



CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

Purpose Permit number:	CPS 8191/1
Permit Holder:	Water Corporation
Duration of Permit:	From 28 July 2020 to 28 July 2035

The Permit Holder is authorised to clear native vegetation subject to the following conditions of this Permit.

1. Purpose for which clearing may be done

Clearing for the purpose of upgrading the Vasse Diversion Drain, including the reconstruction of the Vasse Diversion Dam and duplication of the culverts.

2. Land on which clearing is to be done

Lot 866 on Diagram 4170 (Crown reserve 16061), West Busselton
Lot 80 on Deposited Plan 70429, Bovell
Lot 61 on Plan 5399, West Busselton
Lot 59 on Plan 5399, West Busselton
Lot 58 on Plan 5399, Bovell
Lot 57 on Plan 5399 (Crown reserve 16061), West Busselton
Lot 56 on Plan 9868, Bovell
Lot 56 on Plan 9868, West Busselton
Lot 56 on Plan 5399, Bovell
Lot 55 on Plan 9868, West Busselton
Lot 553 on Plan 23463 (Crown reserve 48018), West Busselton
Lot 5337 on Plan 23318, Bovell
Lot 5210 on Plan 22191 (Crown reserve 45170), West Busselton
Lot 5209 on Plan 22630 (Crown reserve 45170), West Busselton
Lot 5190 on Deposited Plan 220139 (Crown reserve 41460), West Busselton
Lot 5136 on Diagram 42478 (Crown reserve 45588), Bovell
Lot 5068 on Plan 20855 (Crown reserve 44380), Busselton
Lot 5067 on Plan 20770 (Crown reserve 43250), West Busselton
Lot 5067 on Plan 20362 (Crown reserve 43250), West Busselton
Lot 505 on Deposited Plan 417589, West Busselton
Lot 501 on Deposited Plan 417589, West Busselton
Lot 4989 on Plan 18644 (Crown reserve 43250), West Busselton
Lot 4607 on Diagram 40995, West Busselton
Lot 4348 on Diagram 27395 (Crown reserve 26555), West Busselton
Lot 2594 on Deposited Plan 400537 (Crown Reserve 52132), West Busselton
Lot 2593 on Deposited Plan 400537 (Crown Reserve 52132), West Busselton
Lot 1 on Diagram 39001, West Busselton

Lot 100 on Diagram 9165, Bovell
Unallocated Crown Land (PIN 11993547), Bovell
Water Feature (PIN 11725451), Bovell
Road Reserve - 1172836, West Busselton
Road Reserve - 11440716, West Busselton
Road Reserve - 1183896, West Busselton
Deposited Plan 37514 - Easement J140752 (5067)
Deposited Plan 37514 - Easement J140752 (5209)
Deposited Plan 37514 - Easement J140752 (5210)

3. Area of clearing

The Permit Holder must not clear more than 2.16 hectares of native vegetation within the area hatched yellow on attached Plan 8191/1a and 8191/1b.

4. Period in which clearing is authorised

The Permit Holder shall not clear any native vegetation after 28 July 2025.

5. Application

This Permit allows the Permit Holder to authorise persons, including employees, contractors and agents of the Permit Holder, to clear native vegetation for the purposes of this Permit subject to compliance with the conditions of this Permit and approval from the Permit Holder.

6. Type of clearing authorised

This Permit authorises the Permit Holder to clear native vegetation for the *project activities* described in condition 1 of this Permit to the extent that the Permit Holder has the power to carry out works involving clearing for those *project activities* under the *Water Corporation Act 1995* or any other written law.

7. Avoid, minimise and reduce the impacts and extent of clearing

In determining the amount of native vegetation to be cleared authorised under this Permit, the Permit Holder must have regard to the following principles, set out in order of preference:

- (a) avoid the clearing of native vegetation;
- (b) minimise the amount of native vegetation to be cleared; and
- (c) reduce the impact of clearing on any environmental value.

8. Dieback and weed management

When undertaking any clearing authorised under this Permit, the Permit Holder must take the following steps to minimise the risk of the introduction and spread of *weeds* and *dieback*:

- (a) clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;
- (b) ensure that no known *dieback* or *weed*-affected soil, *mulch*, *fill* or other material is brought into the area to be cleared; and
- (c) restrict the movement of machines and other vehicles to the limits of the areas to be cleared.

9. Flora management – *Caladenia procera*

- (a) Prior to undertaking any clearing, the Permit Holder must engage a *botanist* to conduct a *targeted flora survey* within *suitable habitat(a)* within the areas cross-hatched yellow on attached Plan 8191/1a for the presence of *Caladenia procera*;
- (b) The Permit Holder shall ensure no clearing of any *Caladenia procera* individuals identified through the surveys required by condition 9(a);
- (c) The Permit Holder shall ensure that no clearing occurs within 10 metres of *Caladenia procera* individuals identified through the surveys required by condition 9(a), unless the clearing is done in accordance with condition 9(d) of this Permit;
- (d) Where clearing within 10 metres of individuals of *Caladenia procera* is unavoidable, the Permit Holder must:

- (i) install clearly demarked temporary fencing around the individuals of *Caladenia procera* prior to undertaking any clearing and maintain the fencing until the *project activities* have ceased; and
 - (ii) Adhere to the Flora Management Plan required under condition 10 which has been approved by the *CEO*.
- (e) Within two months of undertaking any clearing authorised under this Permit within the areas cross-hatched yellow on Plan 8191/1a, the Permit Holder must provide the results of the *targeted flora survey*, as required by condition 9(a), in a report to the *CEO*; and
- (f) If *Caladenia procera* are identified within 10 metres of the areas cross-hatched yellow on Plan 8191/1a, the *targeted flora survey* report must include the following:
- (i) the location of each *Caladenia procera* identified under condition 9(a), either as the location of individual plants, or where this is not practical, the areal extent of the population and an estimate of the number of plants, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings or decimal degrees;
 - (ii) map/s showing the location of any identified population of *Caladenia procera* cleared and the remaining population; and
 - (iii) the methodology used to survey the Permit area.

10. Flora Management Plan

Where clearing within 10 metres of individuals of *Caladenia procera* is unavoidable, the Permit Holder must submit a Flora Management Plan to the *CEO* for approval, prior to clearing commencing. The management plan must contain the following:

- (i) Details of the Permit Holder's attempts to avoid and minimise impacts to *Caladenia procera*; and
- (ii) Proposed methods of minimising and mitigating any indirect impacts to *Caladenia procera*.

11. Fauna management – other approvals

Prior to clearing, the Permit Holder must provide to the *CEO*:

- (a) a copy of the fauna licence(s) obtained under the *Biodiversity Conservation Act 2016* for the *relocation* and/or *translocation* of Carter's freshwater mussel (*Westralunio carteri*) and the dispersion of western ringtail possum (*Pseudocheirus occidentalis*) individuals; and
- (b) a copy of the approved exemption from the Department of Primary Industries and Regional Development under the *Fish Resources Management Act 1994* and *Fish Resources Management Regulations 1995* for the collection of Carter's freshwater mussel for translocation.

12. Fauna management – Carter's freshwater mussel

(a) Prior to commencement of any clearing activities authorised under this Permit, the Permit Holder must submit a Carter's freshwater mussel (*Westralunio carteri*) Management Plan to the *CEO* for approval. The management plan must contain the following:

- (i) Removal, transportation and *relocation* method, and where required, temporary storage method;
- (ii) Location of the *relocation* site, including a field assessment confirming the suitability of the *relocation* site;
- (iii) Stocking densities; and
- (iv) The success rate monitoring plan.

13. Fauna management – western ringtail possum

- (a) In relation to the area cross-hatched yellow on attached Plans 8191/1a and 8191/1b, the Permit Holder must engage a *fauna specialist* to inspect that area, including all trees and tree hollows present, within 24 hours prior to, and for the duration of clearing, for the presence of western ringtail possum(s) (*Pseudocheirus occidentalis*).
- (b) Clearing must cease in any area where fauna referred to in condition 13(a) above are identified until the western ringtail possum(s) has moved out of the development area to adjoining *suitable habitat*(b).
- (c) Where fauna is identified under condition 13(a) of this Permit, the Permit Holder must provide the following records to the *CEO* as soon as practicable:

- (i) the number of individuals identified;
- (ii) the date each individual was identified;
- (iii) the location where each individual was identified recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings or decimal degrees;
- (iv) the number of individuals displaced;
- (v) the relevant qualifications of the *fauna specialist* undertaking the displacement;
- (vi) the date each individual was displaced;
- (vii) the method of dispersal;
- (viii) the date each individual was dispersed;
- (ix) the location where each individual dispersed to, recorded using a GPS unit set to GDA94, expressing the geographical coordinates in Eastings and Northings or decimal degrees; and
- (x) details pertaining to the circumstances of any death of, or injury sustained by, an individual.

14. Fauna management – western ringtail possum rope bridges

Prior to commencement of any clearing activities authorised under this Permit, the Permit Holder must at a minimum install six rope bridges within the area cross-hatched red on the attached Plan 8191/1c, in accordance with the following requirements:

- (i) the end of each rope bridge must be connected to at least two mature trees, or two different locations in the canopy of a single mature tree, at a height of at least three metres above ground level;
- (ii) the rope bridges must be placed in areas that provide canopy connectivity for western ringtail possum movement across the local area, i.e. across roadways and other gaps in the canopy;
- (iii) be monitored annually and maintained for a period of at least ten years; and
- (iv) Within two months of undertaking any clearing authorised under this Permit within the combined areas cross-hatched yellow on Plan 8191/1a and 8191/1b, the Permit Holder must provide to the *CEO*, the locations where each rope bridge was placed using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings or decimal degrees.

15. Fauna management – western ringtail possum nest boxes

Prior to commencement of any clearing activities authorised under this Permit, the Permit Holder must, at a minimum, install 12 nest boxes within the area cross-hatched red on the attached Plan 8191/1c, in accordance with the following requirements:

- (i) be designed and placed in accordance with the specifications detailed in the Project Revegetation Plan required by condition 17(a);
- (ii) be placed at least three metres above ground level in a mature tree facing the shadiest side of the tree;
- (iii) be monitored annually and maintained for a period of at least ten years; and
- (iv) within two months of undertaking any clearing authorised under this Permit within the combined areas cross-hatched yellow on Plan 8191/1a, the Permit Holder must provide to the *CEO*, the locations where each nest box was placed using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings or decimal degrees.

16. Revegetation and rehabilitation – mitigation

- (a) Within 12 months of the commencement of clearing, the Permit Holder must undertake revegetation within 0.55 hectares of the area hatched red on attached Plan 8191/1d in accordance with condition 17 of this permit.

17. Offset – revegetation and rehabilitation

- (a) Within 3 months of clearing commencing, the Permit Holder must submit a Project Revegetation Plan to the *CEO* for approval for the *revegetation* of 10.34 hectares of land within the areas cross-hatched red on Plan 8191/1e, which shall be developed in accordance with *A Guide to Preparing Revegetation Plans for Clearing Permits* (Department of Water and Environmental Regulation (DWER) 2018).
- (b) The Project Revegetation Plan must be prepared by an *environmental specialist*.
- (c) The Project Revegetation Plan must include the following:
- (i) *site preparation*;
 - (ii) deliberate planting of native vegetation that will provide *suitable habitat(b)* for western ringtail possum;
 - (iii) deliberate planting of species associated with the *Eucalyptus rudis* (flooded gum), *Corymbia calophylla*, *Agonis flexuosa* Closed Low Forest (near Busselton) priority ecological community (PEC) in areas as outlined in the Project Revegetation Plan;
 - (iv) deliberate planting of up to 300 seedlings of *Conospermum caeruleum var.* Busselton;
 - (v) planting of *local provenance* native understorey species at an *optimal time* so as to achieve the *completion criteria* specified in condition 17(a)(xii) below;
 - (vi) a biannual weed control program within the area hatched red on Plan 8191/1e to achieve the *completion criteria* outline under condition 17(a)(xii), criterion 2;
 - (vii) establishment of a total of 34, 5 x 5 metre monitoring *quadrats* within the area hatched red on Plan 8191/1e;
 - (viii) maintenance of sufficient fencing to protect revegetation areas adjacent to areas most impacted by public access as outlined in the Project Revegetation Plan;
 - (ix) implementation of hygiene protocols by cleaning earth-moving machinery of soil and vegetation prior to entering and leaving the site;
 - (x) installation of signage to educate reserve users of the revegetation activities being undertaken;
 - (xi) achieve the below *completion criteria* within the ten year monitoring period for the area hatched red on Plan 8191/1e;

Criterion	Aspect	Scale	Completion criteria description	Monitoring frequency
1	Per cent <i>weed</i> cover	Average of <i>quadrat</i> data and site traverse	<15 per cent weed cover across all sites	Bi-annually in the first 2 years, and annually for the next 8 years
2	Declared <i>weeds</i>	Site traverse	Absence of declared weeds	Bi-annually in the first 2 years, and annually for the next 8 years
3	Per cent bare ground	Average of <i>quadrat</i> data and site traverse	Per cent of bare ground to be no greater than that recorded in the <i>pre clearing surveys</i> .	Bi-annually in the first 2 years, and annually for the next 8 years
4	Vegetation condition	Site traverse	The condition of the vegetation to be in a good to very good condition on average across the revegetation area (Keighery 1994).	Bi-annually in the first 2 years, and annually for the next 8 years
5	Native vegetation cover/density	Average of <i>quadrat</i> data and site traverse	>70 per cent native cover	Bi-annually in the first 2 years, and annually for the next 8 years
6	Species richness	Average of <i>quadrat</i> data	>70 per cent of species planted represented across all sites respectively (PEC sites, Geographe coastal wetland	Bi-annually in the first 2 years, and annually for the next 8 years

			system sites and Quindalup dune sites) as outlined in the species list provided in the Project Revegetation Plan	
7	<i>Conospermum caeruleum</i> var. Busselton	Site traverse and direct survival observation	>50 per cent survival rate to be achieved	Bi-annually in the first 2 years, and annually for the next 8 years

- (xii) remedial actions to be undertaken if *completion criteria* are not met; and
- (xiii) management commitments that will be achieved.

(d) The Permit Holder shall implement the Project Revegetation Plan as approved by the *CEO*.

18. Record keeping

The Permit Holder must maintain the following records:

- (a) In relation to the clearing of native vegetation authorised under this Permit:
 - (i) the boundaries of clearing undertaken on each date, recorded using a Global Positioning System GPS unit set to GDA94, expressing the geographical coordinates in Eastings and Northings or decimal degrees;
 - (ii) the size of the area cleared (in hectares);
 - (iii) actions taken to avoid, minimise and reduce the impacts and extent of clearing in accordance with condition 7 of this Permit;
 - (iv) actions taken to minimise the risk of the introduction and spread of *weeds* and *dieback* in accordance with condition 8 of this Permit;
 - (v) details required in accordance with flora management conditions 9 and 10 of this Permit; and
 - (vi) details required in accordance with fauna management conditions 11, 12, 13, 14 and 15 of this Permit.
- (b) In relation to revegetation activities undertaken pursuant to conditions 16 and 17 of this Permit:
 - (i) the date(s) each area was revegetated;
 - (ii) the location of each area revegetated recorded using a GPS unit set to GDA94, expressing the geographical coordinates in Eastings and Northings or decimal degrees;
 - (iii) at least two photographs of each area revegetated taken on an annual basis at the same location each year;
 - (iv) a description of the revegetation activities undertaken each year for each area revegetated; and
 - (v) a description of the tree density and native understorey vegetation cover for each area revegetated recorded on an annual basis.

19. Reporting

- (a) The Permit Holder must provide to the *CEO* on or before 30 June of each year, a written report:
 - (i) of records required under condition 18 of this Permit; and
 - (ii) concerning activities done by the Permit Holder under this Permit between 1 January to 31 December of the preceding calendar year.
- (b) If no clearing authorised under this Permit has been undertaken, a written report confirming that no clearing under this Permit has been undertaken, must be provided to the *CEO* on or before 30 June of each year.
- (c) Prior to 30 March 2030, the Permit Holder must provide to the *CEO* a written report of records required under condition 18 of this Permit where these records have not already been provided under condition 19(a) of this Permit.

Definitions

The following meanings are given to terms used in this Permit:

botanist means a person who holds a tertiary qualification specialising in environmental science or equivalent, and has a minimum of two (2) years work experience in Western Australian flora identification and undertaking flora surveys native to the bioregion being inspected or surveyed, or who is approved by the CEO as a suitable environmental specialist for the bioregion, and who holds a valid flora licence issued under the *Biodiversity Conservation Act 2016*;

CEO means the Chief Executive Officer of the Department responsible for the administration of the clearing provisions under the *Environmental Protection Act 1986*;

completion criteria (quantitative) means a measurable outcome based on a suitable reference site, used to determine revegetation/rehabilitation success;

dieback means the effect of *Phytophthora* species on native vegetation;

environmental specialist means a person who holds a tertiary qualification in environmental science or equivalent, and has a minimum of 2 years work experience relevant to the type of environmental advice that an environmental specialist is required to provide under this permit, or who is approved by the CEO as a suitable environmental specialist;

fill means material used to increase the ground level, or fill a hollow;

local provenance means native vegetation seeds and propagating material from natural sources within 100 kilometres where practical, based on a species specific assessment and availability of sufficient propagation material and the same Interim Biogeographic Regionalisation for Australia (IBRA) subregion of the area cleared.

mulch means the use of organic matter, wood chips or rocks to slow the movement of water across the soil surface and to reduce evaporation;

optimal time means the most suitable period for undertaking direct seeding and planting based on species availability, as set out in the Project Revegetation Plan;

pre clearing surveys means those surveys undertaken by the applicant prior to the permit being granted, which informed the assessment of the clearing permit application;

quadrat means a sample plot established for the purpose of data collection and monitoring vegetation characteristics, for example species composition, structure, density and condition;

rehabilitate/ed/ion/ing means actively managing an area containing native vegetation in order to improve the ecological function of that area;

relocation means moving an individual animal (or family group) from one location within its home range to another location within the same home range for the purpose of resolving a human-wildlife conflict;

revegetate/ed/ion/ing means the re-establishment of a cover of local provenance native vegetation in an area using methods such as natural regeneration, direct seeding and/or planting, so that the species composition, structure and density is similar to pre-clearing vegetation types in that area;

reference site means a site used to provide baseline data for planning a revegetation project. Measurements from fixed reference points or plots where biodiversity components are measured are used to set measurable completion criteria for revegetation projects. Reference sites are to be in at least very good condition (Keighery 1994);

revegetation plan means a plan prepared by the Permit Holder, or an appropriate *environmental specialist* delegated by the Permit Holder, for the *revegetation* of a site in accordance with a Permit condition;

site preparation means management of existing site topsoil and preparation of the finished soil surface, for example by ripping or tilling the soil surface and respreading site topsoil and chipped native vegetation.

suitable habitat(a) means habitat known to support Carburnup king spider orchid (*Caladenia procera*) within the known current distribution of the species, typically characterised by jarrah (*Eucalyptus marginata*), marri (*Corymbia calophylla*) and peppermint (*Agonis flexuosa*) woodland on alluvial sandy-clay loam flats, with Mangles kangaroo paw (*Anigozanthos manglesii*) amongst dense heath and sedges or low dense shrubs. Other associated species include *Acacia stenoptera* and *Pimelea sylvestris*.

suitable habitat(b) means habitat known to support western ringtail possums (*Pseudocheirus occidentalis*) within the known current distribution of the species, typically characterised by abundant foliage, presence of suitable nesting structures such as tree hollows, as well as high canopy cover and continuity. Known habitat includes peppermint (*Agonis flexuosa*) dominated woodlands, jarrah (*Eucalyptus marginata*) and marri (*Corymbia calophylla*) forests, riparian vegetation with a canopy of Bullich (*Eucalyptus megacarpa*) or flooded gum (*Eucalyptus rudis*), karri (*Eucalyptus diversicolor*) forests, sheoak (*Allocasuarina fraseriana*) dominated woodlands, and other stands of myrtaceous trees growing near swamps, watercourses or floodplains;

targeted flora survey means a field-based investigation, including a review of established literature, of the biodiversity of flora and vegetation of the permit area, focusing on habitat suitable for *Caladenia procera* and carried out during the optimal time to identify the species, which is during the flowering period between September and October. Where target flora are identified in the or in close proximity to the permit area, the survey must also include a minimum of a 10 metre radius of the surrounding areas to place the permit area into local context;


translocation means deliberate, human-mediated movement of living organisms from one area, with release in another for the purpose of establishing, re-establishing or augmenting a population. Movement includes between wild locations and populations, from a captive facility or ex situ population to a wild location, and/or from the wild to a captive facility for population growth, with an intention to return the individuals or their progeny to the wild;

vegetation condition means the rating given to native vegetation which refers to the impact of disturbance on each of the layers and the ability of the community to regenerate (Keighery 1994);

weed/s means any plant -

- (a) that is a declared pest under section 22 of the *Biosecurity and Agriculture Management Act 2007*;
or
- (b) published in a Department of Biodiversity, Conservation and Attractions species-led ecological impact and invasiveness ranking summary, regardless of ranking; or
- (c) not indigenous to the area concerned.

fauna specialist means a person who holds a tertiary qualification specialising in environmental science or equivalent, and has a minimum of 2 years work experience in fauna identification and surveys of fauna native to the region being inspected or surveyed, or who is approved by the CEO as a suitable fauna specialist for the bioregion, and who holds a valid fauna licence issued under the Biodiversity Conservation Act 2016.

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Adrian Wiley
SENIOR MANAGER
NATIVE VEGETATION REGULATION

*Officer delegated under Section 20
of the Environmental Protection Act 1986*

3 July 2020

Plan 8191/1 a

115°19'48.000"E

115°20'24.000"E



33°39'36.000"S

33°40'12.000"S

33°40'48.000"S

33°39'36.000"S

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Legend

-  CPS areas approved to clear
-  Road Centrelines
-  Local Government Authorities



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Officer delegated under section 20 of the Environmental Protection Act 1986






GOVERNMENT OF WESTERN AUSTRALIA

Plan 8191/1 b



Legend

-  CPS areas approved to clear
-  Road Centrelines
-  Local Government Authorities

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GOVERNMENT OF
WESTERN AUSTRALIA




Plan 8191/1 c

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Legend

-  Road Centrelines
-  Local Government Authorities
-  CPS subject to conditions

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Environmental Protection Act 1986



GOVERNMENT OF
WESTERN AUSTRALIA

Plan 8191/1 d

115°19'48.000"E

115°20'24.000"E



115°19'48.000"E

115°20'24.000"E




33°39'36.000"S

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Legend

-  CPS subject to conditions
-  Local Government Authorities
-  Road Centrelines

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Environmental Protection Act 1986






GOVERNMENT OF
WESTERN AUSTRALIA

Plan 8191/1 e



Legend

-  CPS subject to conditions
-  Road Centrelines
-  Local Government Authority

Image

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Environmental Protection Act 1986



GOVERNMENT OF
WESTERN AUSTRALIA



This report has been prepared to fulfil the requirements of an accredited environmental assessment process between the Commonwealth and State governments, pursuant to a bilateral agreement established under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This report is set out in four parts:

- Part 1: Application and site details;
- Part 2: Assessment against matters of national environmental significance (pursuant to the EPBC Act);
- Part 3: Assessment against the clearing principles (pursuant to the *Environment Protection Act 1986* (EP Act)). Appeal rights pursuant to section 101A of the EP Act are relevant to this section of the report; and
- Part 4: References.

Part 1: Application and site details

1. Application details

1.1. Applicant details

Applicant's name:	Water Corporation
Application received date:	13 September 2018

1.2. Property details

Property:	<p>Lot 866 on Diagram 4170 (Crown reserve 16061), West Busselton</p> <p>Lot 80 on Deposited Plan 70429, Bovell</p> <p>Lot 61 on Plan 5399, West Busselton</p> <p>Lot 59 on Plan 5399, West Busselton</p> <p>Lot 58 on Plan 5399, Bovell</p> <p>Lot 57 on Plan 5399 (Crown reserve 16061), West Busselton</p> <p>Lot 56 on Plan 9868, Bovell</p> <p>Lot 56 on Plan 9868, West Busselton</p> <p>Lot 56 on Plan 5399, Bovell</p> <p>Lot 55 on Plan 9868, West Busselton</p> <p>Lot 553 on Plan 23463 (Crown reserve 48018), West Busselton</p> <p>Lot 5337 on Plan 23318, Bovell</p> <p>Lot 5210 on Plan 22191 (Crown reserve 45170), West Busselton</p> <p>Lot 5209 on Plan 22630 (Crown reserve 45170), West Busselton</p> <p>Lot 5190 on Deposited Plan 220139 (Crown reserve 41460), West Busselton</p> <p>Lot 5136 on Diagram 42478 (Crown reserve 45588), Bovell</p> <p>Lot 5068 on Plan 20855 (Crown reserve 44380), Busselton</p> <p>Lot 5067 on Plan 20770 (Crown reserve 43250), West Busselton</p> <p>Lot 5067 on Plan 20362 (Crown reserve 43250), West Busselton</p> <p>Lot 505 on Deposited Plan 417589, West Busselton</p> <p>Lot 501 on Deposited Plan 417589, West Busselton</p> <p>Lot 4989 on Plan 18644 (Crown reserve 43250), West Busselton</p> <p>Lot 4607 on Diagram 40995, West Busselton</p> <p>Lot 4348 on Diagram 27395 (Crown reserve 26555), West Busselton</p> <p>Lot 2594 on Deposited Plan 400537 (Crown Reserve 52132), West Busselton</p> <p>Lot 2593 on Deposited Plan 400537 (Crown Reserve 52132), West Busselton</p> <p>Lot 1 on Diagram 39001, West Busselton</p> <p>Lot 100 on Diagram 9165, Bovell</p> <p>Unallocated Crown Land (PIN 11993547), Bovell</p> <p>Water Feature (PIN 11725451), Bovell</p> <p>Road Reserve - 1172836, West Busselton</p> <p>Road Reserve - 11440716, West Busselton</p> <p>Road Reserve - 1183896, West Busselton</p> <p>Deposited Plan 37514 - Easement J140752 (5067)</p> <p>Deposited Plan 37514 - Easement J140752 (5209)</p> <p>Deposited Plan 37514 - Easement J140752 (5210)</p>
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Local Government Authority:
Localities:

City of Busselton
Busselton, West Busselton, Ambergate and Bovell

1.3. EPBC Act details

Reference No.:

2017/7932

Referral date:

12 May 2017

Proposed action:

To upgrade the Vasse diversion drain within the City of Busselton, approximately 220 kilometres south of Perth, Western Australia

Controlled action decision date:

9 August 2017

Relevant controlled provisions:

Listed threatened species and communities (sections 18 & 18A of EPBC Act)

1.4. EP Act details

Reference No.:

CPS 8191/1

Clearing permit application type:

Purpose Permit

Application date:

Clearing area (hectares):

13 September 2018

No. trees:

2.16 hectares

Method of clearing:

N/A

Purpose category:

Mechanical removal
Drainage

1.5. EP Act decision on application

**Decision on Permit
Application:**

Grant

Decision Date:

3 July 2020

Reasons for Decision:

The clearing permit application has been assessed against the clearing principles, planning instruments and other matters in accordance with section 51O of the *Environmental Protection Act 1986* (EP Act). It has been concluded that the proposed clearing is at variance with Principles (a), (b), (c), (e) and (f), and is not likely to be at variance with the remaining Clearing Principles.

The applicant has proposed a number of minimisation and mitigation measures as outlined in section 5 of this report, including the following:

- A significant reduction in the proposed clearing based on detailed engineering design from 4.6 hectares to 2.16 hectares
- Onsite mitigation by way of infill planting and revegetation of up to 0.55 hectares within the application area

Taking into account the above measures, it is considered that the following significant residual impacts remain:

- loss of up to 2.16 hectares of critical habitat for western ringtail possum;
- loss of up to 1 hectare of native vegetation that is representative of the state listed Priority 1 flooded gum, marri and peppermint forest priority ecological community (PEC); and
- clearing of vegetation in an extensively cleared landscape

With consideration of the proposed onsite mitigation measures, the Delegated Officer determined that additional offsite revegetation of a total of 10.34 hectares (within the general vicinity of the application area) will counterbalance the significant residual impacts to western ringtail possum, the PEC and the clearing of vegetation in an extensively cleared landscape. The revegetation offset will also include planting of seedlings of *Conospermum caeruleum* var. Busselton to mitigate impacts to this species. The applicant will install up to six rope bridges and 12 nest boxes to further enhance western ringtail possum habitat within the revegetation areas.

To minimise the remaining impacts, as a condition of the clearing permit the applicant will be required to undertake the following measures:

- Pre-clearing translocation of Carter's freshwater mussel via an approved fauna management plan;
- Pre-clearing dispersal of western ringtail possums by a suitably qualified specialist; and
- Development of Targeted management strategies to prevent impacts to *Caladenia procera*

The Delegated Officer took into consideration that the proposed upgrades to the Vasse Diversion Drain are critical for mitigating flood risk in the Busselton townsite. It is understood that the existing drain has insufficient capacity to adequately manage a 1-in-100-year flood event.

In granting a clearing permit subject to offset, flora and fauna management, revegetation/rehabilitation, and weed and dieback management conditions, the Delegated Officer determined that the proposed clearing is unlikely to lead to an unacceptable risk to the environment.

2. Application Area

The application is for the proposed clearing of 2.16 hectares of native vegetation within various properties in the localities of Busselton, West Busselton and Bovell for the purpose of upgrading the Vasse Diversion Drain (VDD), including the reconstruction of the Vasse Diversion Dam and duplication of the culverts. The proposed clearing consists of three areas (Figure 1):

- Area A between Queen Elizabeth Ave and the Bussell Hwy Bypass (0.30 hectares)
- Area B west of Queen Elizabeth Ave (1.31 hectares)
- Area C southeast application area portion (0.55 hectares)



Figure 1: CPS 8191/1 application area hatched in blue

2. Vegetation description

Mapped vegetation complexes

The application area has been mapped as Swan Coastal Plain vegetation complexes:

- Abba Complex, described as a mixture of open forest of *Corymbia calophylla* (Marri) - *Eucalyptus marginata* (Jarrah) - Banksia species and woodland of *Corymbia calophylla* (Marri) with minor occurrences of *Corymbia haematoxylon* (Mountain Marri). Woodland of *Eucalyptus rudis* (Flooded Gum) - Melaleuca species along creeks and on flood plains;
- Quindalup Complex, described as coastal dune complex consisting mainly of two alliances - the strand and fore-dune alliance and the mobile and stable dune alliance. Local variations include the low closed forest of *Melaleuca lanceolata* (Rottnest Teatree) - *Callitris preissii* (Rottnest Island Pine), the closed scrub of *Acacia rostellifera* (Summer-scented Wattle) and the low closed *Agonis flexuosa* (Peppermint) forest of Geographe Bay;
- Vasse Complex, described as mixture of the closed scrub of Melaleuca species fringing woodland of *Eucalyptus rudis* (Flooded Gum) - Melaleuca species and open forest of *Eucalyptus gomphocephala* (Tuart) - *Eucalyptus marginata* (Jarrah) - *Corymbia calophylla* (Marri). Will include areas dominated by Tecticornia and Sarcocornia species (Samphire) near Mandurah and south of the Capel River.; and
- Yoongarillup Complex, described as woodland to tall woodland of *Eucalyptus gomphocephala* (Tuart) with *Agonis flexuosa* in the second storey. Less consistently an open forest of *Eucalyptus gomphocephala* (Tuart) - *Eucalyptus marginata* (Jarrah) - *Corymbia calophylla* (Marri). South of Bunbury is characterized by *Eucalyptus rudis* (Flooded Gum)-Melaleuca species open forests (Hedde et al, 1980, Government of Western Australia, 2019).

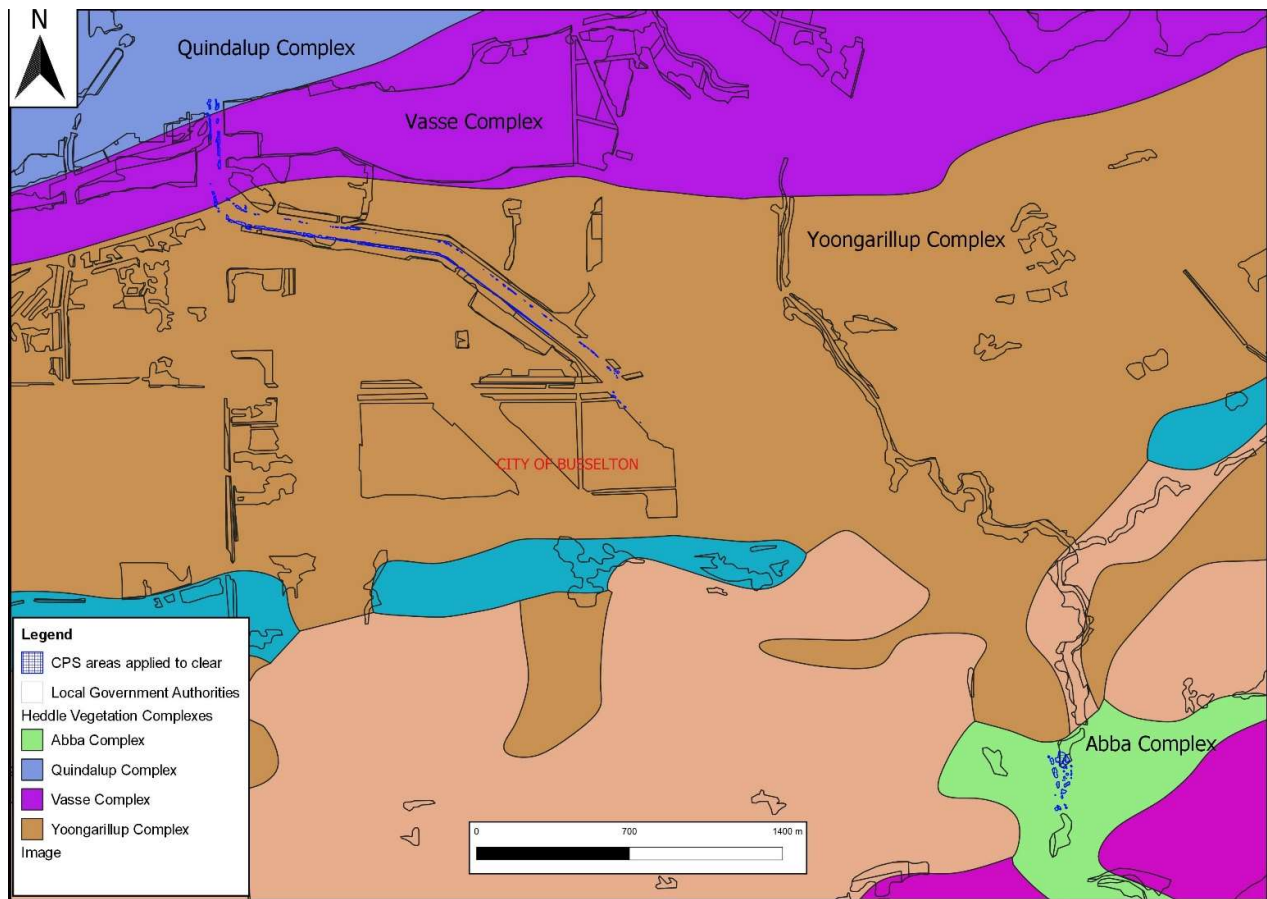


Figure 2: Mapped vegetation complexes within the application area

Vegetation types

A site inspection of the application area conducted by Department of Water and Environmental Regulation (DWER) on 5 December 2018 (DWER, 2018) identified the vegetation within the three areas to consist of:

- Area A between Queen Elizabeth Ave and the Bussell Hwy Bypass vegetation was dominated by *Agonis flexuosa* and *Acacia saligna* over an understorey comprising both native species and introduced grasses;
- Area B west of Queen Elizabeth Ave vegetation predominantly comprised *Agonis flexuosa*, *Acacia saligna* and *Melaleuca* sp. over introduced grasses; and
- Area C the southeast portion of the application area was predominantly *Eucalyptus rudis*, *Agonis flexuosa* and *Corymbia calophylla* over introduced grasses.



Plate 1 – Western ringtail possum observed within Area B



Plate 2 - *Conospermum caeruleum* var. *Busselton* within Area B



Plate 3 – Vegetation within Area C



Plate 4 – Drey observed within Area A

Figure 3: Photographs of the application area (DWER, 2018)

Table 1: Vegetation types recorded in the application area during surveys undertaken

Area ID	Survey*	Vegetation Type	Description
Area A	Survey 1	AfLe	Tall shrubland of <i>Agonis flexuosa</i> and mixed <i>Acacia</i> species over sedgeland of <i>Lepidosperma effusum</i> , <i>Juncus krausii</i> and <i>Ficinia nodosa</i> over weed species.
	Survey 1	Mc*WmLc	Tall open scrub of <i>Melaleuca cuticularis</i> and <i>Agonis flexuosa</i> over herbland of * <i>Watsonia meriana</i> over sedgeland of <i>Lepidosperma carphoides</i> .
	Survey 2	Tall <i>Melaleuca</i> Shrubland (VT5)	<i>Melaleuca cuticularis</i> , <i>M. lanceolata</i> and <i>M. raphiophylla</i> tall open shrubland over <i>Lepidosperma carphoides</i> and <i>Gahnia trifida</i> sedgeland.
	Survey 2	Highly disturbed	Areas that have been cleared and include infrastructure, roads and tracks.
	Survey 9	VU-D	<i>Melaleuca cuticularis</i> , <i>M. lanceolata</i> and <i>M. raphiophylla</i> tall open shrubland over <i>Gahnia trifida</i> and <i>Baumea juncea</i> sedgeland (Good-Very Good) (Part of Conservation category wetland)
	Survey 9	VU-E	<i>Agonis flexuosa</i> woodland over <i>Acacia littorea</i> , <i>Olearia axillaris</i> and <i>Spyridium globulosum</i> tall open shrubland over <i>Lepidosperma gladiatum</i> sedgeland
	Survey 9	VU-F	* <i>Eragrostis curvula</i> , * <i>Cenchrus clandestinus</i> grassland, scattered <i>Acacia saligna</i> shrubs, bare areas and watercourse
Area B	Survey 1	AsAf	Tall shrubland of <i>Acacia saligna</i> and <i>Agonis flexuosa</i> over weed species.
	Survey 1	Heavily disturbed (HD)	Predominantly cleared areas but some disturbance opportunists such as grasses, including * <i>Avena fatua</i> , * <i>Cynodon dactylon</i> and * <i>Eragrostis curvula</i> .
	Survey 2	Peppermint woodland (VT2)	<i>Agonis flexuosa</i> woodland with scattered <i>Corymbia calophylla</i> trees over <i>Acacia saligna</i> and <i>Melaleuca raphiophylla</i> mid to tall shrubland over * <i>Ehrharta longifolia</i> tussock grassland over * <i>Zantedeschia aethiopica</i> , * <i>Watsonia meriana</i> and * <i>Oxalis pescaprae</i> open herbland.
	Survey 2	<i>Acacia</i> and Peppermint shrubland (VT3 and VT4)	<i>Agonis flexuosa</i> , <i>Acacia saligna</i> and <i>Jacksonia furcellata</i> tall shrubland over Poaceae sp. tussock grassland over <i>Conostylis aculeata</i> subsp. <i>aculeate</i> open sedgeland over * <i>Pelargonium capitatum</i> , * <i>Romulea rosea</i> and * <i>Watsonia meriana</i> open herbland
	Survey 2	Highly disturbed	Areas that have been cleared and include infrastructure, roads and tracks.
	Survey 9	VU-A	<i>Corymbia calophylla</i> and <i>Agonis flexuosa</i> with occasional <i>Banksia littoralis</i> and <i>Melaleuca raphiophylla</i> mid open forest over <i>Acacia</i>

	Survey 9	VU-B	<i>cochlearis</i> , <i>A. saligna</i> , <i>Hibbertia cuneiformis</i> <i>Jacksonia furcellata</i> , <i>Kunzea glabrescens</i> and <i>Spyridium globulosum</i> open shrubland over <i>Adenanthos meisneri</i> , <i>Conospermum caeruleum</i> , <i>Daviesia physodes</i> , <i>Hardenbergia comptoniana</i> , <i>Hibbertia hypericoides</i> , <i>Leucopogon propinquus</i> low shrubland over <i>Lepidosperma squamatum</i> and <i>Tetraria octandra</i> sedgeland and <i>Caesia micrantha</i> , <i>Chamaescilla corymbosa</i> , <i>Conostylis aculeata</i> subsp. <i>gracilis</i> , <i>Opercularia hispidula</i> , <i>Sowerbaea laxiflora</i> , <i>*Sparaxis bulbifera</i> , <i>*Watsonia meriana</i> var. <i>bulbillifera</i> and <i>*Zantedeschia aethiopica</i> mid forbland on dark brown sandy loams. (' <i>Eucalyptus rudis</i> , <i>Corymbia calophylla</i> and <i>Agonis flexuosa</i> Closed Low Forest' PEC).
	Survey 9	VU-D	<i>Agonis flexuosa</i> low woodland and scattered <i>Acacia saligna</i> or <i>A. cochlearis</i> tall shrubs over <i>*Ehrharta longifolia</i> , <i>*Watsonia meriana</i> and other introduced herbaceous species
	Survey 9	VU-F	<i>Melaleuca cuticularis</i> , <i>M. lanceolata</i> and <i>M. raphiophylla</i> tall open shrubland over <i>Gahnia trifida</i> and <i>Baumea juncea</i> sedgeland
	Survey 9	VU-F	<i>*Eragrostis curvula</i> , <i>*Cenchrus clandestinus</i> grassland, scattered <i>Acacia saligna</i> shrubs, bare areas and watercourse.
Area C	Survey 2	Marri and Flooded Gum woodland (VT1)	<i>Eucalyptus rudis</i> , <i>Corymbia calophylla</i> and <i>Agonis flexuosa</i> open woodland over <i>Melaleuca raphiophylla</i> tall shrubland over <i>*Avena fatua</i> tussock grassland over <i>*Watsonia meriana</i> and <i>*Oxalis pes-caprae</i> herbland.
	Survey 2	Highly disturbed	Areas that have been cleared and include infrastructure, roads and tracks.
	Survey 2	Peppermint woodland (VT2)	<i>Agonis flexuosa</i> woodland with scattered <i>Corymbia calophylla</i> trees over <i>Acacia saligna</i> and <i>Melaleuca raphiophylla</i> mid to tall shrubland over <i>*Ehrharta longifolia</i> tussock grassland over <i>*Zantedeschia aethiopica</i> , <i>*Watsonia meriana</i> and <i>*Oxalis pes-caprae</i> open herbland.
	Survey 3	Marri woodland	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.
	Survey 9	VU-C	<i>Eucalyptus rudis</i> and <i>Corymbia calophylla</i> mid open forest or woodland over <i>Agonis flexuosa</i> open low woodland over scattered <i>Acacia saligna</i> over <i>*Oxalis pes-caprae</i> , <i>*Watsonia meriana</i> and other introduced herbaceous species.
	Survey 9	VU-F	<i>*Eragrostis curvula</i> , <i>*Cenchrus clandestinus</i> grassland, scattered <i>Acacia saligna</i> shrubs, bare areas and watercourse.

* Note: Further information on the surveys listed in this Table can be found in Appendix 1.

Vegetation condition

As shown in Table 2 below, the vegetation condition for the application area ranges from:

Completely degraded; the structure of the vegetation is no longer intact and the area is completely or almost completely without native species (Keighery, 1994);
to
Very Good; Vegetation structure altered, obvious signs of disturbance (Keighery, 1994).

Table 2: Vegetation condition recorded in the application area during the surveys undertaken (based on the Keighery, 1994 scale)

Area ID	Survey	Vegetation condition
Area A	Survey 1	Completely degraded to good
	Survey 2	Completely degraded to good-very good
	Survey 3	Completely degraded to good-very good
	Survey 9	Completely degraded to very good
Area B	Survey 1	Completely degraded to degraded
	Survey 2	Completely degraded to degraded
	Survey 3	Completely degraded to good-degraded
	Survey 9	Completely degraded to good
Area C	Survey 2	Completely degraded to degraded
	Survey 3	Completely degraded to degraded
	Survey 9	Completely degraded

Based on Survey 9 (EcoEdge Consulting 2020a), approximately 30 per cent of the application area (0.67 hectares) is in good to very good condition.

Soil types

Soils within the application area have been mapped as per Table 3 (Figure 4)

Table 3: Soil types within the application area (DPIRD, 2017)

Area	Map unit	Unit ID	Description
A	Quindalup South Qf2 Phase	211Qu__Qf2	Relict foredunes and gently undulating beach ridge plain with deep uniform calcareous sands.
A	Vasse Wonerup very wet saline flats Phase	211VaWOwy	Vasse, Wonnerup and Broadwater Estuaries, low lying depressions which are often underwater in winter and saline in summer.
B	Vasse Wonerup wet flats Phase	211VaWOw	Poorly drained flats around the edge of the Vasse Estuary. Dark calcareous sands and mixed estuarine deposits.
B	Ludlow wet flats Phase	211SpLDw	Flats with poor subsoil drainage in winter. Deep yellow brown siliceous sands over limestone (i.e. Spearwood Sands).
C	Abba wet vales Phase	213AbABvw	Small narrow swampy depressions along drainage lines. Alluvial soils.
C	Abba Flats Phase	213AbAB1	Flats and low rises with sandy grey brown duplex (Abba) and gradational (Busselton) soils.



Figure 4: Soils within the application area

Local Area

The Local Area is defined as a 10 kilometre radius from the perimeter of the application area.

Part 2: Assessment against matters of national environmental significance

3. Background

The Vasse Diversion Drain (VDD) is a 100-year-old strategic infrastructure corridor, originally constructed in the 1920s to create more arable land in the catchment. Now, its primary function is to prevent flooding of the Busselton township. The drain diverts flows from the catchments of the Vasse and Sabina Rivers, covering a total area of 287 square kilometres. The drain extends approximately 6.3 kilometres from Geographe Bay, to the Busselton Golf Course (Water Corporation, 2020a).

Since construction, surrounding land-uses in the catchment have changed. Clearing of farmland has resulted in increased surface water runoff from storm events, and residential areas have been developed adjacent to both sides of the drain downstream of the Busselton Bypass. The existing drain does not meet the flood mitigation requirements determined by the Busselton Flood Management Steering Committee and State Cabinet. The current infrastructure exposes the community and the state government to high levels of risk in its current form. On completion of this project, the estimated 1-in-100 Annual Exceedance Probability (AEP) flood peak in the drain will be approximately 140 cubic metre per second (m³/s) (Water Corporation, 2020a).

The clearing permit application covers a distance of 5.3 kilometres, from Queen Elizabeth Avenue to south of the Chapman Hill Road Bridge. The proposal comprises the hydraulic and structural improvement of the drain to meet the 1-in-100 AEP. This will involve refurbishment/reconstruction of the levee banks, installation of temporary coffer dams to divert the flow to allow for scouring of the channel, reconstruction of the levees, respraying of the levee walls, repair of the pedestrian bridge footings, reconstruction of the spillway and deepening of the diversion dam, which may involve some dewatering. The work will include increasing capacity of the culvert connecting the diversion drain to the lower Vasse River (Water Corporation, 2020a).

4. Description of controlling provisions

On 9 August 2017, the proposed action to upgrade the Vasse diversion drain was determined to be a controlled action under the *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act). Based on the information available in the referral, the Commonwealth Department of Agriculture, Water and Environment (former Department of the Environment and Energy) considered that the proposed action is likely to have a significant impact on the following species listed under the EPBC Act:

- Western ringtail possum (*Pseudocheirus occidentalis*), listed as critically endangered;
- Baudin's cockatoo (*Calyptorhynchus baudinii*), listed as endangered;
- Forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*), listed as vulnerable;
- Carnaby's cockatoo (*Calyptorhynchus latirostris*) listed as endangered; and
- Carburnup king spider orchid (*Caladenia procera*), listed as critically endangered.

The original referral was for the clearing of 4.6 hectares. A variation (Variation 1) to the original EPBC referral was accepted by the then Department of the Environment and Energy on 18 July 2018, which included a reduced clearing footprint of 3.6 hectares.

A second variation (Variation 2) to the referral was submitted on 23 March 2020, further reducing the clearing footprint to 2.16 hectares, however the Department of Agriculture, Water and Environment (DAWE) advised that a formal variation under the EPBC Act is not required as the project is still within the original development footprint (DAWE, 2020).

Note: Carter's freshwater mussels (*Westrallunio carteri*) are not mentioned in the EPBC referral because the species was only listed as vulnerable under the EPBC Act on 1 February 2018, following the decision on the referral.

Western ringtail possum

The western ringtail possum is a medium sized, nocturnal species that roams through the trees at night, feeding on leaves of eucalypt, marri and peppermint trees and other fruits and flowers. It has a long, thin tail with a white tip that helps it to move through the trees and carry nesting material. It is only found in the south-west of Western Australia and can thrive in urban gardens that have suitable food trees planted and are free from roaming predators, such as cats.

The western ringtail possum is clearly distinguished from the common brushtail possum (*Trichosurus vulpecula*), which also occurs in the south-west, by its smaller rounded ears, and its thin prehensile tail, which is as long as the rest of the body (de Tores, 2008) and by being exclusively herbivorous.

The current distribution of the western ringtail possum is patchy and largely restricted to the moister south-western corner of Western Australia (de Tores, 2008), especially near coastal areas of peppermint (*Agonis flexuosa*) woodland and peppermint/tuart associations from the Australind/Eaton area to the Waychincup National Park (DEC, 2012). Important populations occur in urban Busselton (de Tores, 2008). The Upper Warren area east of Manjimup is the only place the western ringtail possum survives in the absence of coastal peppermint (DEC, 2012).

The species occurs within the Esperance Plains, Jarrah Forest, and Warren IBRA Bioregions, as well as the South West and South Coast Natural Resource Management Regions (DotEE, 2013).

The main identified threats to the western ringtail possum are habitat loss and fragmentation, predation, especially by introduced predators and changing fire regimes. Potential threats include climate change, competition with brushtail possum, road traffic, loss of coastal peppermint trees from dieback caused by *Phytophthora cinnamomi*, insect attack, and myrtle rust (*Puccinia psidii*) (DotEE, 2013).

The western ringtail possum recovery plan identifies a ten year goal of slowing the decline in population size, extent and area of occupancy through managing major threatening processes affecting the subpopulations and their habitats, and allowing the persistence of the species in each of the identified key management zones, the Swan Coastal Plain, southern forests and south coast (DPaW, 2017a).

The western ringtail possum is listed as critically endangered under the Western Australia's *Biodiversity Conservation Act 2016* (BC Act).

Baudin's cockatoo

Baudin's cockatoo is endemic to a 2,000 kilometre area of the humid and sub-humid zones of southwest Western Australia and is generally contained within the 750 millimetre isohyet of average annual rainfall. This species is locally resident, but at the end of the breeding season (January), the birds move away from the breeding area and form flocks that move in response to changing food resources (DEC, 2008).

Baudin's cockatoo mainly feeds on the seeds of marri and nest in mature trees such as marri, karri, jarrah and Wandoo in the lower southwest of Western Australia (DEC, 2008).

The range of this species has declined by more than 50 per cent over the past 50 years (Garnett and Crowley, 2000). The principal cause of the decline in range was clearing of the eastern margins of the forests for agriculture and the current primary threat to the population is illegal shooting (DEC, 2008). The main identified threats to the Baudin's cockatoo are illegal shooting, habitat loss through land clearing, nest hollow shortage and competition from other species (DEC, 2008).

Baudin's cockatoo is also listed as endangered under the BC Act.

Forest red-tailed black cockatoo

The forest red-tailed black cockatoo is endemic to the southwest humid and sub-humid zones of southwest Western Australia and inhabits jarrah, karri and marri forests receiving more than 600 millimetres of annual average rainfall (DEC, 2008).

The forest red-tailed black cockatoo occurs in one population of approximately 15,000 individuals and is known to nest in the large hollows of marri, jarrah and karri (Johnstone and Kirkby, 1999).

The main identified threats to the forest red-tailed black cockatoo are illegal shooting, habitat loss through land clearing, nest hollow shortage and competition from other species (DEC, 2008; DEWHA, 2009).

Forest red-tailed black cockatoo is also listed as vulnerable under the BC Act.

Carnaby's cockatoo

Carnaby's cockatoo is endemic to the southwest of Western Australia. Breeding takes place between late July and December and occurs mostly in the inland wheatbelt region of its distribution, in areas receiving between 300 and 750 millimetres of annual average rainfall (Saunders, 1974). During the non-breeding season (January to July) the majority of the birds move to the higher rainfall coastal regions of their range including the midwest coast, Swan Coastal Plain and south coast (Saunders, 1980; Saunders, 1990; Berry, 2008; Johnstone *et al.*, 2011). There has been an apparent expansion in the breeding range to include areas further west and south since the middle of last century with a more rapid increase into the jarrah and marri forests of the southwest (Johnstone and Storr, 1998; Johnstone *et al.*, 2011). This expansion in breeding range is due to threatening processes such as clearing of breeding habitat and competition for suitable breeding hollows.

Carnaby's cockatoo preferred habitat is remnant native eucalypt woodlands, especially those of salmon gum (*Eucalyptus salmonophloia*) and wandoo (*Eucalyptus wandoo*), and in shrubland or kwongan heathland dominated by plants of the Proteaceae family. It also occurs in forests containing marri, jarrah, karri (*Eucalyptus diversicolor*) and tuart (*Eucalyptus gomphocephala*) (DPaW, 2013).

Carnaby's cockatoo forages on the seeds, flowers and nectar of native proteaceous plant species (e.g. *Banksia*, *Hakea* and *Grevillea* species), eucalypts and *Callistemon* species. The species also forages on seeds of introduced species (e.g. *Pinus* and *Erodium* species, canola and almonds), insects and insect larvae. Carnaby's cockatoo generally forages within six kilometres of a night roost site and, while nesting, within a 12 kilometres radius of their nest site (Commonwealth of Australia, 2012).

Carnaby's cockatoo nests in large hollows in tall, living or dead eucalypts. It nests most commonly in smooth-barked wandoo and salmon gum, but has also been recorded breeding in red morrel (*Eucalyptus longicornis*), York gum (*Eucalyptus loxophleba*), tuart, flooded gum (*Eucalyptus rudis*), swamp yate (*Eucalyptus occidentalis*), gimlet (*Eucalyptus salubris*) and marri, and are said to nest in any species of eucalypt with a suitable hollow (DPaW, 2013).

Currently, the overall population trend for Carnaby's cockatoo is one of decline due to the loss and fragmentation of habitat as a result of clearing of native vegetation (Saunders, 1990; Johnstone and Storr, 1998; Saunders and Ingram, 1998; Garnett *et al.*, 2011).

The Carnaby's cockatoo recovery plan summarises habitat critical to the survival of Carnaby's cockatoos as:

- the eucalypt woodlands that provide nest hollows used for breeding, together with nearby vegetation that provides feeding, roosting and watering habitat that supports successful breeding;
- woodland sites known to have supported breeding in the past and which could be used in the future, provided adequate nearby food and/or water resources are available or are re-established; and
- in the non-breeding season the vegetation that provides food resources as well as the sites for nearby watering and night roosting that enable the cockatoos to effectively utilise the available food resources (DPaW, 2013).

The recovery plan also states that success in breeding is dependent on the quality and proximity of feeding habitat within 12 kilometres of nesting sites. Along with the trees that provide nest hollows, the protection, management and increase of this feeding habitat that supports the breeding of Carnaby's cockatoo is a critical requirement for the conservation of the species (DPaW, 2013).

The Carnaby's cockatoo is also listed as endangered under the BC Act.

Carbunup king spider orchid

Carbunup king spider orchid (*Caladenia procera*) was declared to be Rare Flora under the Western Australian *Wildlife Conservation Act 1950* in April 2002 and is currently ranked as Critically Endangered (CR) in WA under International Union for Conservation of Nature (IUCN 2001) Red List. Carbunup king spider orchid was first described in 2001 by Stephen Hopper and Andrew Phillip Brown from a specimen collected near Carbunup River in Western Australia. It is known from a small extent of approximately 15 square kilometres south-west of Busselton in south-western Australia, and also from a disjunct occurrence some 70 km north near Kemerton. It grows in Jarrah (*Eucalyptus marginata*), Marri (*Corymbia calophylla*) and Peppermint (*Agonis flexuosa*) woodland on alluvial sandy-clay loam flats, with Mangles Kangaroo Paw (*Anigozanthos manglesii*) amongst dense heath and sedges or low dense shrubs. Other associated species include *Acacia stenoptera* and *Pimelea sylvestris* (TSSC, 2009).

The known records of Carbunup king spider orchid is estimated at 276, with five known subpopulations. This species occurs within the South West Natural Resource Management Region. The distribution of the species is not known to overlap with any EPBC Act-listed threatened ecological community (TSSC, 2009). The main threats include clearing for development, road, firebreak and power utility maintenance, weed invasion, inappropriate fire regimes and grazing.

There has been development at subpopulations 2, 4 and 5, with permits issued to take Threatened Flora. In the case of subpopulation 4, the permit was issued to salvage up to 32 plants and translocate them to a proposed conservation area within the same location. The permit for subpopulation 5 was for the potential removal of soil-stored seed and subterranean tubers during the construction of a gas pipeline. The area where subpopulation 2 occurs has been proposed for subdivision. The status of these proposals is uncertain as their approval (by WA DEC) occurred prior to the listing of this species under the EPBC Act (Stack & English 2004).

The Carbunup king spider orchid recovery plan notes all known habitat that holds wild populations is critical to the survival of the species and that all populations, including those based on translocation, are important populations (DEC, 2011).

The Carbunup king spider orchid recovery plan notes habitat that is critical to the survival of *Caladenia procera* comprises:

- The area of occupancy of known populations;
- Areas of similar habitat surrounding known populations (these provide potential habitat for population expansion and provide habitat and a food source for pollinators);
- Corridors of remnant vegetation that link populations;
- Additional occurrences of similar habitat that do not currently contain the species but may have done so in the past (these represent possible translocation sites); and
- The local catchment for the surface and/or groundwater that maintains the habitat of the species (DEC, 2011).

The approved conservation advice for the species identifies research priorities that would inform future regional and local priority actions, which include:

- Design and implement a monitoring program or, if appropriate, support and enhance existing programs; and
- Undertake seed germination and/or vegetative propagation trials to determine the requirements for successful establishment, including mycorrhizal association trials (DEC, 2011).

5. Legislative context

The overarching legislative framework of this assessment is the:

- *Environmental Protection Act 1986* (EP Act)
- *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (Clearing Regulations)
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

The key guidance statements which inform this assessment are:

- A guide to the assessment of applications to clear native vegetation (DWER, 2013)
- Technical guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016a)
- Environmental Factor Guideline – Terrestrial Fauna (EPA, 2016b)
- Technical Guidance – Sampling methods for terrestrial vertebrate fauna (EPA, 2010)
- Technical Guidance – Terrestrial fauna surveys (EPA, 2004)
- Survey guidelines for Australia's threatened mammals. EPBC Act survey guidelines 6.5 (Department of Sustainability, Environment, Water, Population and Communities, 2011)
- Commonwealth EPBC Act Environmental Offsets Policy (Commonwealth of Australia, 2012)
- WA Environmental Offsets Policy (Government of Western Australia, 2011)
- WA Environmental Offsets Guidelines (Government of Western Australia, 2014)

The DWER considers that the following current environmental policy and guidance is relevant to its assessment of the clearing permit application for the following species:

Western ringtail possum

- Approved Conservation Advice for *Pseudocheirus occidentalis* (western ringtail possum) (Department of the Environment and Energy, 2013)
- Western ringtail possum (*Pseudocheirus occidentalis*) Recovery Plan (WA Department of Parks and Wildlife, 2017a)

Carnaby's cockatoo, Baudin's Cockatoo and Forest Red-tailed Black Cockatoo

- Carnaby's cockatoo (*Calyptorhynchus latirostris*) Recovery Plan (Department of Parks and Wildlife, 2013)
- Forest Black cockatoo (Baudin's cockatoo) (*Calyptorhynchus baudinii*) and forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*) Recovery Plan (Department of Environment and Conservation, 2008)
- EPBC Act Referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo, Baudin's cockatoo and Forest red-tailed black cockatoo (Department of Sustainability, Environment, Water, Population and Communities, 2012)
- Approved Conservation Advice for *Calyptorhynchus banksii naso* (Forest Red-tailed Black Cockatoo) (Department of the Environment, Water, Heritage and the Arts, 2009).

Carbunup king spider orchid

- Approved Conservation Advice for *Caladenia procera* (Carbunup King Spider Orchid) (Department of the Environment, Water, Heritage and the Arts, 2008)
- Carbunup king spider orchid (*Caladenia procera*) Recovery Plan – Interim recovery plan no. 316 (Department of Environment and Conservation, 2011)

6. Summary of Impacts

Western ringtail possum

Survey 1 (as summarised in Appendix 1) recorded four individual western ringtail possums (WRPs) and found scats and dreys within and adjacent to the proposed development footprint (GHD, 2009). Subsequent surveys in 2017 (survey 2 and 3) recorded scats and dreys within and adjacent to the proposed development footprint, but did not record any individuals (GHD, 2017a and b). None of these surveys included night surveys for WRP. A targeted WRP assessment within and adjacent to the application area (survey 9) recorded a total of 206 dreys, with 62 possums recorded within the dreys, while four individuals were found asleep on branches where there was no drey. Of the 206 dreys recorded, 204 were recorded within and adjacent to Area A and B, with only two dreys recorded in Area C. Spotlighting recorded 25 possums within and adjacent to Areas A and B, and nine possums and two brushtail possums within and adjacent to Area C. Possum density in Area A and B ranged from four to over eight animals per hectare (Bramford Consulting, 2019).

The clearing proposed for the majority of Area B is to a width of approximately 10 metres, this area has been mapped as WRP habitat suitability class B (ie: effectively the highest quality habitat remaining in the Binningup to Dunsborough area with exception of a few remnant class A patches). DBCA has advised the DWER that "The majority of the drainage reserve vegetation at this location is only 20-30 metres wide, the proposed reduction of this vegetated area by 30-50 per cent is highly significant and will displace a number of animals and has the potential to alter the population dynamics of the larger area. The remnant vegetation in the drainage reserve forms an integral part of a WRP fauna corridor that has been mapped by DBCA and serves to link core habitat patches associated with the New River Nature Reserve to the west and the Peppermint Park and nearby remnant habitat on the south side of the Busselton Bypass. Maintenance of viable corridors to allow for dispersal

and recolonisation is regarded by the department as fundamental to sustaining viable populations of WRP on the southern swan coastal plain” (DBCA. 2018).

Most of the application area is mapped as highly suitable habitat for WRP by DBCA (Figure 5). DBCA southwest region advised that all remnant vegetation in urban Busselton is significant in supporting this species (DBCA. 2020).

Given the survey findings and DBCA advice, the entire application area is considered to provide significant habitat for western ringtail possum.

A key objective of the WRP recovery plan is the identification and projection of habitat critical for survival of WRP in each key management zone and recommended management actions include the protection and effective management of habitat critical for survival to maintain viable subpopulations, including ongoing implementation of strategies to reduce and mitigate the effect of development on the species and its habitat (WA Department of DPaW, 2017).

The applicant has proposed to enhance habitat for WRPs and provide connectivity between areas of local distribution by installing possum bridges and nest boxes in adjacent areas immediately prior to proposed clearing (Water Corporation, 2020b, Tranen, 2020), which will provide greater opportunity for any WRPs to disperse to adjacent areas.

Additionally, the proposed infill planting and revegetation within and immediately adjacent to the proposed clearing will ensure habitat for the local WRP population is maintained. The remaining significant residual impacts will be addressed and approved subject to the implementation of an offset. Refer ‘avoidance, mitigation and offset’ section below for details on the proposed offset to counterbalance significant residual impacts to WRP.

The applicant’s efforts to minimise impacts by reducing the clearing footprint and committing to undertake infill planting and revegetation within the VDD corridor are acknowledged. A revegetation credit has been accounted for in the offset requirement.

With the application of the mitigation measures and offsets discussed above, the proposed clearing of 2.16 hectares of habitat that supports WRP is not considered to be inconsistent with the objectives of the WRP recovery plan.



Figure 5: Western ringtail possum habitat suitability adjacent to the application area as mapped by DBCA

Carnaby’s cockatoo, Baudin’s Cockatoo and Forest Red-tailed Black Cockatoo

According to the Commonwealth Department of the Environment’s EPBC Act referral guidelines for Western Australia’s three threatened black cockatoo species, the proposed clearing falls within the known breeding range for Carnaby’s cockatoo, Baudin’s Cockatoo and the forest red-tailed back cockatoo (DSEWPac, 2012) (collectively referred to as black cockatoos hereafter).

Black cockatoos generally forage within six kilometres of a night roost site and, while nesting, within a 12 kilometre radius of their nest site (DSEWPac, 2012). According to current DBCA databases, two confirmed black cockatoo roosting sites occur within 12 kilometres of the application area. The application area is within 5 kilometres of a confirmed breeding area for Carnaby's black cockatoo.

In accordance with the referral guidelines for the three species of black cockatoo, nesting habitat is defined as trees of species known to support nesting within the range of the species, which either have a suitable nest hollow or are of a suitable DBH to develop a nest hollow (DSEWPac, 2012). For jarrah and marri trees, DBH is 50 centimetres or above (DSEWPac, 2012).

Nesting/breeding habitat

Fauna surveys of the application area identified several trees with hollows which may provide suitable breeding habitat for black cockatoos (GHD, 2017a and b). A closer inspection of the hollow bearing trees (a total of 14 hollows were inspected) noted that while most hollows were too small to be utilised by black cockatoos, one flooded gum was of a suitable size and showed signs of use by way of chewing at the hollow entrance. A closer inspection with a pole camera showed this hollow to have extensive internal chewing, confirming the historic use of the hollow by black cockatoos (Kirkby, 2019). However, this tree is outside the proposed clearing footprint and is connected to vegetation west of the application area and therefore its potential as a future breeding site will not be impacted by the proposed clearing.

Roosting habitat

No roosting sites were recorded in survey 2 and 3 (as summarised in appendix 1), however both surveys recorded potential roosting habitat within the development area in the form of marri and flooded gum woodland (GHD 2017a and b). The closest known roost site is approximately ten kilometres southwest of the application area. Given the lack of confirmed roosting sites within the application area and that the majority of the potential habitat recorded occurs outside the application area, the proposed clearing is not likely to result in significant impacts to black cockatoo roosting habitat.

Foraging habitat

Survey 2 and 3 (as summarised in appendix 1) identified suitable foraging habitat for black cockatoos comprising mixed woodlands and shrubs within the development footprint, with marri and flooded gum providing high value foraging habitat. No evidence of foraging was observed during both surveys (GHD, 2017a and b).

The Carnaby's Cockatoo Recovery Plan notes that there are multiple reasons for the decline of Carnaby's cockatoo, however the decline to-date has primarily been brought about by the extensive clearing of nesting and feeding habitat (DPaW, 2013). Loss of nesting habitat, together with foraging areas and watering sites within foraging distance of breeding sites is one of the key threatening processes contributing towards the decline of the species. A further significant threat is the clearing, fragmentation and degradation of foraging and night roosting habitat in the non-breeding parts of Carnaby's cockatoo range in the southwest of Western Australia and particularly on the Swan Coastal Plain (DPaW, 2013). The long-term survival of Carnaby's cockatoo depends on the availability of suitable breeding habitat and foraging habitat capable of providing enough food to sustain the population (DPaW, 2013). In relation to Baudin's cockatoo and the forest red-tailed black cockatoo, the Recovery Plan for these species identify habitat critical to the species survival as Marri and Jarrah forest (DEC, 2008). Therefore, it is considered that the proposed clearing may contain critical habitat for the Baudin's cockatoo and forest red-tailed black cockatoo.

In total, the proposed clearing will result in the loss of 2.1 hectares of foraging habitat for black cockatoos, however noting the linear nature of the proposed clearing, the minimal black cockatoo activity recorded within the application area and that the majority of the application area is degraded to completely degraded, with the predominant canopy species (*Agonis flexuosa*, *Acacia saligna*, *Eucalyptus rudis* and *Melaleuca* sp.) within the application area not being preferred foraging species for black cockatoos, the proposed clearing is not likely to have a significant impact on foraging habitat for black cockatoos.

Carbunup king spider orchid

Survey 4 (as summarised in appendix 1) found no evidence of Carbunup king spider orchid or suitable habitat for Carbunup king spider orchid within the survey area during the targeted survey (GHD, 2017c). Survey 9 (EcoEdge Consulting, 2019) positively identified Carbunup king spider orchid, two populations located 1.9 metres (1 flower, 15 basal leaves) and 1.2 m (two basal leaves) south of the survey area boundary. During the survey, the population of 15 basal leaves (i.e. 15 plants) were considered likely to also be Carbunup king spider orchid based on their morphology, proximity to the flowering specimen and 'stiffness' of the leaf. The second population of two basal leaves (i.e. 2 plants) were also considered likely to be Carbunup king spider orchid. However it was noted that there is a level of uncertainty regarding identification based purely on leaf morphology especially where the leaves are similar; which is the case with *C. procera* and *C. attingens* (EcoEdge Consulting, 2019). Water Corporation personnel completed two additional confirmation visits, and specimens were reviewed and identified by a Botanist from photos (Water Corporation, 2019). Specimens were found to be predominantly *C. attingens*. The single confirmed (through flowering) record of Carbunup king spider orchid, and additional unconfirmed orchid specimens are located between 2.5 - 5 metres from the edge of the proposed temporary clearing footprint (Water Corporation, 2020a).

Given the proximity to the confirmed (through flowering) record of Carbunup king spider orchid and other potential records within 5 metres of the proposed temporary clearing footprint, the proposed clearing may have an indirect impact on 2-3 populations of Carbunup king spider orchid. The Carbunup king spider orchid recovery plan notes all known habitat that holds wild populations is critical to the survival of the species. The recovery plan for the species identify the need for development and implementation of translocation proposals and deterring access by fencing (Department of Environment and Conservation, 2011). The applicant has proposed fencing around any records within the development footprint and translocation of a custodial collection of plants (Water Corporation, 2020a).

DBCA southwest region also notes that the habitat for Caribunup king spider orchid adjacent to area B is under considerable pressure from urban development and recreation, thus the long term impact as a result of clearing in the drainage reserve is likely to be significant to the ongoing survival of the Threatened Flora in this area” (DBCA, 2018). The approved conservation advice for the species notes road widening and maintenance activities (or other infrastructure or development activities) involving substrate or vegetation disturbance in areas where the species occurs need to ensure no adverse impacts on known populations (DEWHA, 2008).

The applicant has proposed the following impact minimisation and mitigation measures:

- Construction site access areas have been carefully selected to avoid the known orchid habitat to prevent further fragmentation or deterioration in vegetation condition;
- Rabbit control along the drain, to maintain the integrity of the levees, may have additional positive impacts on the orchid population through reduction in grazing; and
- The work being undertaken for this project is considered to be the ‘ultimate design’ for the asset. It is unlikely that future clearing will occur within the remaining vegetation. This Crown land remains vested with the City of Busselton with a ‘Drainage and Conservation’ encumbrance (Water Corporation, 2020a).

The applicant will develop a targeted environmental management plan for the species including:

- Construction will be undertaken between November 2020 to April 2021 during the time of the year when the orchid tubers are dormant;
- Prof. Kingsley Dixon will undertake a Spring reconnaissance survey to note the location and extent of to the population in 2020. This information will inform the position and extent of fencing to be installed;
- The protection zone will be clearly delineated on the ground with fencing and fine mesh to be installed, and approved by Prof. Kingsley Dixon. Fencing will remain in place for the duration of the project, and will not be removed until all works have been completed and ceased;
- During construction the location of the protected area will be indicated on plans. This zone will be highlighted in daily tool box meetings when clearing is actively being undertaken in close proximity;
- Water Corporation personnel will be present on site to monitor clearing works in the immediate vicinity of the protection zone; and
- Water Corporation Environmental Officers will regularly inspect the exclusion zone during construction to ensure it is visible, intact and in the correct location (Water Corporation, 2020a).

The proposed clearing will not remove any populations of Caribunup king spider orchid and the proposed mitigation measures as outlined above will ensure any population within ten metres of the proposed clearing will not be adversely impacted.

To mitigate impacts to Caribunup king spider orchid the management plan will be required to be submitted to DBCA for endorsement and subsequently to DWER for approval. Conditions on the clearing permit will require the implementation of the approved plan.

Public consultation

Early community engagement activities undertaken by the applicant include:

- August 2016: Stakeholder forum with City of Busselton, DoW and Busselton Water
- September 2016: Brief to Local Member of Parliament
- October 2017: Meet with landowners in southern section of Drain. Brief on plans to upgrade.
- April 2018: Update key landowners of project status (letter) – Survey works and progressing approvals (Water Corporation, 2019)
- 30 November – 2 December 2019: Community stalls at Bunnings (Saturday) and the local Farmers Market (Sunday)
- 22 and 23 February 2020: Community stalls at Bunnings (Saturday) and the Busselton Farmers Market (Sunday) (Water Corporation, 2020c)

The applicant had undertaken public consultation as follows:

- Inviting the general public to have an open dialogue with the project team by reaching out to the project’s dedicated Community Engagement Advisor via an online engagement platform (<https://yoursay.watercorporation.com.au/VasseDrainUpgrade>). Over 100 people are understood to have visited the webpage and read or engaged with the content;
- Two rounds of letters and emails sent to over 350 properties along the drain providing a description of the proposal and inviting comments and feedback;
- As of December 2019, Water Corporation had spoken with over 100 Busselton community members, including six representatives of local environmental stakeholder groups;
- Pop-up project information booths established in Busselton in late February 2020 to share how Water Corporation incorporated the community feedback into the design, surveys and rehabilitation plans (Water Corporation, 2020a).

The clearing application was advertised for public comment on DWER’s website on 5 December 2018. The public comment period ended on 26 December 2018. One public submissions were received during this comment period, raising concerns on

the revisions to the project footprint, impacts to western ringtail possum, Caribunup king spider orchid, *Conospermum caeruleum*.subsp Busselton and the inadequacy of surveys for these species.

On 3 January 2019, DWER wrote to the applicant, requesting a response to the public submission. On 13 February 2019 the applicant provided a response to the public submission, which is available to view online at <ftp://ftp.dwer.wa.gov.au/permit> (reference 8191).

Avoidance, mitigation and offset

Avoidance and Mitigation

Impact avoidance

The applicant advised that detailed engineering design was used to minimise the footprint of permanent clearing of native vegetation and, as a result, has reduced the proposed clearing from 4.6 hectares to 2.16 hectares. Key detailed design factors reducing the clearing extent included:

- Shifting the alignment as far to the northern side of the drain (where less vegetation is present) as existing services safely permit;
- Limiting clearing for construction to no greater than 2 metre from the levee toe in areas constrained by sensitive receptors;
- Construction of a 400 metre retaining structure (maximum height of 1 metre) limiting clearing along the southern section of the drain bordering Crown reserve 52132, where significant remnant vegetation occurs;
- Construction access locations utilising existing areas of completely degraded vegetation; and
- The construction lay-down area was moved upstream to agricultural land-use area to utilise existing cleared land, at additional land-access and transportation cost to the project (Water Corporation, 2020a).

In February 2019 DWER requested that the applicant to consider the construction of concrete levee walls on each side of the drain, instead of widening the drain, with the assumption that this may reduce the clearing footprint. The Water Corporation undertook high level design and cost/benefit analysis of this alternative and made the determination that concrete levee walls along the drain was not a sustainable design option for the following reasons:

- The levee walls would have to be constructed to 2.8 metre tall with additional fencing and barbed wire for safety. Basic designs included deep footings for the structures, likely to result in little reduction in the overall clearing footprint;
- The walls would create a physical barrier to fauna crossing the drain. Fauna surveys conducted for the project noted evidence of fauna traversing the drain;
- There was little, if any, reduction in the clearing footprint due the depth and width of excavations required for footings;
- The walls pose a significant public safety risk leaving Water Corporation and the State Government exposed to high risk;
- The City of Busselton advised this was not their preferred option due to the impact on visual amenity and public safety risks;
- The cost was prohibitive. Cost estimates for the construction of a wall on both sides of the drain were significant. Ongoing maintenance, including refurbishments, safety management and vandalism control, was also considered a significant financial and operation cost;
- Concrete production globally contributes approximately 8 per cent of global carbon emissions;
- The carbon footprint to construct 2.8 metre high walls along the length of the drain would be a significant contributor to corporate emissions, and be contrary to the Water Corporations objective towards Zero Net Emissions by 2030; and
- The wall would be contrary to the efforts towards Waterwise Cities, and does not align with the drainage and liveability goals, aiming to provide people with greater connectivity and access to water (Water Corporation, 2020a).

Impact reduction

The Water Corporation will prepare a number of management plans for implementation during the Project, including a Construction Environmental Management Plan (CEMP) and a Construction Environmental Management Framework (CEMF). Targeted management strategies will be incorporated into the CEMF for the management of specific environmental matters with advice from technical specialists, which include:

- Acid Sulfate Soils and Dewatering Management Plan
- *Caladenia procera* management
- Fauna management strategies
- *Westralunio carteri* (Carter's Freshwater Mussel) Translocation and Environmental Management Plan

Fauna and flora impact management strategies identified in the CEMF will be incorporated into the contractor CEMP by the applicant, including but not limited to:

- The clearing boundary will be delineated on plans and on ground by a qualified surveyor;
- The clearing boundary will be clearly delineated on the ground with flagging. Flagging will remain in place for the duration of the project, and will not be removed until all earth works have ceased;

- Prior to clearing works, the Geographe Landcare Nursery will undertake a salvage operation within the clearing footprint;
- During construction the clearing boundary will be highlighted in daily tool box meetings when clearing is actively being undertaken;
- Water Corporation personnel will be present on site to monitor clearing works; and
- Water Corporation Environmental Officers and contractor personnel will regularly inspect flagging during construction to ensure it is visible, intact and in the correct locations (Water Corporation, 2020a).

Infill planting and revegetation

Water Corporation will also undertake infill planting and revegetation in and around the drain to mitigate and offset potential impacts from the project in the aim of providing better environmental outcomes for the local environment, whilst improving the amenity of the strategic infrastructure corridor. The proposed revegetation and infill planting within and adjacent to the drain totals 10.89 hectares.

Water Corporation has liaised closely with the Busselton DWER and GeoCatch Officers, as well as revegetation specialists to ensure that the vision for improving the ecosystem and vegetation condition around the drain is viable. In particular, the opportunity to extend the existing GeoCatch revegetation works from Bussell Highway to the northern extent of the project area was identified as desirable for both visual amenity, improvement to the existing habitat for flora and fauna, and an improvement to the corridor linkage.

The applicant will be enhancing WRP habitat and provide additional connectivity between other revegetation zones across the northern side of Area B (Figure 6, 'The Possum Infill Zone') installing numerous rope bridges connecting pockets of vegetation, with strategic infill planting across the entire area to improve habitat and ecological value. Rope bridges will be installed at each road cross-over running west-to-east and additional bridges installed across more major roads to provide connectivity to the greater area (Tranen, 2020). Nest boxes specifically designed to support WRP will be installed amongst the existing peppermint trees within Area A (Figure 6, 'Upland Section').

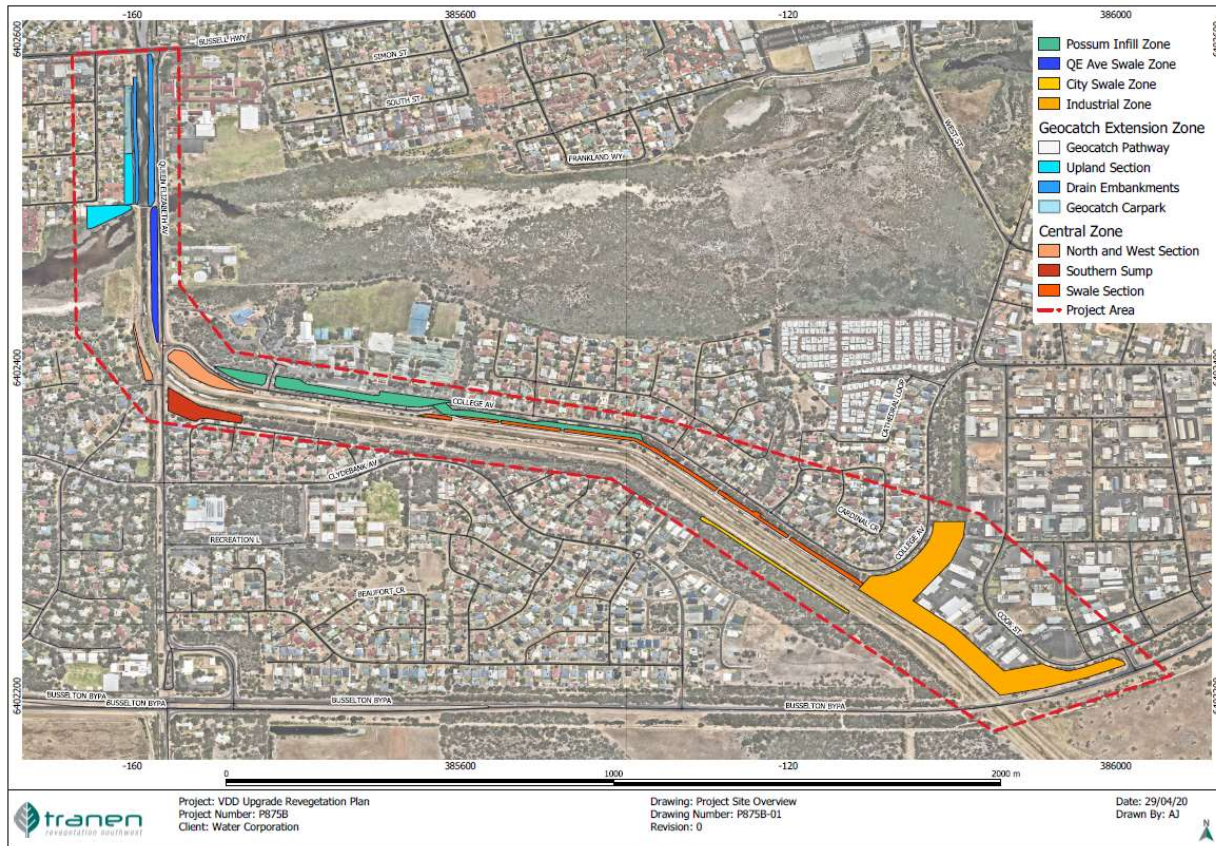


Figure 6: Proposed revegetation within and around the application area (Tranen, 2020)

Offset

A revegetation and rehabilitation offset is proposed to offset the residual impacts of removal of 2.16 hectares of critical habitat for western ringtail possum, up to 1 hectares of vegetation representative of the state listed Priority 1 flooded gum, marri and peppermint forest PEC and vegetation within an extensively cleared landscape.

Principle 1 of the WA Environmental Offsets Policy September 2011 outlines that environmental offsets will only be considered after avoidance and mitigation options have been pursued. The WA Environmental Offsets Guidelines August 2014 outlines

a four step mitigation hierarchy; avoid, minimise, rehabilitate and offset. The mitigation measures undertaken by the applicant outlined above, are deemed to be adequate in addressing this requirement.

DWER applied an offset credit for the proposed revegetation and infill planting of up to 0.55 hectares of vegetation within the application area.

Utilising the EPBC Act offsets calculator, the Delegated Officer determined that additional offsite revegetation and rehabilitation of a total of 10.34 hectares (within the general vicinity of the application area) to vegetation in Good to Very good condition (Keighery, 1994) that provides suitable habitat for western ringtail possum will counterbalance the 2.16 hectare loss of critical habitat for a constrained and urbanised population of western ringtail possum. Justifications used for values in the offsets calculator can be found in Appendix 2.

- **Residual impact** = 2.16 hectares of critical habitat for western ringtail possum in an extensively cleared landscape and approximately one hectare of native vegetation that is representative of the state listed Priority 1 flooded gum, marri and peppermint Forest PEC
- **Offset required** = 10.34 hectares of revegetation/rehabilitation to vegetation in Good to Very good condition that provides suitable habitat for western ringtail possum and are representative of the state listed Priority 1 flooded gum, marri and peppermint forest PEC, in an extensively cleared landscape

The proposed revegetation plan and the proposed installation of rope brides and WRP nest boxes will enhance WRP habitat adjacent to the proposed clearing and provide connectivity for WRPs to disperse to adjacent areas.

DWER considers the mitigation measures and the revegetation/rehabilitation outlined above are adequate to counterbalance the significant residual impacts to western ringtail possum, the flooded gum, marri and peppermint Forest PEC and the clearing of vegetation in an extensively cleared landscape.

Other relevant considerations

Economic and Social Matters

The assessment of the financial damages associated with failure of the drain has an annualised present value of AUD 18.9 million. The basis of the present value calculation includes discount rate for PV analysis (4.6 per cent), project term (50 years) and inflation (2.5 per cent). The total project cost of the upgrade is estimated at AUD 20.2 million. The construction cost of the upgrade is currently estimated to be around AUD 14.5 million. Given the significant project budget, the applicant envisage there will be multiple job opportunities, particularly in construction (Water Corporation, 2019).

Applicant's Environmental History

The applicant has advised that the magnitude of their operations across the State of Western Australia and diversity of the natural environment in which it operates is vast. This is reflected in the range of evidence for excellence in environment performance, including the climate adaptation award from the Banksia Environmental Foundation (2013), the Earth awards (2011) for the Walkington Avenue Community Verge Garden Project (Margaret River), the Prime Minister's Award (2004) for environmental excellence in Public Sector Management, the WA Premiers Award (2004), the 2003 Australian Greenhouse Office Gold Award, and the United Nations Association of Australia World Environment Day Award 2004 for excellence in Marine and Coastal Management (Water Corporation, 2017).

The Water Corporation has advised that it has had no actions brought against it in relation to its environmental performance under Commonwealth legislation, but has received two modified penalty notices from WA State authorities; however notes that under the applicable WA legislation modified penalty notices do not represent an admission for the purposes of criminal or civil proceedings (Water Corporation, 2017).

7. Assessment of application against clearing principles, planning instruments and other relevant matters

(a) Native vegetation should not be cleared if it comprises a high level of biodiversity.

Proposed clearing is at variance with this principle

Delegated Officer's Key Considerations

The proposed clearing is at variance with this principle as the application area contains:

- One Threatened flora species and one ecologically significant flora species
- 2.16 hectares of significant habitat for western ringtail possum
- Approximately one hectare of native vegetation that is representative of the state listed Priority 1 flooded gum, marri and peppermint forest PEC
- Vegetation within the naturally restricted and poorly reserved Abba complex
- Vegetation associated with two regional ecological linkages

The applicant has committed to avoiding impacts to the flooded gum, marri and peppermint Forest PEC and western ringtail possum, including a substantial reduction in the clearing footprint compared with initial project designs, and by moving the proposed clearing away from vegetated areas where possible, including minimal clearing next to Crown reserve 52132.

The applicant has also committed to mitigating impacts by revegetation and infill planting a total of 0.55 hectares (within the application area) and offsetting impacts by revegetating 10.34 hectares in and around the drain (adjacent to the application area) with species representative of the PEC and suitable habitat species for western ringtail possum. In addition, the applicant has committed to propagating 300 seedlings of *Conospermum caeruleum* var. Busselton for use in revegetation.

The applicant has committed to avoiding impacts to Threatened flora species via management plans, with the remaining impacts considered acceptable on the basis that they are unlikely to impact on the species conservation status.

As stated in Section 2, the application area is made up of three areas (Areas A, B and C) and comprises of several vegetation units dominated by *Agonis flexuosa*, *Acacia saligna*, *Eucalyptus rudis* and *Corymbia calophylla* open forest in good to degraded condition, as well as highly disturbed areas in completely degraded condition.

The local area retains approximately ten per cent (approximately 3,135 hectares) pre-European vegetation extent (Table 4). The majority of the remnant vegetation in the local area is contained within nature reserves associated with the Vasse-Wonnerup wetland system, with some contained within private estate.

Area C consists of vegetation within the naturally restricted and poorly reserved Abba complex, of which less than seven per cent of its pre-European extent remains, however has more than the Molloy et al. (2007) recommended 1,500 hectare level of retention (Table 4). The proposed clearing will only reduce 0.55 hectares of vegetation in degraded to completely degraded condition within this vegetation complex, and therefore is not considered to have a significant impact on this restricted vegetation complex.

The mapped boundary of a conservation category wetland associated with the New River occurs within Area A and the vegetation within Area A is consanguineous with wetland vegetation.

Threatened and Priority Flora

As outlined in Section 5, the application area comprises habitat for the Threatened flora species *caladenia procera* (Carbunup king spider orchid). One confirmed flowering specimen was recorded within 2 meters of the application area (EcoEdge Consulting, 2019). As discussed in section 5, a Carbunup king spider orchid management plan implemented via permit conditions will ensure impacts are avoided.

As discussed in principle (c), the application area may support habitat for the Threatened flora species, *Austrostipa bronwenae*, with the closest record located approximately 100 metres from the development footprint.

Based on the findings of the numerous surveys undertaken and the mapped vegetation and soil subsystems, the application area does not comprise habitat for any other known Threatened or Priority flora species, including *Drakaea elastica* (hammer orchid).

The application area supports significant habitat for *Conospermum caeruleum* var. Busselton. This subspecies is a distinct form of *Conospermum caeruleum* associated with Spearwood Dune vegetation directly south of Busselton, first documented by Webb et al. (2009). DBCA species and communities branch advised that the subspecies would meet the criteria for Priority 1 (DBCA, 2019b), however it had not been formally recognised by the WA Herbarium to be a district form. Populations of *Conospermum caeruleum* var. Busselton were observed during the DWER site inspection (Figure 2, DWER, 2018). A targeted survey (Survey 5) recorded 489 GPS assessments, with each assessment consisting of typically more than one plant (often found as carpets including several plants), however genetic testing was required to determine if subsp. Busselton and the non-threatened *Conospermum caeruleum* subsp. *marginatum* are the same or different taxa (Bennett, 2019). A majority of the subsp. 'Busselton' plants recorded by Survey 5 are in unsecured tenure, in that they are within private ownership or public land that is earmarked for future development, very little of the recorded plants are within lands demarcated for conservation (DBCA, 2020).

The results of genetic testing, commissioned by the Applicant during the assessment of this application, did not recommend the recognition of the Busselton populations as a distinct subspecies but noted that it as one of three independent Management Units

(MUs) that belong to a single, morphologically variable southwest species, which exhibits strong population genetic structure. The genetic research study recommended that *Conospermum caeruleum* var. Busselton should be managed separately and considered an independent conservation unit until more information is known (Bradbury et al., 2019).

DBCA southwest region advised that the Bradbury et.al (2019) genetic work has shown that the *C.caeruleum* complex can be separated into three separate taxa, being those associated with the Albany & Stirlings area, those associated with the eastern Jarrah forest and those of the Busselton to Scott Coastal Plain area (this later group includes subsp. '*Busselton*'). It has also shown that within the Busselton to Scott Coastal Plain group are three distinct Management Units and each unit has a level of conservation significance. The presence and significance of such management units has recently been discussed in Coates et.al (2018) and they recommend that greater recognition needs to be given to such concepts and also within the conservation legislation.

The Applicant's conservative estimates indicate 105 plants will be removed as part of the clearing works (Water Corporation, 2020a). Noting the targeted survey found 489 records within the vicinity of the drain (with the number of individual plants many times greater) (Bennett, 2019), the proposed clearing will result in approximately a 20 per cent reduction in the local population of the species. Additionally, the applicant has committed to propagating 300 seedlings of *Conospermum caeruleum* var. Busselton for use during revegetation post construction.

Noting that *Conospermum caeruleum* var. Busselton is not currently listed as a Priority or Threatened flora species, replanting of propagated seedlings immediately adjacent to the application area will mitigate potential impacts to this ecologically significant species.

A total of 22 introduced plant species have been recorded within the development footprint, including *Zantedeschia aethiopica* (Arum-lily), listed as a Pest Plant under the *Biosecurity and Agriculture Management Act 2007* (BAM Act) (EcoEdge Consulting 2020a). Currently there are no obligations for management of this species under the BAM Act.

Threatened and Priority Ecological Communities

The application area A intersects the Subtropical and Temperate Coastal Saltmarsh Threatened ecological community, listed as vulnerable under the EPBC Act and as a Priority 3 ecological community under State legislation. However the proposed clearing will impact only 0.051 hectares of the mapped TEC and therefore the impacts to the TEC are not considered significant (DBCA, 2019a).

The state listed Priority 1 '*Eucalyptus rudis* (flooded gum), *Corymbia calophylla*, *Agonis flexuosa* Closed Low Forest (near Busselton)' PEC is mapped over parts of Area B. Surveys 1, 2 and 3 did not record the presence of this PEC within the development footprint (GHD, 2010, GHD 2017a, b and c), however Survey 9 (targeted) found approximately one hectare of the application area to resemble the characteristics of this PEC (EcoEdge Consulting, 2020a). The survey found approximately 0.29 hectares of the recorded PEC vegetation to be in Good (Keighery, 1994) condition.

This PEC is extremely restricted in distribution and is very high priority for assessment as a TEC (DBCA, 2019a). DBCA advised that "while the applied area may be degraded, it is contiguous with Good or better condition vegetation (both within the narrow drainage reserve and the larger conservation reserve). In this situation the surrounding context of the particular area has to be considered, and in that context, the applied vegetation is part of the larger PEC in Good or better condition and is considered vital to the maintenance of the larger area" (DBCA, 2019a). DBCA's advice highlights the value of the PEC within the application area as a buffer to the better condition PEC within the adjacent conservation area.

DBCA further advised that, "given the extremely restricted distribution of this PEC and that several of the remaining PEC areas are already under discussion for future clearing (road widening, recreational facilities) and urban development, DBCA considers that the impact of this proposed clearing would be significant" (DBCA, 2019a). It is understood from DBCA's advice that there are no viable options for offsetting impacts to this PEC through land acquisition.

To minimise impacts to the mapped PEC, the applicant has proposed the following actions:

- The clearing boundary will be delineated on plans and on ground by a qualified surveyor;
- The clearing boundary will be clearly delineated on the ground with flagging. Flagging will remain in place for the duration of the project, and will not be removed until all earth works have ceased;
- During construction the clearing boundary will be highlighted in daily tool box meetings when clearing is actively being undertaken;
- Water Corporation personnel will be present on site to monitor clearing works;
- Water Corporation Environmental Officers and contractor personnel will regularly inspect flagging during construction to ensure it is visible, intact and in the correct locations;
- Proposed infill and reinstatement works will include species aligned with the PEC where suitable (Water Corporation, 2020a).

The Delegated Officer notes that, in addition to the above mitigation measures, the revegetation and infill planting a total of 10.89 hectares within and adjacent to the application area will include areas with species representative of the PEC will further offset impacts to the PEC. Noting DBCA's advice that the main impact associated with the proposed clearing is the loss of buffering vegetation, the Delegated Officer considers that the proposed replacement of buffering vegetation through revegetation and infill planting will appropriately counterbalance the impacts of clearing.

Fauna

As outlined in Section 2, the application area is not considered to consist of significant foraging, roosting and breeding habitat for threatened fauna species, the Carnaby's cockatoo, Baudin's cockatoo and the forest red-tailed black cockatoo.

As outlined in Section 2, the application area supports significant habitat for western ringtail possum. Impacts to WRP will be managed by permit conditions, management plans and the implementation of offsets.

As outlined in principle (b), the proposed development footprint supports significant habitat for Carter's freshwater mussel. However, as outlined in principle (b), the impacts are considered minimal and will be managed via permit conditions.

The application area is intersected by two ecological linkages as defined by the South West Regional Ecological Linkage Report (Molloy et al., 2009). One associated with the New River and Vasse River Estuary, occurs at Area A and the other associated with the Vasse River, occurs at Area C. Vegetation within the application area in proximity to these axis lines has been assigned the PV ratings of "1a, 1b and 1c". Water Corporation notes that clearing within Area C will facilitate the reconstruction of the diversion dam and culvert duplication and therefore will be permanent in nature and therefore the area cannot be revegetated (Water Corporation, 2020c). Noting the extent of the ecological linkage, the relatively small size of the application area and degraded nature of the vegetation within Area C, the proposed clearing is not expected to significantly contribute to the further fragmentation of the mapped ecological linkages.

Given that the application area contains significant habitat for western ringtail possum, vegetation consistent with a PEC, may provide habitat for Threatened and other environmentally significant flora and consists of a restricted vegetation complex, it is considered to comprise a high level of biological diversity. The proposed clearing is at variance with this principle.

(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna.

Proposed clearing is at variance with this principle

Delegated Officer's Key Considerations

The proposed clearing is at variance with this Principle as the application area contains:

- 2.16 hectares of significant habitat for western ringtail possum
- Habitat for a significant population of Carter's freshwater mussel
- Vegetation associated with two regional ecological linkages

The applicant has committed to avoiding impacts to western ringtail possum by revegetation and infill planting 0.55 hectares (within the application area) with species that provide suitable habitat for western ringtail possums.

The applicant has committed to a revegetation offset of 10.34 hectares (adjacent to the application area) to address the remaining impacts to western ringtail possum (see Section 5).

The applicant has committed to translocation of Carter's freshwater mussel impacted by the proposed VDD upgrade works.

The impacts to the northern ecological linkage will be mitigated by the proposed revegetation offset. The proposed clearing is not expected to significantly contribute to the further fragmentation of the southern ecological linkage.

Western ringtail possum

As outlined in Section 2, the application area supports significant habitat for western ringtail possum. Impacts to WRP will be mitigated via permit conditions, and significant residual impacts will be addressed by the implementation of offsets.

Carter's freshwater mussel

The proposed development footprint supports habitat for Carter's freshwater mussel (*Westralunio carteri*), listed as Endangered under the EPBC Act and Critically Endangered under the WC Act.

CFM is the only species of freshwater mussel in southwestern Australia. The current distribution of CFM is bounded by Gingin Brook in the north to the Kent, Goodga and Waychinicup Rivers in the south, within 50-100 kilometres of the coast. The species has been found to have undergone a 49 per cent reduction in extent of occurrence in less than three generations, due primarily to secondary salinisation. Apart from salinity, perenniality of stream flow was identified to be the other major limiting variable in the distribution of CFM, suggesting that habitat drying, inadequate provision of environmental stream flows and dewatering could pose further conservation constraints on the species (Klunzinger et al., 2015).

Dehydration, heat stress, nutrient pollution, cattle trampling and predation by feral pigs have also been identified as current threats to CFM. Maintaining shading riparian vegetation is recommended in relation to limiting dehydration and heat stress related impacts. The species is also most abundant amongst submerged tree root complexes, along the edges of stream banks and amongst woody debris/leaf litter out of direct streamflow or on the leeward side of logs in faster-flowing ripple zones (TSSC, 2018).

Survey 2 recorded approximately 38 individuals of Carter's freshwater mussel (*Westralunio carteri*) within the drain in Area C (GHD, 2017a), however did not report whether they were alive or dead specimens. A targeted mussel survey (Survey 6) recorded

live mussels at two locations (transects 9 and 10), with mussel density varying between 0.4 to 15.1 mussels per square metre. Highest density observed at an opportunistic search point at 40 mussels per square metre. Dead mussels recorded at four transects and at ten opportunistic search points, at shallow residual pools and scattered on dry areas of drain bed (GHD, 2019).

Additional surveys (Survey 11) across 15 sites found the species to be present throughout the proposed VDD reconstruction footprint upstream of Chapman Hill Road. A total of 192 alive and seven dead mussels recorded at a mean density of 7.4 mussels. The survey results demonstrated there was no difference in the abundance of *W. carteri* between the right and left banks. Total abundance of mussels along the development footprint was estimated at 10,043 (Murdoch University, 2019). The survey findings indicated that the “proposed drain reconstruction works in the VDD will have a very high probability of causing mortality to *W. carteri* upstream of the Chapman Hill Road. This is due to the high likelihood of physical damage or removal of mussels during the reconstruction of the levee banks” (Murdoch University, 2019).

The applicant has proposed to implement the following management measures.:

- Prior to the proposed works, individual *W. carteri* to be relocated from the ~700 stretch of the VDD upstream of the Chapman Hill Road;
- Removal to be achieved by an intensive hand searching particularly targeting near-bank habitats and then prompt transportation in biosecure, aerated, insulated containers to a secure relocation site;
- Subject to additional site assessment and approvals, it is recommended that the Taylor’s Lake relocation site within the Iluka Capel Wetlands be used to house the relocated mussels within purpose built cages. This site was identified as a suitable site for housing the species within the *Busselton Eastern Link Project: Carter’s Freshwater Mussel Westralunia carteri Environmental Management Plan* (Beatty et al., 2019). 4) It is also recommended that that the Environmental Management Plan for *W. carteri* that will need to be prepared for the current VDD reconstruction project directly aligns with the above EMP. This includes following the management objectives, targets, monitoring protocols and triggers outlined in Beatty et al. (2019);
- Following the completion of the proposed works, a field assessment will occur to confirm that the habitat conditions within the VDD upstream of Chapman Hill Rd are suitable for the species to be restocked. The assessment of habitat suitability should meet the relocation trigger values outlined in Beatty et al. (2019);
- It is recommended that all relocated *W. carteri* be restocked within the VDD upstream of Chapman Hill Rd at densities not exceeding those recently recorded in the VDD by GHD (2019) and the current survey; and
- The proposed relocation activity will require the granting of a Regulation 17 Application for a licence to take (i.e. capture, collect, disturb, study) fauna for scientific purposes. It will also require approved exemption from DPIRD (Application To Collect Fish Under Exemption From Fish Resources Management Act 1994 And Regulations) (Murdoch University, 2019).

The impacts to CFM are likely to be from the proposed development works and not from the proposed clearing of vegetation. Noting the Vasse Diversion Drain is a man-made drain, it isn’t considered a natural habitat for the species. However the occurrence of the species along the drain is significant for the conservation of the species (Water Corporation, 2020a).

The applicant has committed to relocating those individuals impacted by the proposed works to a suitable site upstream of the project works, but still within the Vasse River. The applicant has further advised that “the translocation and environmental management plan will be incorporated into the CEMF for inclusion in the CEMP. The relocation plan will be approved by the DBCA. The plan will be implemented by a suitably qualified specialist consultant (Water Corporation, 2020a).

Impacts to CFM will be managed via permit conditions, including the requirement to submit a detailed management plan for approval.

Black cockatoos

As outlined in Section 2, the application area is not considered to consist of significant foraging, roosting and breeding habitat for threatened fauna species, the Carnaby’s cockatoo, Baudin’s cockatoo and the forest red-tailed black cockatoo.

Other fauna

Survey 1 recorded quenda (*Isoodon obesulus* subsp. *fusciventer*) tunnels within the development footprint, however did not report the location (GHD, 2010). Survey 2 recorded an osprey (*Pandion haliaetus*) perched on a *Melaleuca* within the development area (GHD, 2017a). Several other migratory waterbirds may utilise the application area, however noting the urbanised landscape adjacent to the application area, impacts to these species are likely to be minimal.

The applicant has also advised that “fauna management strategies will also include additional management for Quenda, Rakali and migratory bird species, in the event they are sighted during construction (Water Corporation, 2020a).

Ecological linkages

As discussed under Principle (a) above, the application area is intersected by two ecological linkages as defined by the South West Regional Ecological Linkage Report (Molloy et al., 2009). One associated with the New River and Vasse River Estuary, occurs at Area A and the other associated with the Vasse River, occurs at Area C. Vegetation within the application area in proximity to these axis lines has been assigned the PV ratings of “1a, 1b and 1c”. Noting the extent of the ecological linkage, the relatively small size of the application area that intersects the linkage, and the degraded nature of the vegetation within Area C, the proposed clearing is not expected to significantly contribute to the further fragmentation of the mapped ecological linkages.

Noting the application area supports significant habitat for western ringtail possum and the proposed works will impact a significant population of carter's freshwater mussel, the application area is considered to contain significant habitat for Threatened fauna.

Given the above, the proposed clearing is at variance with this principle.

(c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, threatened flora.

Proposed clearing is at variance with this principle

Delegated Officer's Key Considerations

The proposed clearing is at variance with this Principle as the application area contains:

- One confirmed record of *Caladenia procera* and one additional possible record immediately adjacent to the application area, and habitat suitable for the species
- Suitable habitat for *Austrostipa bronwenae* with one possible record adjacent to the application area

No threatened flora are proposed to be cleared and permit conditions will ensure minimal impacts to known populations and critical habitat (where possible) within and adjacent to the application area.

Current DBCA databases have recorded 16 Threatened flora species within the local area. As outlined in Section 5, the application area comprise habitat for the Threatened flora species *Caladenia procera* (Carbunup king spider orchid). Fourteen records of the species have been reported within the local area, including a formal record within approximately 25 metres of the application area. Survey 9 recorded two populations (17 specimens) of *Caladenia procera* within two metres of the application area, however all specimens were not positively recorded as *Caladenia procera* due to lack of flowering at the time of the survey. One confirmed flowering specimen was recorded within 2 meters of the application area (EcoEdge Consulting, 2019). As discussed in section 2, a Carbunup king spider orchid management plan implemented via permit conditions will mitigate impacts to the species and ensure any impacts are addressed appropriately via management measures. The permit conditions will ensure critical habitat for the species is protected.

Survey 9 also recorded three plants of the Threatened grass *Austrostipa bronwenae*, located approximately 100 metres from the development footprint, in road reserve vegetation (EcoEdge Consulting, 2019). The application area may contain suitable habitat for *A. bronwenae*. This species is listed as Critically Endangered under the BC Act and Endangered under the EPBC Act and is currently known from a total of nine records (comprising of populations ranging from 1-3 individuals to 20 plants) from Kenwick, Bunbury, Kemerton and Busselton. *A. bronwenae* grows in calcareous, winter-wet grey-brown sandy-loam or dark brown loam over clay (DPaW, 2017b). According to DBCA data, the closest known record of the species is approximately 200 metres from the application area.

The area of occupancy for *A. bronwenae* is estimated to be less than 500 square kilometres and the reasons for the conservation significance of the species include populations being severely fragmented, a continuing decline in its area of occupancy, quality of habitat, and the number of mature individuals, there being less than 2500 mature individuals and no subpopulations having more than 250 mature individuals (DPaW, 2017b).

Habitat critical to the survival of *A. bronwenae* includes the area of occupancy of populations and areas of similar habitat surrounding populations (providing potential habitat for population expansion). It may also include additional occurrences of similar habitat that may contain undiscovered populations of the species or be suitable for future translocations, and the local catchment for the surface and/or groundwater that maintains the habitat of the species (DPaW, 2017b).

A further targeted survey (Survey 10) did not observe any records of *A. bronwenae* within the development footprint (EcoEdge Consulting, 2020b). The survey report notes "because of its distinctive blue green appearance which sets it apart from the only other co-occurring and similar *Austrostipa* species, *Austrostipa flavescens*, that it would have been observed, had it occurred within the area searched" (EcoEdge Consulting, 2020b).

Noting the above, the application area is not likely to contain occurrences of *A. bronwenae* or support buffer vegetation for the species.

Noting the occurrence of *Caladenia procera* within 2 metres of the application area, the application area is considered to support habitat for Threatened flora species that occur within the local area and therefore the proposed clearing is at variance with this principle. As stated above, potential impacts will be mitigated via permit conditions.

(d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.

Proposed clearing is not likely to be at variance with this principle

According to available datasets, there are five state-listed TEC's mapped within the local area. No state-listed TECs have been mapped within the application area.

None of the surveys recorded the presence of any known state-listed TECs within the application area. Based on the vegetation types mapped within the application area, the vegetation is not considered likely to be representative of any known state-listed TEC's.

Given the above, the proposed clearing is not likely to be at variance with this principle.

(e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

Proposed clearing is at variance with this principle

Delegated Officer's Key Considerations

The proposed clearing is at variance with this Principle as the application area:

- Is within a local area with ten per cent remnant native vegetation remaining
- Contains an occurrence of a vegetation complex with seven per cent of its pre-European vegetation extent remaining
- Native vegetation adjacent to an extensively cleared belt urban environment
- Significant remnant vegetation which provides significant habitat for western ringtail possum, and of which approximately one hectare is representative of the state listed flooded gum, marri and peppermint Forest PEC

The applicant has provided the following mitigation measures to address impacts to clearing significant vegetation within a highly cleared area:

- Revegetation and rehabilitation of approximately 0.55 hectares of vegetation within the application area

The applicant has also committed to a revegetation offset of 10.34 hectares to address the remaining residual impacts (see Section 5).

The national objectives and targets for biodiversity conservation in Australia include a target to prevent clearance of ecological communities with an extent below 30 per cent of that present pre-1750, below which species loss appears to accelerate exponentially at an ecosystem level (Commonwealth of Australia, 2001).

The application area is located within the Swan Coastal Plain Interim Biogeographic Regionalisation of Australia (IBRA) bioregion. As indicated in Table 4, the Swan Coastal Plain bioregion has approximately 39 per cent of its pre-European extent remaining, of which only 15 per cent is contained within conservation estate (Government of Western Australia, 2019). One of the mapped vegetation complexes within the application area (Abba complex) retains only approximately 7 per cent of its pre-European extent (Government of Western Australia, 2019). Survey findings indicate that Area C (refer Table 1) is representative of the Abba complex. The proposed clearing of 0.55 hectares of vegetation will further reduce this complex by 0.005 per cent, however it is noted that the Abba complex more than the Molloy et.al. (2007) recommended 1,500 hectare level of retention (Table 4).

The pre-European vegetation extent of the Abba complex has been significantly reduced and only 0.36 per cent of remaining vegetation mapped within this complex lies within conservation estate, occurrences of vegetation representative of the Abba complex is likely to be significant for its maintenance, and the clearing of vegetation representative of the Abba complex may be significant.

However noting that the adjacent vegetation within the mapped Abba complex is highly disturbed, the application area (and its immediate surrounds) is considered a poor quality representation of the Abba complex. This is also based on the consideration of its location being along the northern edge of the mapping for the Abba complex. Noting the presence of better quality remnant vegetation south of the application area, the proposed clearing of 0.55 hectares of vegetation of the mapped Abba complex is not considered to have a significant impact on the vegetation complex.

The local area (10 kilometre radius) surrounding the application area measures approximately 29,500 hectares. Based on available datasets, the local area retains approximately 11 per cent (approximately 3,135 hectares) pre-European vegetation extent (Figure 7). The majority of the remnant vegetation in the local area is contained within nature reserves associated with the Vasse-Wonnerup wetland system, with some contained within private estate.

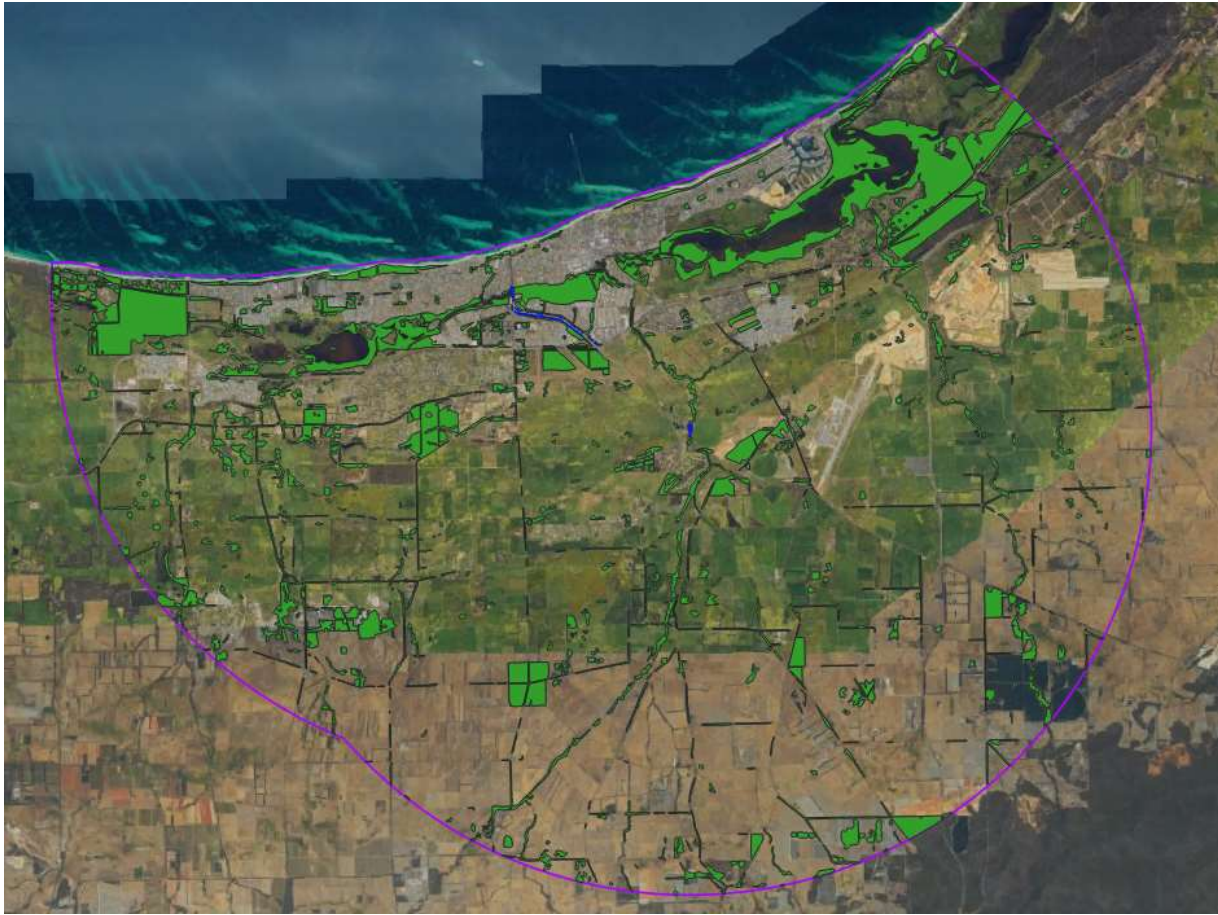


Figure 7: Remnant vegetation (green shading) remaining in the local area (purple outline)

The application area is considered a significant remnant as it contains high biodiversity, significant fauna habitat, may contain a PEC and habitat for Threatened flora and is within an extensively cleared landscape.

Table 4: Vegetation extent remaining statistics (Government of Western Australia, 2019)

	Pre-European (ha)	Current Extent (ha)	Remaining (%)	Current Extent in DBCA Managed Lands	
				(ha)	Proportion of Pre-European extent (%)
IBRA Bioregion					
Swan Coastal Plain	1,501,221.93	579,813.47	38.62	222,916.97	14.85
Local government					
City of Busselton	146,478.41	60,013.68	40.97	41,385.80	28.25
Hedde Vegetation Complex					
Abba Complex	50,892.78	3,326.20	6.54	253.55	0.36
Quindalup Complex	54,573.87	33,011.64	60.49	6,632.92	10.98
Vasse Complex	15,691.63	4,926.97	31.40	2,876.77	14.62
Yongarillup Complex	27,977.93	10,018.14	35.81	6,030.12	18.41
Local area					
10 kilometre radius	29,476.01	3,135.45	10.64	-	-

(f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

Proposed clearing is at variance with this principle

Delegated Officer's Key Considerations

The proposed clearing is at variance with this Principle as the application area contains approximately 0.3 hectares of riparian vegetation.

The impact to riparian habitat is limited to scattered segments along the northern application area (Area A) and some within the southern application area (Area C), and the proposed clearing is not expected to significantly impact on riparian habitat within the local area.

According to available databases, Area A is mapped as a conservation category wetland and Area C is immediately adjacent to a multiple use wetland.

The application area is upstream of the Vasse-Sabina catchment and the Vasse Diversion drain catchment is one of the largest of the Geographe subcatchments (DWER, 2019).

Area A consists of tall open scrub of *Melaleuca cuticularis*, which is considered riparian vegetation associated with the conservation category wetland. This vegetation is in Completely Degraded to Very Good condition (Keighery, 1994).

Species associated with floodplains were recorded within the marri and flooded gum woodland in Area C, however the vegetation is predominantly in Completely Degraded to Degraded condition (Keighery, 1994), with no understorey remaining.

Noting that the application area includes vegetation that is growing in, or in association with a wetland, the proposed clearing is at variance with this principle. The extent of clearing within these larger riparian habitats is considered to be minimal and is not likely to significantly impact on the larger extent of riparian habitat associated with the mapped wetlands within the local area.

(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

Proposed clearing is not likely to be at variance with this principle

As indicated in Table 3, the application area is mapped as several soil subsystems, comprising of calcareous sands in the north and alluvial soils in the south of the application area.

Table 5: Land degradation risks for mapped soil units (DPIRD, 2019)

Risk category	Quindalup South Qf2 Phase	Vasse Wonerup very wet saline flats Phase	Vasse Wonerup wet flats Phase
Wind erosion	30-50% of map unit has a high to extreme wind erosion risk	3-10% of map unit has a high to extreme wind erosion risk	10-30% of map unit has a high to extreme wind erosion risk
Water erosion	<3% of map unit has a high to extreme water erosion risk	>70% of map unit has a high to extreme water erosion risk	3-10% of map unit has a high to extreme water erosion risk
Waterlogging	<3% of map unit has a moderate to very high waterlogging risk	>70% of map unit has a moderate to very high waterlogging risk	>70% of map unit has a moderate to very high waterlogging risk
Water repellence	>70% of map unit has a high water repellence risk	<3% of map unit has a high water repellence risk	10-30% of map unit has a high water repellence risk
Subsurface Acidification	<3% of map unit has a high subsurface acidification risk or is presently acid	50-70% of map unit has a high subsurface acidification risk or is presently acid	>70% of map unit has a high subsurface acidification risk or is presently acid
Phosphorus export risk	<3% of map unit has a high to extreme phosphorus export risk	>70% of map unit has a high to extreme phosphorus export risk	50-70% of map unit has a high to extreme phosphorus export risk
Salinity	<3% of map unit has a moderate to high salinity risk or is presently saline	>70% of map unit has a moderate to high salinity risk or is presently saline	30-50% of map unit has a moderate to high salinity risk or is presently saline
Risk category	Ludlow wet flats Phase	Abba wet vales Phase	Abba Flats Phase
Wind erosion	>70% of map unit has a high to extreme wind erosion risk	3-10% of map unit has a high to extreme wind erosion risk	10-30% of map unit has a high to extreme wind erosion risk
Water erosion	<3% of map unit has a high to extreme water erosion risk	50-70% of map unit has a high to extreme water erosion risk	<3% of map unit has a high to extreme water erosion risk
Waterlogging	30-50% of map unit has a moderate to very high waterlogging risk	>70% of map unit has a moderate to very high waterlogging risk	50-70% of map unit has a moderate to very high waterlogging risk
Water repellence	<3% of map unit has a high water repellence risk	3-10% of map unit has a high water repellence risk	10-30% of map unit has a high water repellence risk
Subsurface Acidification	>70% of map unit has a high subsurface acidification risk or is presently acid	>70% of map unit has a high subsurface acidification risk or is presently acid	>70% of map unit has a high subsurface acidification risk or is presently acid
Phosphorus export risk	30-50% of map unit has a high to extreme phosphorus export risk	>70% of map unit has a high to extreme phosphorus export risk	10-30% of map unit has a high to extreme phosphorus export risk

Salinity	<3% of map unit has a moderate to high salinity risk or is presently saline	3-10% of map unit has a moderate to high salinity risk or is presently saline	<3% of map unit has a moderate to high salinity risk or is presently saline
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The land subsystems mapped within the application area are associated with various levels of land degradation risk (Table 5). A majority of the application area has a high risk of subsurface acidification, and Area A is mapped as high to moderate risk for Acid Sulfate Soils (ASS). The remainder of the application area is mapped as moderate to low risk for ASS. The applicant has committed to managing ASS soils via an Acid Sulfate Soils and Dewatering Management Plan.

Surface and groundwater quality impacts from the clearing are assessed under clearing principle (i) below. As described under principle (i) extensive work is being undertaken to manage the water quality within the VDD and within the greater the Geographe catchment. Therefore, impacts to surface and underground water quality associated with the proposed clearing are considered to be short-term.

Any clearing of native vegetation within the survey area has the potential to cause water and wind erosion in areas with sandy soils. However, given these soils are porous and well-drained and the survey area is linear in nature, the risk of water erosion is low and the highly urbanised landscape adjacent to the application area indicate the risk of wind erosion is low.

Noting the above, the proposed clearing is not likely to result in appreciable land degradation and the proposed clearing is not likely to be at variance with this principle.

(h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

Proposed clearing is not likely to be at variance with this principle

A majority of the landscape adjacent to the application area is cleared for development (Figure 1). The closest conservation area is a DBCA managed nature reserve associated with the conservation category wetland within Area A, however noting the minimal clearing within this area, impacts to this nature reserve is not considered significant.

Several drainage reserves associated with housing development and a conservation covenant associated with Peppermint Park are also likely to be impacted by the proposed clearing. However considering the ongoing impacts to these conservation areas from the residential developments within the local area, the impacts from the proposed clearing are considered to be minimal. Any potential impacts will be mitigated via weed and dieback management conditions.

The proposed clearing is not likely to be at variance with this principle.

(i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

Proposed clearing is not likely to be at variance with this principle

The application area is located in the *Rights in Water and Irrigation Act 1914* (RIWI Act) 'Busselton-Capel Groundwater Area' Groundwater area. Seven Geomorphic Wetlands occur within the survey area, including a Conservation Category wetlands within Area A and a Multiple Use wetland adjacent to Area C.

The Vasse Diversion drain catchment is one of the largest of the Geographe subcatchments. The subcatchment supports a thriving agricultural industry dominated by beef and dairy grazing. Urban residential and lifestyle lots of west Busselton also occur in this catchment. Water quality in the drain is generally poor, and median winter concentrations are consistently above the Vasse Wonnerup wetlands Geographe Bay Water Quality Improvement Plan (2010) guideline values for both total nitrogen and total phosphorus (DWER, 2019).

The DWER southwest land-use planning division advised that the main risks associated with the clearing relate to erosion, sediment mobilisation and turbidity in the Vasse Diversion Drain. In addition, the risks associated with the works include accidental spills of fuel, either through refuelling of equipment, leaks or spillage of stored chemicals, potential risk of herbicides or other chemicals associated with weed control, potential impacts of excavation and dewatering in a 'high to moderate' risk of acid sulphate soils and potential for localised flooding (DWER, 2018b). DWER southwest land-use planning division advised that to mitigate these risks, appropriate risk control measures should be planned and undertaken such as via a Construction Environmental Management Plan (CEMP).

The Revitalising Geographe Waterways program aimed at improving water quality, waterway health and management of Geographe waterways, is overseen by the Vasse Taskforce, comprised of several agencies including DWER, City of Busselton and Geographe Catchment Council (GeoCatch). As such, the Geographe Catchment Drainage Management Plan has been developed to identify and document opportunities to optimise drainage infrastructure within the Geographe Catchment to improve water quality in Geographe waterways. The plan included the Revitalising the Vasse Diversion Drain project coordinated by GeoCatch in 2018/2019, which involved rehabilitation and restoration of the lower section of the VDD below Bussell Highway including rock facing, weed and erosion control, removal of wooden baffles, installation of a viewing platform and installation of a Bay OK waterwise garden (DWER, 2019). The Geographe Catchment Drainage Management Plan lists several VDD management recommendations including the proposed upgrade of the VDD associated with the proposed clearing.

Noting the extensive work being undertaken to manage the water quality within the VDD and within the greater the Geographe catchment, impacts to surface and underground water quality associated with the proposed clearing are considered to be short-term.

Given the above, the proposed clearing is not likely to be at variance with this principle.

(j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.

Proposed clearing is not likely to be at variance with this principle

The soils in the north of the survey area are mostly sandy and porous and the area is generally well-drained. In the middle to the south of the survey area, the soils are composed of a loam and are subject to inundation. Majority of the areas adjacent to the application area is associated with wetland systems.

The Vasse Diversion Drain is a major arterial drain that forms an important component of Busselton's flood mitigation network. The drain diverts flows from the upper Sabina and Vasse Rivers into Geographe Bay (DWER, 2019). Noting that key objective of the proposed upgrade works to the VDD is to mitigate flooding in the expanding Busselton township, the proposed clearing is not considered likely to cause or exacerbate flooding and is not likely to be at variance with this principle.

Planning instruments and other relevant matters.

The application area is zoned "Recreation" under Local Planning Scheme and "Public Purpose" and "Recreation" pursuant to the Town Planning Scheme.

The City of Busselton was invited to comment on the application on 5 December 2018. No comments have been received from the City. The applicant has advised that a Development Approval from the City is not required for the proposed works, and that it has been liaising regularly with the City of Busselton through the life of the project (Water Corporation, 2020c)

The application area is located within Busselton-Capel Groundwater Area and within a 'non-proclaimed' area for surface water under the *Rights in Water and Irrigation Act 1914*. DWER's southwest region noted that it is not known if dewatering is proposed, which may be subject to licensing. The applicant is advised to contact the Department's Busselton licensing section for further licensing information (DWER, 2018b).

The applicant will require the following licences and approvals prior to undertaking the proposed clearing:

- A licence/authorisation to take (i.e. capture, collect, disturb, study) fauna for scientific purposes (for both western ringtail possum and Carter's freshwater mussel) from the Minister for Environment under section 40 of the *Biodiversity Conservation Act 2016 (BC Act)*.
- Approved exemption from DPIRD - Application to collect fish under exemption from *Fish Resources Management Act 1994 And Regulations*.

The applicant may also require a licence to take flora under the BC Act.

There is one site of Aboriginal significance within the application area. It is the applicant's responsibility to comply with the *Aboriginal Heritage Act 1972* and ensure that no Aboriginal sites of significance are damaged through the clearing process.

The clearing application was advertised for public comment on DWER's website on 5 December 2018. The public comment period ended on 26 December 2018. One public submissions was received during this comment period, raising concerns regarding revisions to the project footprint, impacts to western ringtail possum, Carburnup king spider orchid, *Conospermum caeruleum*.subsp Busselton and the inadequacy of surveys for these species.

On 3 January 2019, DWER wrote to the applicant, requesting a response to the public submission. On 13 February 2019 the applicant provided a response to the public submission, which is available to view online at <ftp://ftp.dwer.wa.gov.au/permit> (reference 8191).

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Geographic Information System (GIS) datasets:

- Aboriginal Sites and Heritage Places
- Cadastre, Land Tenure
- DBCA Managed Land
- DBCA Species and Communities Bio Datasets
- Geomorphic wetlands of the Swan Coastal Plain
- Hydrography
- Interim Biogeographic Regionalisation of Australia (IBRA) Bioregions
- Landgate WA Now Aerial Imagery
- Local Planning Scheme Zones
- Native Vegetation Current Extent
- Pre-European Vegetation
- Swan Coastal Plain vegetation complexes
- Soil Landscape Mapping

9. Appendices

Appendix 1: Surveys commissioned for the application

The applicant commissioned a range of terrestrial flora, vegetation and fauna surveys to support the application. A summary of these surveys (i.e. Surveys 1 to 11) is provided below. It should be noted that the survey locations listed are approximate only and a wider footprint than the application area may have been utilised. Therefore the results of the surveys may relate to a larger area than the application area.

Survey	Title	Survey location	Survey dates	Field work	Comment
Survey 1	Report for Vasse Diversion Drain Upgrade Fauna and Flora Study (GHD, 2010)	Areas A and B only (along the wider project footprint)	<u>Vegetation and flora assessment:</u> 15 and 16 October 2009 <u>Fauna survey:</u> 15 and 16 October 2009	<u>Vegetation and flora assessment:</u> Conducted using relévés <u>Fauna survey</u> An opportunistic survey involving visual and aural surveys for any fauna species utilising the study area	<u>Vegetation and flora assessment:</u> 5 vegetation types identified. No TECs or PECs recorded. 77 taxa from 29 families recorded. No Threatened or Priority Flora species recorded. <u>Fauna survey:</u> 39 bird, seven mammal, 11 reptile, five amphibians, two fish and one crustacean recorded. Western ringtail possum (WRP) - four individuals were observed active during the day. Dreys recorded. Quenda tunnels observed, however location not reported.
Survey 2	Vasse Diversion Drain Upgrade Flora and Fauna Study (GHD, 2017a)	Areas A, B and C	<u>Vegetation and flora assessment:</u> 28 and 29 September 2016 <u>Fauna survey:</u> 28 and 29 September 2016	<u>Vegetation and flora assessment:</u> A total of 8 quadrats (10x10m) and opportunistic sampling <u>Fauna survey:</u> An opportunistic survey involving visual and aural surveys for any fauna species utilising the study area A targeted habitat assessment for the Carnaby's black cockatoo, Baudin's black cockatoo and forest red-tailed black cockatoo was undertaken	<u>Vegetation and flora assessment:</u> Three broad floristic formations containing six vegetation types identified. No TECs recorded. Two vegetation types recorded align with the state listed Priority 1 PEC, <i>Eucalyptus rudis</i> (flooded gum), <i>Corymbia calophylla</i> , <i>Agonis flexuosa</i> Closed Low Forest (near Busselton). Seventy-three flora taxa representing 32 families and 62 genera recorded. No Threatened or Priority Flora species recorded. <u>Fauna survey:</u> Six fauna habitat types recorded.

					<p>A total of 37 fauna species, consisting of 22 bird species, three reptiles, eight mammals, three amphibians and one mollusc recorded.</p> <p><u>WRP</u>: Dreys and scats recorded throughout (and adjacent to) the survey Area.</p> <p>Carters freshwater mussel (CFM): Approximately 38 individual mussels recorded within Area C.</p> <p><u>Osprey</u>: An Osprey observed perched on a <i>Melaleuca</i> within the survey area.</p> <p><u>Black cockatoos</u>: Suitable foraging habitat present. No roosting sites recorded; Potential breeding trees observed, with one tree containing one medium hollow and two trees contain three small hollows that could provide suitable breeding habitat in the future.</p>
Survey 3	Vasse Diversion Drain Fauna and Vegetation Assessment - Additional Survey Area (GHD, 2017b)	Areas A, B and C (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).	8 March 2017	<p>The survey area was traversed on foot to identify native vegetation, fauna habitats, fauna evidence and environmental features for threatened fauna.</p> <p>A targeted habitat assessment for the Carnaby's black cockatoo, Baudin's black cockatoo and Forest red-tailed black cockatoo was undertaken.</p> <p>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.</p>	<p>The additional survey area comprised three vegetation types, marri and flooded gum woodland (VT1), <i>Melaleuca</i> shrubland (VT5) and marri woodland (VT7), as well as highly disturbed areas. Marri woodland (VT7) is newly described for the revised development area.</p> <p>No TECs recorded.</p> <p><u>WRP</u>: Five records of scats throughout the development area in the Peppermint woodland and marri and flooded gum woodland; Six dreys recorded in marri and flooded gum woodland.</p> <p><u>Black cockatoos</u>: three trees found to 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.</p>
Survey 4	Vasse Diversion Drain – Caribunup King Spider Orchid Targeted Survey (GHD, 2017c)	Areas A, B and C	27 - 28 September 2017	Transects along the Vasse Diversion Drain channel were spaced approximately 5-10 meters (m) apart, which equated to approximately 2 transects on each side of the	No evidence of Caribunup king spider orchid or suitable habitat for Caribunup king spider orchid was recorded within the survey area during the targeted survey.

				channel. Visual assessment undertaken in inaccessible areas by looking down into the channel from the upper banks.	
Survey 5	Distribution of <i>Conospermum caeruleum</i> subsp. Busselton (Bennett, 2019)	Areas B (and other areas outside the development footprint)	1-5 April 2019	Transects walked through the bushland recording all plants of subsp. Busselton observed, their GPS (WGS84) and condition. The condition of plants was recorded, as the percentage of the plant with dead leaves or totally dead. Any other observations of interest were recorded.	<p>A total of 485 GPS assessments were recorded during the survey (including areas outside the development footprint). Each assessment varied from an individual plant, to several plants to a carpet consisting of an unknown number of plants, so the number of individual plants is many times greater than the 489 assessments.</p> <p>A total of 152 assessments were recorded within Area B. Most of the plants were in very good condition but there was one drier area where several plants were recorded dead.</p>
Survey 6	Busselton Flood Protection Project: Vasse Diversion Drain Upgrade Mussel Survey (GHD, 2019)	Area B and C	24-25 January 2019	<p>Ten sites selected based on water presence and drain access; at each site a 50 m survey transect was established within the river or drain bed catchment. Along each transect, 10 sample quadrats of one square meter established, totalling 100 quadrats.</p> <p>Each of the quadrat was thoroughly searched for Carter's freshwater mussel. Where water turbidity was too high for visual detection of mussels, hand searching of the drain and river bed was done to find mussels. Number of live and dead mussels, measurements, substrate description, water depth range and water quality (based on algal presence and turbidity) and GPS locations recorded.</p>	<p>Live mussels recorded at two locations (transects 9 and 10), with mussel density varying between 0.4 to 15.1 mussels per square metre. Highest density observed at an opportunistic search point at 40 mussels per square metre.</p> <p>Dead mussels recorded at four transects and at ten opportunistic search points, at shallow residual pools and scattered on dry areas of drain bed.</p>
Survey 7	Inspection of possible Black Cockatoo (<i>Calyptorhynchus spp</i>) Breeding Hollows at Vasse Diversion Drain, Busselton (Kirkby, 2019)	Area C	13 February 2019	14 hollows located in nine trees inspected from ground level with binoculars for the presence of suitable hollows. Hollows which showed signs of use such as chewing or wear at the entrance photographed internally using a pole camera. A further photograph taken of the outside of the hollow using a telephoto lens.	Only one hollow in a flooded gum was found to be suitable for black cockatoo breeding and it showed signs of use such as chewing at the hollow entrance. Closer inspection with a pole camera showed this hollow has extensive internal chewing, confirming it as a black cockatoo breeding hollow, likely to belong to Carnaby's black cockatoo.
Survey 8	Assessment of the Western Ringtail Possum along the Vasse Main Drain, Busselton	Areas A, B and C	<p><u>Daylight survey:</u> 11 March 2019</p> <p><u>Night survey/Spotlighting:</u></p>		A total of 206 dreys recorded, with 204 recorded in Area A and B, and two dreys in Area C.

	(Bamford Consulting, 2019)		Northern area (Area A and B) – 10 and 12 March 2019 Southern area (Area C) – 27 March 2019		66 possums were recorded during the drey survey, including four possums asleep on branches where there was no drey. Night survey recorded 25 possums in Areas A and B, and nine possums and two brushtail possums in the southern area. Possum density in Area A and B ranged from four to over eight animals per hectare. While commonly associated with Peppermint trees, possums' nesting and especially their feeding was found to be biased towards less common trees in the area such as Marri and <i>Acacia saligna</i> .
Survey 9	Detailed and Targeted Flora and Vegetation Survey - Vasse Diversion Drain Upgrade (EcoEdge Consulting, 2020a)	Areas A, B and C	4, 18, 24 September 2019 and 5 October 2019 Follow up visit on 18 December 2019	A targeted search for <i>C. procera</i> and <i>D. elastica</i> was carried out in all potential habitat areas Three 10 m x 10 m floristic quadrats were also installed and assessed just outside the survey area. The quadrats were rechecked for later-flowering species on 5 October 2019. During the survey, flora and vegetation data was collected from more than 120 collection points in order to characterise the vegetation type and vegetation condition.	One hundred and four (104) vascular flora taxa were identified within the survey area, 22 of these being naturalised non-native or planted species. Two species of conservation significance were found: <ul style="list-style-type: none"> Two populations of <i>Caladenia procera</i> (T, CR) were located 1.9 m (1 flower, 15 basal leaves) and 1.2 m (two basal leaves) south of the survey area boundary. Three plants of <i>Austrostipa bronwenae</i> (T, EN) located approximately 108 m west of the survey area recorded. <i>Drakaea elastica</i> (T, EN) was not found during this survey. The pest plant <i>Zantedeschia aethiopica</i> (Arum-lily) was found in the Survey Area. Six vegetation complexes recorded; one vegetation unit comprising an area of 1.26 ha shows similar characteristics to the Priority 1 ecological community (PEC) ' <i>Eucalyptus rudis</i> , <i>Corymbia calophylla</i> and <i>Agonis flexuosa</i> Closed Low Forest'. Approximately 0.29 ha of this vegetation unit is classified as in 'good' condition.
Survey 10	Addendum to Detailed and Targeted Flora and Vegetation Survey - Vasse Diversion Drain Upgrade (EcoEdge Consulting, 2020b)	Area B	5 March 2020	Four 10m x 10m quadrats installed in vegetation of Degraded to Good condition within the development footprint and all vascular species within them were recorded along with an estimate of cover. A targeted survey for <i>Austrostipa bronwenae</i> was also undertaken	No plants of <i>Austrostipa bronwenae</i> recorded. Results from the multivariate analysis confirmed that the vegetation assemblages on all four quadrats were of the PEC <i>Eucalyptus rudis</i> , <i>Corymbia calophylla</i> and <i>Agonis flexuosa</i> Closed Low Forest.

Survey 11	Vasse Drain Mussel Survey (Murdoch University, 2019)	Diversion (Murdoch University, 2019)	Area A, B and C	30 July 2019	15 sites on the VDD upstream of Chapman Hill Rd; both banks surveyed at the majority of sites, but not the off-bank habitats.	<p>The species was present throughout the proposed VDD reconstruction footprint upstream of Chapman Hill Rd.</p> <p>A total of 192 alive and seven dead mussels recorded at a mean density of 7.4 mussels.</p> <p>No difference in the abundance of <i>W. carteri</i> between the right and left banks.</p> <p>Estimated total abundance of mussels along the development footprint is estimated at 10,043.</p>
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Appendix 2: Justification of values used in the EPBC offsets calculator

Offset (mitigation credit) calculation - Revegetation and rehabilitation

Field Name	Description	Justification for value used
<i>IUCN Criteria</i>	The IUCN criteria for the value being impacted	6.8% - Afforded to Western Ringtail Possum (WRP) as this species is listed as critically endangered under the <i>Biodiversity Conservation Act 2016</i> (WA) and the <i>Environment Protection and Biodiversity Conservation Act 1999</i> .
<i>Area of impact (habitat/community) or Quantum of impact (features/individuals)</i>	The area of habitat/community impacted or number of features/individuals impacted	2.16 ha - The proposed clearing will impact 2.16 hectares of high quality habitat for WRP (majority of the application area is mapped as 'high' habitat suitability areas for WRP by DBCA and the survey by Bramford 2019 justifies that the entire application area is utilised by WRP)
<i>Quality of impacted area (habitat/community)</i>	The quality score for area of habitat/community being impacted - a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability	4 - The quality of the site as suitable habitat for WRP is considered 'good' based on the following: condition of the vegetation ranges from good to completely degraded, however the entire application area is given a quality score of 4, which is considered to provide 'good to very good' quality habitat for WRP - Bramford 2019 report 206 dreys and at least 66 possums (day survey) and 34 possums (night survey/spotlighting) within 100 meters of the application footprint, which is considered as significant habitat; therefore the quality score for the impacted area was considered to be in good to very good condition for WRP habitat suitability.

<i>Time over which loss is averted (habitat/community)</i>	This describes the timeframe over which changes in the level of risk to the proposed mitigation site can be considered and quantified	20 - The offset site will be conserved in perpetuity. 20 years is the maximum value associated with this field.
<i>Time until ecological benefit (habitat/community) or Time horizon (features/individuals)</i>	This describes the estimated time (in years) that it will take for the main benefit of the quality (habitat/community) or value (features/individuals) improvement of the proposed mitigation to be realised	10 - The benefit of the revegetation is considered to be available after 10 years
<i>Start area (habitat/community) or Start value (features/individuals)</i>	The area of habitat/community or number of features/individuals proposed to mitigate the impacts	0.55 ha - the total area of proposed onsite revegetation and infill planting as per Plan 8191/1 d
<i>Start quality (habitat/community)</i>	The quality score for the area of habitat/community proposed as mitigation - a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability	0 - Noting the area will be completely cleared for the proposed works, the starting quality will be in completely degraded condition
<i>Future quality without offset (habitat/community) or Future value without offset (features/individuals)</i>	The predicted future quality score (habitat/community) or value (features/individuals) of the proposed mitigation site without the mitigation	1 - It is assumed that some natural regeneration may occur over time, albeit minimal
<i>Future quality with offset (habitat/community) or Future value with offset (features/individuals)</i>	The predicted future quality score (habitat/community) or value (features/individuals) of the proposed mitigation site with the mitigation	5 - It is assumed that the revegetation works could provide good or slightly better quality vegetation that provides habitat for western ringtail possum
<i>Risk of loss (%) without offset (habitat/community)</i>	This describes the chance that the habitat/community on the proposed mitigation site will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future without the mitigation	30% - Noting the disturbed environment around the drain and the degraded nature of the existing vegetation, along with maintenance responsibilities of Water Corporation in relation to the drain infrastructure, the risk of loss without the proposed revegetation is considered medium-to-high
<i>Risk of loss (%) with offset (habitat/community)</i>	This describes the chance that the habitat/community on the proposed mitigation site will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future with the mitigation	10% - The revegetation areas will have a high level of security and protection from future clearing if DWER and Water Corporation can reach an agreement which ensures that this vegetation is protected from future clearing
<i>Confidence in result (%) – risk of loss (habitat/community)</i>	The capacity of measures to mitigate risk of loss of the mitigation site	90% - there is a high level of confidence that the revegetation will mitigate the risk of loss.
<i>Confidence in result (%) – Change in quality (habitat/community) or Change in value (features/individuals)</i>	The level of certainty about the successful achievement of the proposed change in quality (habitat/community) or value (features/individuals)	50% - there is a conservative level of confidence that the applicants revegetation will be able to achieve a future quality score of 5, knowing the difficulties of successful revegetation.
<i>% of impact offset (net present value)</i>	The net present value of the mitigation (area of habitat/community or number of individuals/features) that will be applied to the quantum of impact	The onsite revegetation and infill planting of a total of 0.55 hectares proposed by the applicant will contribute 6.15% credit towards the offset requirement for the proposed clearing.

Offset calculation - revegetation and rehabilitation

Field Name	Description	Justification for value used
<i>IUCN Criteria</i>	The IUCN criteria for the value being impacted	6.8% - Afforded to Western Ringtail Possum (WRP) as this species is listed as critically endangered under the <i>Biodiversity Conservation Act 2016</i> (WA) and the <i>Environment Protection and Biodiversity Conservation Act 1999</i> .
<i>Area of impact (habitat/community) or Quantum of impact (features/individuals)</i>	The area of habitat/community impacted or number of features/individuals impacted	2.16 ha - The proposed clearing will impact 2.16 hectares of high quality habitat for WRP (majority of the application area is mapped as 'high' habitat suitability areas for WRP by DBCA and the survey by Bramford 2019 justifies that the entire application area is utilised by WRP)
<i>Quality of impacted area (habitat/community)</i>	The quality score for area of habitat/community being impacted - a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability	4 - The quality of the site as suitable habitat for WRP is considered 'good' based on the following: condition of the vegetation ranges from good to completely degraded, however the entire application area is given a quality score of 4, which is considered to provide 'good to very good' quality habitat for WRP - Bramford 2019 report 206 dreys and at least 66 possums (day survey) and 34 possums (night survey/spotlighting) within 100 meters of the application footprint, which is considered as significant habitat; therefore the quality score for the impacted area was considered to be in good to very good condition for WRP habitat suitability.
<i>Time over which loss is averted (habitat/community)</i>	This describes the timeframe over which changes in the level of risk to the proposed mitigation site can be considered and quantified	20 - The offset site will be conserved in perpetuity. 20 years is the maximum value associated with this field.
<i>Time until ecological benefit (habitat/community) or Time horizon (features/individuals)</i>	This describes the estimated time (in years) that it will take for the main benefit of the quality (habitat/community) or value (features/individuals) improvement of the proposed mitigation to be realised	10 - The benefit of the revegetation is considered to be available after 10 years
<i>Start area (habitat/community) or Start value (features/individuals)</i>	The area of habitat/community or number of features/individuals proposed to mitigate the impacts	10.34 ha - To offset impacts to WRP by 100%, a total offset revegetation area of 10.34 hectares of suitable habitat for WRP is required, when added to the mitigation credit from the proposed onsite revegetation of 0.55 hectares.
<i>Start quality (habitat/community)</i>	The quality score for the area of habitat/community proposed as mitigation - a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability	2 - The vegetation within the areas proposed for revegetation are in degraded condition
<i>Future quality without offset (habitat/community) or Future value without offset (features/individuals)</i>	The predicted future quality score (habitat/community) or value (features/individuals) of the proposed mitigation site without the mitigation	2 - It is assumed that some natural regeneration may occur over time, albeit minimal, however noting the disturbance from adjacent build-up areas, no improvement to vegetation quality is anticipated, i.e. the vegetation will continue to be in degraded condition.
<i>Future quality with offset (habitat/community) or Future value with offset (features/individuals)</i>	The predicted future quality score (habitat/community) or value (features/individuals) of the proposed mitigation site with the mitigation	5 - It is assumed that the revegetation works could provide good or slightly better quality vegetation that provides habitat for western ringtail possum
<i>Risk of loss (%) without offset (habitat/community)</i>	This describes the chance that the habitat/community on the proposed mitigation site will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future without the mitigation	30% - Noting the disturbed environment around the drain and the degraded nature of the existing vegetation, along with maintenance responsibilities of Water Corporation in relation to the drain infrastructure, the risk of loss without the proposed revegetation is considered to be medium.

<i>Risk of loss (%) with offset (habitat/community)</i>	This describes the chance that the habitat/community on the proposed mitigation site will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future with the mitigation	10% - The revegetation areas will have a high level of security and protection from future clearing if DWER and Water Corporation can reach an agreement which ensures that this vegetation is protected from future clearing
<i>Confidence in result (%) – risk of loss (habitat/community)</i>	The capacity of measures to mitigate risk of loss of the mitigation site	90% - there is a high level of confidence that the revegetation will mitigate the risk of loss.
<i>Confidence in result (%) – Change in quality (habitat/community) or Change in value (features/individuals)</i>	The level of certainty about the successful achievement of the proposed change in quality (habitat/community) or value (features/individuals)	50% - there is a conservative level of confidence that the applicants' revegetation will be able to achieve a future quality score of 5, knowing the difficulties of successful revegetation.
<i>% of impact offset (net present value)</i>	The net present value of the mitigation (area of habitat/community or number of individuals/features) that will be applied to the quantum of impact	The onsite revegetation and infill planting of 0.55 hectares proposed by the applicant will contribute 6.15% credit towards the offset requirement for the proposed clearing. The offset revegetation of 10.34 hectares as identified in Plan 8191/1 e will counterbalance the residual impacts by 100 per cent.
<i>Other comments</i>	Include here any relevant additional comments	N/A