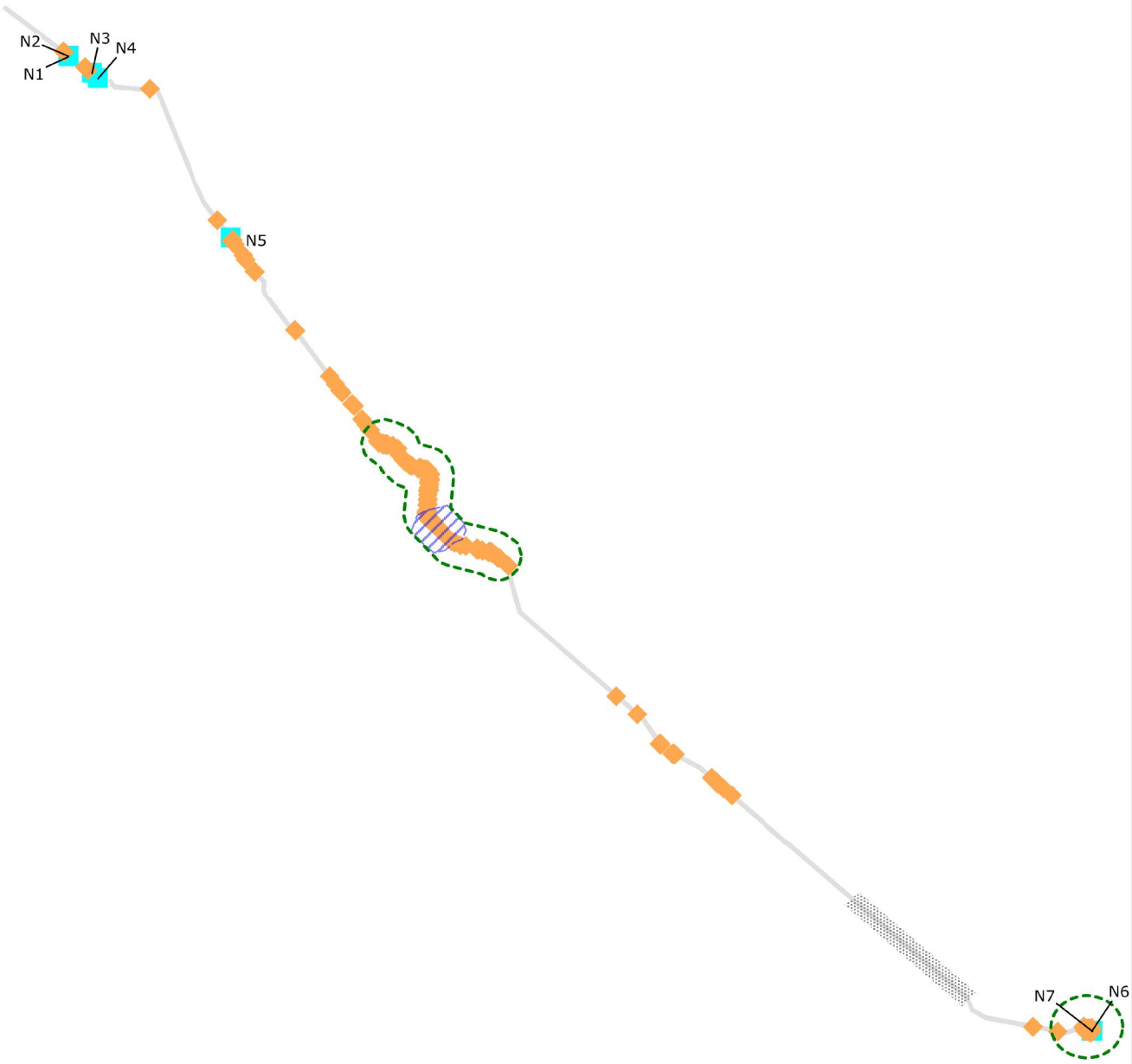

Figure 4: Results of the fauna breeding places survey

Project: Haughton Pipeline Duplication Project: Supplementary Ecological Surveys (August 2018)

Proposed HPDP alignment (July 2018)

Bird nest (N1 - N7 ID as per Table 3)

Hollow-bearing trees

Not surveyed

Suitable habitat for threatened bats; high density of hollow-bearing trees

Moderate potential nesting habitat for Black-throated Finch; hollow-bearing trees present

N

0 6

Kilometres

Source:
GHD, Townsville City Council, NRA

NRA Ref: 135035
Date: August 2018

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4. Summary and Recommendations

The findings of the supplementary surveys are provided below. Recommendations relevant to these findings are also provided. These recommendations should be read in conjunction with NRA (2018a) and NRA (2018b).

4.1 Weeds

The Project area contains several weed species, including species listed under Commonwealth and State legislation or policy, and/or recognised in local and regional polices and plans.

Recommendation 1: The data presented in this report should inform preparation of a Project-specific weed management plan.

Recommendation 2: The Siam Weed plant recorded on the northern bank of Major Creek (**Figure 2g**) requires an immediate management response. At the time of the survey, the plant contained fertile material (flowers and seed). To reduce the risk of Project-related activities spreading seed from this plant, the following actions should occur prior to further Project-related works in that area:

- physical removal, and secure containment, of flower and seed heads
- physical removal of plant, including the root system
- disposal of plant material via incineration or deep burial (>1 m below ground surface) in stable land
- excavation of the top 10 cm of soil from beneath the plant (which may contain Siam Weed seed) and deep burial of soil material (>1 m below ground surface) in stable land.

4.2 Threatened and near threatened flora species

One, mature Black Ironbox, listed as vulnerable under the EPBC Act, is likely to occur within the Project area.

Recommendation 3: Avoid direct impacts to the Black Ironbox on the north bank of the Haughton River. This would involve protecting the Tree Protection Zone (as defined in AS4970-2009) from direct disturbance during construction.

Recommendation 4: If it is not possible to avoid clearing the mature Black Ironbox, it is recommended that the loss of this individual be offset by compensatory plantings. Ideally the planting should occur in the immediate vicinity in suitable riverine habitat and use local seeds and/or cuttings. The planting should be maintained to protect the plants from the impacts of weeds and fire. If this approach is taken, advice should be sought from the Commonwealth Department of the Environment and Energy (DoEE) to confirm whether there are any permitting requirements associated with the removal of a vulnerable tree.

4.3 Fauna breeding places

No active breeding places were confirmed during the survey. Numerous nests and tree-hollows (potential roosting/nesting resource) were recorded. One nest (N4, **Table 3**) and certain tree hollows have the potential to be used by threatened (NC Act and EPBC Act) fauna species.

Recommendation 5: The data presented in this report should inform preparation of a Project-specific Species Management Plan.

Recommendation 6: Wherever possible, large trees with hollows should not be removed as these trees provide potential nesting/roosting sites for a variety of fauna. This will be most achievable for trees on the edge of the clearing footprint. A buffer, at least equivalent to the diameter of the canopy, should be maintained to reduce the risk of root damage. The protection of living hollow-bearing trees has priority over dead hollow-bearing trees.

Recommendation 7: High densities of hollow-bearing trees are present at Mountview Drive (north and south of Major Creek) and at the southern-most point of the survey area, adjacent to Black Road (**Figure 4**). Wherever possible, contraction of the disturbance footprint in these areas to 20 m wide is recommended.

Recommendation 8: The bird nests identified during the survey should be inspected prior to clearing to ascertain if they are being used for breeding. Subsequent management of these nests should be in accordance with the Species Management Plan.

4.4 Other

The Project alignment through Major Creek (north) (**Figure 1**) traverses the main channel and a flood-out channel. Riparian vegetation is present along both of these channels. Currently the reduced (20 m wide) clearing corridor covers the main channel only. It is recommended that the reduced clearing corridor be extended to cover the flood-out channel. This will help protect riparian vegetation and bank stability along the flood-out channel.

Recommendation 9: At Major Creek (north) (**Figure 1**), extend the reduced (20 m wide) clearing corridor approximately 40 m north (to approximately -19.592864, 146.926145 (GDA94)) to protect vegetation and bank stability along the flood-out channel.

5. References

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Appendix A:
Incidental weed species list from the 2018 and 2015 weed surveys

Incidental weed species list from 2018 and 2015 surveys

Species	Common Name	Status				
		WoNS[1]	Biosecurity Act[2]	BDT RPMS[3]	TCC Biosecurity Plan[4]	BSC Biosecurity Plan[5]
Ageratum conyzoides	Billygoat Weed					
Alternanthera ficoidea	Joyweed					
Alternanthera sp.	Joyweed					
Amaranthus sp.	Amaranth					
Annona reticulata	Custard Apple					
Argemone mexicana	Prickly Poppy				Medium	
Argyreia nervosa	Monkey Rose					
Azadirachta indica	Neem Tree				High	Medium
Bidens pilosa						
Bothriochloa pertusa	Indian Couch					
Cascabela thevetia	Yellow Oleander		Category 3	Priority	Medium	
Celosia argentea	Cockscomb					
Cenchrus ciliaris	Buffel Grass				Low	
Cenchrus purpureus	Elephant Grass				Medium	
Chamaecrista rotundifolia var. rotundifolia					Medium	
Chloris inflata	Purpletop Chloris					
Chromolaena odorata	Siam Weed		Category 3	Priority	High	High
Crotalaria goreensis	Gambia Pea					
Crotalaria pallida	Streaked Rattlepod					
Cryptostegia grandiflora	Rubber Vine	X	Category 3	Priority	High	Medium
Cucumis anguria var. anguria	West Indian Gherkin					
Cyperus involucratus	Umbrella Plant				Low	
Delonix regia	Poinciana				Low	
Emilia sonchifolia	Lilac Tasselflower					
Euphorbia heterophylla	Milkweed					
Euphorbia hirta	Asthma Weed					
Gomphrena celosioides	Gomphrena Weed					
Hyparrhenia rufa	Thatch Grass				High	
Jatropha gossypiifolia	Bellyache Bush	X	Category 3	Priority	High	Medium
Lantana camara	Lantana	X	Category 3	Priority	High	
Leucaena leucocephala	Leucaena			Priority	Medium	Medium
Macroptilium atropurpureum	Siratro					

Species	Common Name	Status				
		WoNS[1]	Biosecurity Act[2]	BDT RPMS[3]	TCC Biosecurity Plan[4]	BSC Biosecurity Plan[5]
Macroptilium lathyroides	Phasey Bean					
Malvastrum americanum						
Mangifera indica	Mango				Low	
Megathyrsus maximus	Guinea Grass				Medium	
Melinis repens	Red Natal Grass					
Mesosphaerum suaveolens	Hyptis				Medium	
Mitracarpus hirtus						
Ocinum basilis	Basil					
Passiflora foetida	Stinking Passion Flower				Low	
Physalis sp.	Gooseberry					
Praxelis clematidea	Praxelis				Low	
Ricinus communis	Castor Oil Bush				Medium	
Scoparia dulcis	Scoparia					
Senna obtusifolia	Sicklepod			Priority	High	High
Senna occidentalis	Coffee Senna				Low	
Sida acuta	Spinyhead Sida					
Sida cordifolia	Flannel Weed					
Sida subspicata syn. hackettiana	Spiked Sida					
Solanum nigrum	Black Berry Nightshade					
Solanum torvum	Devil's Fig					
Sporobolus jacquemontii	American Rat's Tail Grass		Category 3	Priority	Medium	Medium
Stachytarpheta jamaicensis	Jamaica Snakeweed			Priority	Low	
Stylosanthes hamata						
Stylosanthes humilis	Townsville Stylo				Low	
Stylosanthes scabra	Shrubby Stylo				Low	
Stylosanthes spp.	Stylo				Low	
Synedrella nodiflora						
Tamarindus sp.	Tamarind				Low	
Themeda quadrivalvis	Grader Grass				High	High
Tribulus terrestris	Goat's Head Burr					
Tridax procumbens	Tridax Daisy					
Triumfetta rhomboidea	Chinese burr				Low	
Urena lobata	Urena weed					
Urochloa mosambicensis	Sabi Grass					

Species	Common Name	Status				
		WoNS[1]	Biosecurity Act[2]	BDT RPMS[3]	TCC Biosecurity Plan[4]	BSC Biosecurity Plan[5]
Vachellia farnesiana	Mimosa Bush			Priority		
Xanthium pungens	Noogoora Burr			Priority		
Ziziphus mauritiana	Chinee Apple		Category 3	Priority	High	Medium

[1] WoNS = Weeds of National Significance; 'X' indicates species listed as WoNS.

[2] Biosecurity Act = Queensland *Biosecurity Act* 2014 (restricted matter categories comprise: Category 1, Category 2, Category 3, Category4, Category 5, and Category 6).

[3] BDT RPMS = Burdekin Dry Tropics Regional Pest Management Strategy 2014 - 2019 (NQ Dry Tropics 2014) (categories comprise: Priority and Alert).

[4] TCC Biosecurity Plan. Townsville Local Government Area Biosecurity Plan 2017 – 2021 (TCC 2017, Draft) (categories comprise: Low, Medium, High, Critical and Alert).

[5] BSC Biosecurity Plan = Burdekin Shire Council Biosecurity Plan 2016-2019 V2.1 (BSC undated) (categories comprise: High and Medium).

Appendix B:
Locations of potential fauna breeding places

Appendix B: Locations of potential fauna breeding places

Number	Latitude	Longitude	Type of Breeding Place[1]	Tree Species	ID[2]
1	-19.5101	146.8532	Bird Nest (Finch)	*Ziziphus mauritiana*	N1
2	-19.51	146.8532	Bird Nest (Finch)	*Ziziphus mauritiana*	N2
3	-19.5135	146.8584	Bird Nest (Finch)	*Ziziphus mauritiana*	N3
4	-19.5146	146.8596	Bird Nest (Finch)	*Ziziphus mauritiana*	N4
5	-19.5473	146.8885	Bird Nest (Raptor/Crow)	*Eucalyptus platyphylla*	N5
6	-19.7101	147.076	Bird Nest (Other)	*Eucalyptus platyphylla*	N6
7	-19.7101	147.0762	Bird Nest (Other)	*Eucalyptus platyphylla*	N7
8	-19.5153	146.8622	Bat Roost/Bird Nest (Fairy Martin)	-	
9	-19.5168	146.8709	HB Tree	*Corymbia clarksoniana*	
10	-19.5929	146.9261	HB Tree	*Corymbia clarksoniana*	
11	-19.5946	146.93	HB Tree	*Corymbia clarksoniana*	
12	-19.5958	146.932	HB Tree	*Corymbia clarksoniana*	
13	-19.6533	146.9853	HB Tree	*Corymbia clarksoniana*	
14	-19.6118	146.9452	HB Tree	*Corymbia clarksoniana*	
15	-19.6033	146.9313	HB Tree	*Corymbia clarksoniana*	
16	-19.6034	146.9313	HB Tree	*Corymbia clarksoniana*	
17	-19.5091	146.8521	HB Tree	*Corymbia clarksoniana*	
18	-19.6593	146.9946	HB Tree	*Corymbia dallachiana*	
19	-19.5664	146.9027	HB Tree	*Corymbia tessellaris*	
20	-19.6533	146.985	HB Tree	*Corymbia tessellaris*	
21	-19.6451	146.9771	HB Tree	*Corymbia tessellaris*	
22	-19.6532	146.985	HB Tree	Dead tree	
23	-19.6532	146.9847	HB Tree	Dead tree	
24	-19.6116	146.9434	HB Tree	Dead tree	
25	-19.6084	146.9353	HB Tree	Dead tree	
26	-19.606	146.933	HB Tree	Dead tree	
27	-19.6059	146.9328	HB Tree	Dead tree	
28	-19.6052	146.9318	HB Tree	Dead tree	
29	-19.6022	146.9313	HB Tree	Dead tree	
30	-19.6019	146.9315	HB Tree	Dead tree	
31	-19.6001	146.9315	HB Tree	Dead tree	
32	-19.5989	146.9317	HB Tree	Dead tree	
33	-19.6146	146.949	HB Tree	*Eucalyptus crebra*	
34	-19.6111	146.9422	HB Tree	*Eucalyptus crebra*	
35	-19.6106	146.9397	HB Tree	*Eucalyptus crebra*	
36	-19.6083	146.9351	HB Tree	*Eucalyptus crebra*	
37	-19.605	146.9319	HB Tree	*Eucalyptus crebra*	
38	-19.6012	146.9315	HB Tree	*Eucalyptus crebra*	
39	-19.5437	146.8857	HB Tree	*Eucalyptus platyphylla*	
40	-19.5478	146.8891	HB Tree	*Eucalyptus platyphylla*	
41	-19.5487	146.8894	HB Tree	*Eucalyptus platyphylla*	
42	-19.5518	146.8918	HB Tree	*Eucalyptus platyphylla*	
43	-19.5519	146.8918	HB Tree	*Eucalyptus platyphylla*	
44	-19.5543	146.8938	HB Tree	*Eucalyptus platyphylla*	
45	-19.5542	146.8937	HB Tree	*Eucalyptus platyphylla*	
46	-19.548	146.8888	HB Tree	*Eucalyptus platyphylla*	
47	-19.5509	146.8913	HB Tree	*Eucalyptus platyphylla*	
48	-19.5663	146.9025	HB Tree	*Eucalyptus platyphylla*	
49	-19.5758	146.9101	HB Tree	*Eucalyptus platyphylla*	
50	-19.5773	146.9114	HB Tree	*Eucalyptus platyphylla*	
51	-19.5786	146.9124	HB Tree	*Eucalyptus platyphylla*	
52	-19.5787	146.9125	HB Tree	*Eucalyptus platyphylla*	
53	-19.5788	146.9125	HB Tree	*Eucalyptus platyphylla*	
54	-19.5791	146.9128	HB Tree	*Eucalyptus platyphylla*	
55	-19.5814	146.915	HB Tree	*Eucalyptus platyphylla*	

Number	Latitude	Longitude	Type of Breeding Place[1]	Tree Species	ID[2]
56	-19.5815	146.9151	HB Tree	*Eucalyptus platyphylla*	
57	-19.5818	146.9154	HB Tree	*Eucalyptus platyphylla*	
58	-19.5846	146.9171	HB Tree	*Eucalyptus platyphylla*	
59	-19.5857	146.918	HB Tree	*Eucalyptus platyphylla*	
60	-19.5867	146.9189	HB Tree	*Eucalyptus platyphylla*	
61	-19.5867	146.9188	HB Tree	*Eucalyptus platyphylla*	
62	-19.5868	146.9189	HB Tree	*Eucalyptus platyphylla*	
63	-19.589	146.9206	HB Tree	*Eucalyptus platyphylla*	
64	-19.589	146.9207	HB Tree	*Eucalyptus platyphylla*	
65	-19.5891	146.9207	HB Tree	*Eucalyptus platyphylla*	
66	-19.5894	146.9208	HB Tree	*Eucalyptus platyphylla*	
67	-19.5895	146.9217	HB Tree	*Eucalyptus platyphylla*	
68	-19.5898	146.9217	HB Tree	*Eucalyptus platyphylla*	
69	-19.5897	146.9219	HB Tree	*Eucalyptus platyphylla*	
70	-19.5897	146.9221	HB Tree	*Eucalyptus platyphylla*	
71	-19.5896	146.9223	HB Tree	*Eucalyptus platyphylla*	
72	-19.5899	146.9226	HB Tree	*Eucalyptus platyphylla*	
73	-19.5897	146.9226	HB Tree	*Eucalyptus platyphylla*	
74	-19.5897	146.9228	HB Tree	*Eucalyptus platyphylla*	
75	-19.5899	146.9238	HB Tree	*Eucalyptus platyphylla*	
76	-19.5906	146.9249	HB Tree	*Eucalyptus platyphylla*	
77	-19.5928	146.9263	HB Tree	*Eucalyptus platyphylla*	
78	-19.5932	146.9266	HB Tree	*Eucalyptus platyphylla*	
79	-19.5934	146.9266	HB Tree	*Eucalyptus platyphylla*	
80	-19.5939	146.9276	HB Tree	*Eucalyptus platyphylla*	
81	-19.594	146.9275	HB Tree	*Eucalyptus platyphylla*	
82	-19.5941	146.928	HB Tree	*Eucalyptus platyphylla*	
83	-19.5947	146.9294	HB Tree	*Eucalyptus platyphylla*	
84	-19.5945	146.9298	HB Tree	*Eucalyptus platyphylla*	
85	-19.5945	146.9299	HB Tree	*Eucalyptus platyphylla*	
86	-19.5949	146.9303	HB Tree	*Eucalyptus platyphylla*	
87	-19.595	146.9303	HB Tree	*Eucalyptus platyphylla*	
88	-19.5948	146.9306	HB Tree	*Eucalyptus platyphylla*	
89	-19.5949	146.9309	HB Tree	*Eucalyptus platyphylla*	
90	-19.5949	146.9313	HB Tree	*Eucalyptus platyphylla*	
91	-19.5949	146.9314	HB Tree	*Eucalyptus platyphylla*	
92	-19.595	146.9315	HB Tree	*Eucalyptus platyphylla*	
93	-19.5952	146.9314	HB Tree	*Eucalyptus platyphylla*	
94	-19.5953	146.9316	HB Tree	*Eucalyptus platyphylla*	
95	-19.5957	146.9319	HB Tree	*Eucalyptus platyphylla*	
96	-19.5958	146.932	HB Tree	*Eucalyptus platyphylla*	
97	-19.596	146.932	HB Tree	*Eucalyptus platyphylla*	
98	-19.5967	146.932	HB Tree	*Eucalyptus platyphylla*	
99	-19.5968	146.9318	HB Tree	*Eucalyptus platyphylla*	
100	-19.597	146.932	HB Tree	*Eucalyptus platyphylla*	
101	-19.597	146.932	HB Tree	*Eucalyptus platyphylla*	
102	-19.5971	146.932	HB Tree	*Eucalyptus platyphylla*	
103	-19.5972	146.9318	HB Tree	*Eucalyptus platyphylla*	
104	-19.5975	146.9318	HB Tree	*Eucalyptus platyphylla*	
105	-19.5976	146.9317	HB Tree	*Eucalyptus platyphylla*	
106	-19.5979	146.9319	HB Tree	*Eucalyptus platyphylla*	
107	-19.613	146.9471	HB Tree	*Eucalyptus platyphylla*	
108	-19.613	146.9468	HB Tree	*Eucalyptus platyphylla*	
109	-19.6128	146.9465	HB Tree	*Eucalyptus platyphylla*	
110	-19.6125	146.9462	HB Tree	*Eucalyptus platyphylla*	
111	-19.6617	146.9977	HB Tree	*Eucalyptus platyphylla*	
112	-19.6603	146.9959	HB Tree	*Eucalyptus platyphylla*	

Number	Latitude	Longitude	Type of Breeding Place[1]	Tree Species	ID[2]
113	-19.6593	146.9946	HB Tree	*Eucalyptus platyphylla*	
114	-19.659	146.9944	HB Tree	*Eucalyptus platyphylla*	
115	-19.6589	146.9942	HB Tree	*Eucalyptus platyphylla*	
116	-19.659	146.9942	HB Tree	*Eucalyptus platyphylla*	
117	-19.6581	146.9933	HB Tree	*Eucalyptus platyphylla*	
118	-19.6514	146.9821	HB Tree	*Eucalyptus platyphylla*	
119	-19.6512	146.9819	HB Tree	*Eucalyptus platyphylla*	
120	-19.6511	146.9821	HB Tree	*Eucalyptus platyphylla*	
121	-19.612	146.9455	HB Tree	*Eucalyptus platyphylla*	
122	-19.6118	146.9454	HB Tree	*Eucalyptus platyphylla*	
123	-19.6117	146.9449	HB Tree	*Eucalyptus platyphylla*	
124	-19.6119	146.9447	HB Tree	*Eucalyptus platyphylla*	
125	-19.6114	146.9432	HB Tree	*Eucalyptus platyphylla*	
126	-19.6113	146.9425	HB Tree	*Eucalyptus platyphylla*	
127	-19.6113	146.9421	HB Tree	*Eucalyptus platyphylla*	
128	-19.6104	146.9386	HB Tree	*Eucalyptus platyphylla*	
129	-19.6099	146.9374	HB Tree	*Eucalyptus platyphylla*	
130	-19.6099	146.9372	HB Tree	*Eucalyptus platyphylla*	
131	-19.6096	146.9366	HB Tree	*Eucalyptus platyphylla*	
132	-19.6067	146.9337	HB Tree	*Eucalyptus platyphylla*	
133	-19.6063	146.933	HB Tree	*Eucalyptus platyphylla*	
134	-19.6063	146.9331	HB Tree	*Eucalyptus platyphylla*	
135	-19.6054	146.9326	HB Tree	*Eucalyptus platyphylla*	
136	-19.6057	146.9324	HB Tree	*Eucalyptus platyphylla*	
137	-19.6059	146.9326	HB Tree	*Eucalyptus platyphylla*	
138	-19.6059	146.9327	HB Tree	*Eucalyptus platyphylla*	
139	-19.606	146.9327	HB Tree	*Eucalyptus platyphylla*	
140	-19.6053	146.9318	HB Tree	*Eucalyptus platyphylla*	
141	-19.6049	146.932	HB Tree	*Eucalyptus platyphylla*	
142	-19.6049	146.9317	HB Tree	*Eucalyptus platyphylla*	
143	-19.6039	146.9312	HB Tree	*Eucalyptus platyphylla*	
144	-19.6037	146.9313	HB Tree	*Eucalyptus platyphylla*	
145	-19.6036	146.9312	HB Tree	*Eucalyptus platyphylla*	
146	-19.6034	146.9313	HB Tree	*Eucalyptus platyphylla*	
147	-19.6034	146.9313	HB Tree	*Eucalyptus platyphylla*	
148	-19.6034	146.9312	HB Tree	*Eucalyptus platyphylla*	
149	-19.6033	146.9313	HB Tree	*Eucalyptus platyphylla*	
150	-19.6032	146.9314	HB Tree	*Eucalyptus platyphylla*	
151	-19.602	146.9315	HB Tree	*Eucalyptus platyphylla*	
152	-19.6011	146.9315	HB Tree	*Eucalyptus platyphylla*	
153	-19.6009	146.9315	HB Tree	*Eucalyptus platyphylla*	
154	-19.5994	146.9316	HB Tree	*Eucalyptus platyphylla*	
155	-19.5992	146.9315	HB Tree	*Eucalyptus platyphylla*	
156	-19.5992	146.9316	HB Tree	*Eucalyptus platyphylla*	
157	-19.599	146.9316	HB Tree	*Eucalyptus platyphylla*	
158	-19.5989	146.9316	HB Tree	*Eucalyptus platyphylla*	
159	-19.5989	146.9317	HB Tree	*Eucalyptus platyphylla*	
160	-19.5991	146.9318	HB Tree	*Eucalyptus platyphylla*	
161	-19.5991	146.9318	HB Tree	*Eucalyptus platyphylla*	
162	-19.5992	146.9318	HB Tree	*Eucalyptus platyphylla*	
163	-19.5992	146.9317	HB Tree	*Eucalyptus platyphylla*	
164	-19.5986	146.9317	HB Tree	*Eucalyptus platyphylla*	
165	-19.5985	146.9318	HB Tree	*Eucalyptus platyphylla*	
166	-19.5129	146.8574	HB Tree	*Eucalyptus platyphylla*	
167	-19.5129	146.8575	HB Tree	*Eucalyptus platyphylla*	
168	-19.5124	146.8568	HB Tree	*Eucalyptus platyphylla*	
169	-19.5123	146.8569	HB Tree	*Eucalyptus platyphylla*	

Number	Latitude	Longitude	Type of Breeding Place[1]	Tree Species	ID[2]
170	-19.5092	146.8523	HB Tree	*Eucalyptus platyphylla*	
171	-19.7101	147.0752	HB Tree	*Eucalyptus platyphylla*	
172	-19.7101	147.0753	HB Tree	*Eucalyptus platyphylla*	
173	-19.7101	147.0753	HB Tree	*Eucalyptus platyphylla*	
174	-19.7102	147.0755	HB Tree	*Eucalyptus platyphylla*	
175	-19.7102	147.0758	HB Tree	*Eucalyptus platyphylla*	
176	-19.7103	147.0758	HB Tree	*Eucalyptus platyphylla*	
177	-19.7103	147.0758	HB Tree	*Eucalyptus platyphylla*	
178	-19.7105	147.0757	HB Tree	*Eucalyptus platyphylla*	
179	-19.7104	147.0758	HB Tree	*Eucalyptus platyphylla*	
180	-19.7103	147.0759	HB Tree	*Eucalyptus platyphylla*	
181	-19.7103	147.076	HB Tree	*Eucalyptus platyphylla*	
182	-19.7101	147.076	HB Tree	*Eucalyptus platyphylla*	
183	-19.7099	147.0759	HB Tree	*Eucalyptus platyphylla*	
184	-19.7094	147.076	HB Tree	*Eucalyptus platyphylla*	
185	-19.7097	147.076	HB Tree	*Eucalyptus platyphylla*	
186	-19.7098	147.0758	HB Tree	*Eucalyptus platyphylla*	
187	-19.7095	147.0756	HB Tree	*Eucalyptus platyphylla*	
188	-19.7096	147.0755	HB Tree	*Eucalyptus platyphylla*	
189	-19.7096	147.0754	HB Tree	*Eucalyptus platyphylla*	
190	-19.7095	147.0753	HB Tree	*Eucalyptus platyphylla*	
191	-19.7096	147.0752	HB Tree	*Eucalyptus platyphylla*	
192	-19.7102	147.0747	HB Tree	*Eucalyptus platyphylla*	
193	-19.7099	147.0746	HB Tree	*Eucalyptus platyphylla*	
194	-19.7091	147.0743	HB Tree	*Eucalyptus platyphylla*	
195	-19.7093	147.0742	HB Tree	*Eucalyptus platyphylla*	
196	-19.7102	147.0687	HB Tree	*Eucalyptus platyphylla*	
197	-19.7092	147.0633	HB Tree	*Eucalyptus platyphylla*	
198	-19.7092	147.0632	HB Tree	*Eucalyptus platyphylla*	
199	-19.6414	146.9725	HB Tree	*Grevillea striata*	
200	-19.5917	146.9252	HB Tree	*Melaleuca sp.*	

[1] HB Tree = Hollow-bearing tree
[2] ID = relates to the labels used in Table 3 and on Figure 4 of the report.

Environmental Approval & Compliance Solutions

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Certified Integrated Management System: AS/NZS ISO 9001:2015 (Quality), AS/NZS ISO 14001:2015 (Environment), AS/NZS 4801:2001 (Safety).