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HALLADALE AND BLACK WATCH PROJECT

Flora and fauna assessment

February 2011

Project no. 12242

Natural & Cultural Heritage Consultants 449 Doveton Street North (PO Box 18N) Ballarat North Victoria 3350

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Report to Origin Energy Pty. Ltd.

HALLADALE AND BLACK WATCH PROJECT

Flora and fauna assessment

FINAL REPORT 10 February 2011

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- Paul Young, mapping
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SUMMARY

Biosis Research Pty. Ltd. was commissioned by Origin Energy Pty. Ltd. to undertake a flora and fauna assessment of two sites associated with the Halladale and Black Watch Project.

The first site, at Halladale, is located 30 km southeast of Warrnambool. At this location drilling of four long-reach wells to reach the Halladale and Black Watch gas fields will be undertaken. A pipeline of approximately 1.3 km in length will be constructed to take gas to the Croft #1 gas main.

The second site, at Newfield, is located approximately 6.5 km north of Port Campbell. At this location the construction of an 8.7 km pipeline connecting the Heytesbury and Otway gas plants is proposed.

The purpose of this report was to assess the flora and fauna values of these sites, identify potential impacts to these values, identify suitable mitigation measures to reduce these impacts where possible and assess the project against biodiversity legislation.

Results

The majority of both sites consists of introduced pasture and crop vegetation. Native vegetation and fauna habitat is largely restricted to linear remnants along roadsides, small patches on private land and in association with water bodies.

The Halladale and Black Watch Proposed Well Site, including the Bay of Islands Coastal Park, supports five Ecological Vegetation Classes (Coastal Headland Scrub, Coastal Tussock Grassland/Coastal Heathland Scrub Mosaic, Damp Heath Scrub, Heathy Woodland and Damp Heathy Woodland), two of which are proposed for impact (Heathy Woodland and Damp Heathy Woodland). The Heytesbury Pipeline site supports four Ecological Vegetation Classes (Lowland Forest, Swamp Scrub, Damp Heath Scrub and Sedgy Riparian Woodland). Two significant flora species (Port Campbell Guinea Flower and Wavy Swamp Wallaby-grass) were recorded within the Heytesbury site.

Fauna habitat at both sites is restricted to areas of heathy woodlands, heathlands, wetlands, scattered trees and introduced vegetation. A number of significant fauna species were recorded at the Halladale and Black Watch Proposed Well Site.

Further survey for Slender Pink-fingers is recommended at the Halladale and Black Watch Proposed Well Site if areas of Heathy Woodland or Damp Heathy Woodland are proposed for removal. Further survey for the Port Campbell Guinea Flower and Wavy Swamp Wallaby-grass are recommended if impacts to Damp Heath Scrub and Swamp Scrub or other wet areas cannot be avoided.

Government Legislation and Policy

Summary of legislative requirements for the project

Legislation / Policy	Relevant Ecological Feature on site	Permit / Approval Required	Other Requirements
EPBC Act	Listed flora and fauna species predicted to occur within the study area	Referral not essential as impacts to Matters of NES can be avoided, however referral is a reasonable risk management strategy	If impacts as outlined cannot be avoided, targeted surveys for the Growling Grass Frog is recommended
FFG Act	Threatened and protected flora species present	Permit required to remove threatened and protected species	Site is a mix of private and public land. A protected flora permit is required to remove protected flora from public land (road reserves).
Planning & Environment Act	Areas of native vegetation proposed to be cleared	Planning permit required, including permission to lop or remove native vegetation except for along the pipeline route where removal of native vegetation is exempt from the requirement for a planning permit (see Pipelines Act below)	Permit application needs to address provisions of SLO3 and ESO1 (Halladale and Black Watch Proposed Well Site) and VPO 2 (Heytesbury Pipeline) Permit application needs to outline measures taken to address steps 1 and 2 of Net Gain policy. Comply with 3 step approach to Net Gain May require provision of Net Gain offsets
Pipelines Act	Areas of native vegetation along the proposed pipeline route	A licence to construct the pipeline must be obtained under the Pipelines Act. This licence provides an exemption under the Planning & Environment Act	Environmental Management Plan is required Provision of Net Gain offsets is required
CaLP Act	Regionally controlled weeds and pest animals present within study area	No permit or approvals required	Comply with requirements to control/eradicate regionally controlled weeds and pest animals as identified
Water Act	Wallaby Creek, Port Campbell Creek	Works on Waterways Permit required	Mitigation measures to be implemented, particularly for Port Campbell Creek
SEPP	Wallaby Creek, Port Campbell Creek	Relevant actions identified in policy to be incorporated into mitigation measures	

The Framework and Net Gain

The Halladale and Black Watch Proposed Well Site contains a total of 1.41 hectares of native vegetation in three habitat zones (all High conservation significance), which comprise 0.53 habitat hectares.

The current Halladale and Black Watch Proposed Well Site access route will result in the loss of 0.24 hectares (0.09 habitat hectares) of native vegetation of High conservation significance. A revision of this access route is currently being undertaken to avoid impacts to native vegetation. Results of this revision will be presented in an additional report at a later date.

The Heytesbury Pipeline (base case) alignment supports a total of 0.78 hectares of native vegetation which comprises 0.21 habitat hectares. The Heytesbury Pipeline (alternate) alignment contains a total of 1.16 hectares of native vegetation which comprises 0.26 habitat hectares.

No concept plan detailing vegetation removal is currently available so precise vegetation losses will need to be assessed at a later stage.

No offsets have been identified at this stage.

Impacts and Mitigation

The majority of impacts to flora and fauna values will result from removal of native vegetation and fauna habitat. Additional impacts may occur due to increased noise, dust and lighting and increased traffic associated with construction.

Mitigation measures are discussed in detail in Section 6.2. Key measures include:

- Avoid removal of native vegetation by siting works, including the Pipeline Right of Way and access tracks, in areas that do not support native vegetation.
- Undertake design based on the base case pipeline alignment (Heytesbury) as this will result in fewer impacts to biodiversity.
- Implement Horizontal Directional Drilling in areas containing significant flora or fauna values, such as waterways and associated riparian vegetation and roadsides.
- Avoid placing works areas within 200 m of water bodies. Where this is not possible, fence all areas within 200 m of water bodies to prevent fauna species accessing the works area and to prevent sediment run-off.
- Protect all areas of retained vegetation and fauna habitat with fencing prior to construction. Maintain these “No Go” areas during construction.
- Implement vehicle hygiene at entry and exit points to prevent spread of weeds and the plant pathogen Phytophthora dieback *Phytophthora cinnamomi*.
- Implement suitable sediment control measures to prevent indirect impacts to waterways and water bodies. This includes fencing bell holes with sediment fencing.
- Ensure fauna do not become trapped in open trenches.

- Ensure suitable revegetation and rehabilitation works are implemented following construction.

Conclusions and Recommendations

Impacts from the works are expected to be short term. Provided significant flora and fauna values identified within this report are avoided during the design phase and mitigation measures outlined in Section 6.2 are implemented, the project is unlikely to result in a significant impact to biodiversity.

1.0 INTRODUCTION

1.1 Project Background

Biosis Research Pty. Ltd. was commissioned by Origin Energy Pty. Ltd. (hereafter referred to as Origin) to undertake a flora and fauna assessment of two sites associated with the Halladale and Black Watch Project (HBWP).

In brief, the HBWP will involve:

- The preparation of a 1 ha drill pad site on private land at the southern end of Baileys Road, Nirranda South;
- Drilling of up to four long-reach wells from the drill pad site to reach the Halladale and Black Watch gas fields, located approximately 5 km off Nirranda in southwest Victoria;
- Construction of a small well head facility (approximately 1 ha); and
- Construction of two sections of pipeline:
    - Approximately 1.3 km between the drill pad site and the Croft #1 gas main; and
    - Approximately 8.7 km between the Heytesbury and Otway Gas Plants.

Two site assessments were undertaken to investigate the flora and fauna values present within the HBWP area. The first assessment site included the drill pad site, the 1.3 km pipeline between the drill pad and the Croft #1 gas main, and the proposed access route (hereafter referred to as the Halladale and Black Watch Proposed Well Site - Figure 1).

The second assessment site included the proposed pipeline route, both the base case and alternate route, between the Heytesbury and Otway Gas Plants (here after referred to as the Heytesbury site - Figure 2).

1.2 Scope of Assessment

The objectives of this investigation are to:

- Review databases relating to flora and fauna issues relevant to the study area, including the Victorian Biodiversity Atlas and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool (PMST).
- Review any existing reports for the project area.

- Conduct a field assessment of the flora and fauna values present within the study area, including describing the vascular flora (ferns, conifers, flowering plants) and vertebrate fauna (birds, mammals, reptiles and frogs).
- Conduct a fish and freshwater crayfish survey targeted towards capture of threatened species.
- Conduct an in-stream habitat assessment including physical attributes (e.g. depth, substrate, flow, cover, aquatic vegetation, riparian vegetation etc.), existing sources of disturbance and in situ water quality (i.e. dissolved oxygen, electrical conductivity, pH, turbidity and temperature) for all sites surveyed.
- Describe the aquatic habitat at each of the sites surveyed and provide detail relating to the recorded aquatic vertebrate fauna and decapod crustacea of the waterways surveyed, and those species with the potential to occur.
- Identify and map native vegetation, determine Ecological Vegetation Classes (EVCs) where possible, map habitat features and assess the potential for the study area to support habitat for threatened species.
- Undertake a Vegetation Quality Assessment (required for determining Net Gain outcomes).
- Provide a report outlining the following:
  - The findings of the investigations.
  - Identify the implications of state and federal biodiversity legislation and local policy and planning approvals relevant to the project, particularly Net Gain policy and the requirement for a referral under the EPBC Act.
  - Assessment of potential impacts, including noise, dust and night time lighting, relevant to the proposal.
  - Assessment of identified potential mitigation measures.
  - Recommend any further assessments of the site that may be required (such as targeted searches).

1.3 Site Description

1.3.1 Halladale and Black Watch Proposed Well Site

The Halladale and Black Watch Proposed Well Site is located approximately 30 km southeast of Warrnambool and approximately 145 km southwest of Ballarat (Figure 1).

The area that will potentially be impacted by the preparation of the drilling pad and well head includes approximately 1 ha of private land. The permanent well head footprint will be reduced to an area of approximately 10 x 10 m. This

private land consists largely of grazed pasture grasses, with a number of ephemeral freshwater wetlands.

The area that will potentially be impacted by the proposed pipeline between the drill pad site and the Croft #1 gas main includes approximately 3.9 ha of grazed pasture on private land, along with native vegetation in the Baileys Road road reserve.

Upgrading of roads to provide access to the drilling site will also potentially result in impacts to roadside vegetation. At this stage Origin are undertaking a redesign of the access routes to avoid and minimise these impacts. A net gain assessment has been undertaken for the current proposed access route and the results of this assessment are included in this report. A further Net Gain assessment will be undertaken following the redesign of access routes and these results will be presented in an additional report at a later date.

The study area predominantly supports grazed exotic pasture. Subsidence of the underlying limestone geology has resulted in the presence of a number of ephemeral freshwater wetlands across the study area. These wetlands contain a varying cover of submerged, floating and emergent vegetation. Native vegetation is largely restricted to roadsides, where areas of Damp Heath Scrub, Damp Heathy Woodland and Heathy Woodland are present. Scattered shrubs and trees also occur along roadsides.

The study area is within the:

- Warrnambool Plain Bioregion.
- Hopkins River and Otway Coast River Basins.
- Glenelg Hopkins Catchment Management Authority (CMA).
- Moyne Local Government Area (LGA).

1.3.2 Heytesbury Site

The Heytesbury site is located approximately 6.5 km north of Port Campbell and approximately 135 km southeast of Ballarat (Figure 2).

An area of 185 ha, encompassing 100 m either side of the base case and alternate pipeline routes, was investigated to allow micro-siting of the pipeline to avoid impacts to significant flora and fauna values. The majority of the study area encompasses private land and supports predominantly exotic pasture used for cattle and sheep grazing. There are several patches of planted trees (native and introduced) as well as a number of water bodies including farm dams and grassy wetlands.

The pipeline crosses two roads: North South Road and Cobden Port Campbell Road. These road reserves support areas of native vegetation including one EVC: Damp Heath Scrub.

The pipeline routes cross Port Campbell Creek, Wallaby Creek and the upper reaches of several unnamed tributaries of these creeks. These creeks are generally degraded; flowing through cleared land supports exotic pasture with limited riparian vegetation. Revegetation has been undertaken in some areas.

The study area is within the:

- Warrnambool Plain Bioregion.
- Otway Coast River Basin.
- Corangamite CMA.
- Corangamite LGA.

2.0 METHODS

2.1 Literature and Database Review

In order to provide a context for the study site, information about flora and fauna of the local area was obtained from relevant databases. Database searches encompass an area within 5 km of the study site. Records from the following databases were collated and reviewed:

- Victorian Biodiversity Atlas (VBA).
- DSE Victorian Aquatic Fauna database (VAF).
- Birds Australia database (BA).
- EPBC Act DSEWPaC database accessed using the PMST.

Other sources of biodiversity information include:

- DSE Biosites Register;
- DSE Biodiversity Interactive Map 3.0 (Modelled 1750 and 2005 EVCs);
- Conservation Status of Australian Fishes (ASFB 2004); and
- A Census of the Vascular Plants of Victoria (Walsh and Stajsic 2007).

The following reports were also reviewed:

- Biosis Research 2009a. *Origin Energy Halladale and Blackwatch Project, Nirranda South, Victoria. Flora and desktop terrestrial fauna assessment. Report for Origin Energy Pty. Ltd.*
- Biosis Research 2009b. *Speculant 3D Transitional Seismic Survey: Flora and fauna assessment. Report for Origin Energy Pty. Ltd.*
- Biosis Research 2009c. *Halladale Drilling and Pipeline Project: Comparison of Three Proposed Drilling Locations. Letter to Origin Energy Pty. Ltd.*
- Biosis Research 2010. *Halladale Blackwatch Development Project: Net Gain Assessment for Roadside Vegetation Clearing. Letter to Origin Energy Pty. Ltd.*

2.1.1 Definitions of Significance

Significance of a species or community is determined relative to the scale at which it is considered. The sources used to categorise significance of species and communities in this report are summarised in Appendix 1.

2.1.2 Likelihood of occurrence

Database searches provide lists of species from the local area that have potential to occur on the site. Where database records of state and nationally significant species exist from the local area, but these species are not identified during field survey, it is necessary to consider the likelihood that they occur on the site. The DSEWPaC PMST may nominate EPBC Act-listed species and communities where the site lies within their broad geographic range.

The likelihood of a particular species occurring at a site is determined by assessing factors including the quality of habitat present for the species. For fauna species that occur at low density across their ranges; are highly mobile; or are adapted to exploit rare or episodic resources, the history of past occurrence in the local area may also assist in evaluating the potential for future occurrence.

The likelihood of occurrence is a broad categorisation used by Biosis Research to indicate the potential for a species to occur within the site. It is based on expert opinion, using general categories such as those provided in Table 1 below. The determination of likelihood is expressed as negligible, low, medium or high. If the species has been identified on site during our assessment or by other confirmed records then it is documented here as having been 'recorded'. Information relating to these species is presented in the results and discussion section of the report (Section 3.3.1.2 and 3.4.1.2).

Table 1: Likelihood of occurrence for significant species and examples of criteria

Likelihood of occurrence	Potential criteria
Recorded	• Species recorded on site during current or previous assessment • Aquatic species recorded from connected water bodies in close proximity to the site during current or previous assessment.
High	• Sufficient good quality habitat is present on site • Sufficient good quality habitat is present in connected water bodies in close proximity to the site. • Site is within species natural distributional range (if known). • Species has been recorded within 5 km or from the relevant catchment since 1980.
Medium	• Records of terrestrial species within 5 km of the site or of aquatic species in the relevant catchment/neighbouring catchment but habitat limited in its capacity to support the species due to extent, quality, or isolation.
Low	• No records within 5 km of the site or for aquatic species, the relevant basin/neighbouring basin, since 1980. • Records of aquatic species in the relevant catchment/neighbouring catchment but habitat severely limited in its capacity to support the species due to extent, quality, or isolation. • Substantial loss of habitat since any previous record(s).
Negligible	• Habitat not present on site • Habitat for aquatic species not present in connected water bodies in close proximity to the site. • Habitat present but sufficient targeted survey has been conducted at an optimal time of year and species wasn't recorded.

Species listed as rare or threatened on the DSE Advisory Lists and which have at least medium likelihood of occurrence are given further consideration. These species are addressed in the assessment of conservation significance for Net Gain (DSE 2007b). The need for targeted survey for these species is also considered.

2.2 Site Investigation

The Halladale and Black Watch Proposed Well Site was assessed as a part of the flora and fauna assessment for the Speculant 3D Transitional Seismic Survey which was completed over five days from 23 November to 27 November 2009. This assessment included the area proposed to be impacted by the HBWP, in addition to areas of the adjacent Bay of Islands Coastal Park (BOICP) and a large area of private land to the west, north and east. This survey was considered adequate to assess the flora and fauna values of the Halladale and Black Watch Proposed Well Site and data obtained during these surveys are incorporated into this report.

The Heytesbury site was assessed for flora and terrestrial fauna on the 30 November and 1 December 2010. This assessment included the base case and alternate pipeline routes between the Heytesbury and Otway Gas Plants,

including 100 m either side of each route to allow for modifications to the pipeline route should significant values be identified. Aquatic habitat assessment and survey was conducted over three days from 25 to 27 October 2010. This assessment was undertaken within and in the vicinity of the pipeline routes and included downstream sites in order to adequately assess habitat which may potentially be impacted on by offsite (i.e. downstream) impacts.

2.2.1 Flora assessment

The Halladale and Black Watch Proposed Well Site was traversed on foot and by vehicle. Four lists of flora species were collected for wetland (#S13960200), roadside (EVC) (#S1360300), coastal park (#S1360400) and beach/shoreline (#S1360500) vegetation. These lists were entered into the Flora Information System (FIS) and will be submitted to DSE for incorporation into the VBA database.

The Heytesbury site was traversed on foot and by vehicle and five lists of flora species were collected (#S1439300, #S1439400, #S1439500, #S1439600 and #S1439700). These lists were entered into the Flora Information System (FIS) and will be submitted to DSE for incorporation into the VBA database. Planted species have not been recorded unless they are naturalised.

The general condition of native vegetation was observed as well as the effects of current seasonal conditions. Notes were made on specific issues such as noxious weed infestations (if present), evidence of management activities, current grazing impacts and the regeneration capacity of the vegetation.

Vegetation Quality Assessment for Net Gain

Native vegetation within the site was mapped and assessed in relation to Net Gain policy according to standard habitat hectare assessment methods provided by DSE (2004). A habitat zone is the base spatial unit for conducting a habitat hectare assessment and is defined as a discrete area (patch) of native vegetation consisting of a single vegetation type (EVC) within an assumed similar quality. Separate Vegetation Quality Assessments (or habitat hectare assessments) are conducted for identified patches (habitat zones) using the DSE Vegetation Quality Assessment Sheet (DSE 2004).

Indigenous canopy trees were mapped and their diameter at breast height (DBH) measured as follows:

- Within patches – all trees that are benchmark size and greater are termed Large Old Trees (LOTs) and assessed (NRE 2002).
- Scattered trees outside patches – Small Trees (STs) and Large Old Trees (LOTs) are assessed (NRE 2002).

For the purposes of this assessment the limit of the resolution for the habitat hectare assessment process is taken to be 0.01 habitat hectares. That is, if native vegetation is present with sufficient cover but its condition and extent would not result in the identification of at least 0.01 habitat hectares then that vegetation will not be mapped or assessed as a separate habitat zone.

2.2.2 Fauna assessment

Both the Halladale and Black Watch Proposed Well Site and Heytesbury site were investigated to determine their values for terrestrial fauna. These were primarily determined on the basis of the types and qualities of habitat(s) present on site. All species of fauna observed during these assessments were noted and active searching for fauna was undertaken. Survey methods included direct observation, searching under rocks and logs, examination of tracks and scats and identifying calls. Particular attention was given to searching for significant species and their habitats. Fauna species were recorded with a view to characterising the values of the sites and were not intended to provide a comprehensive survey of all fauna that has potential to utilise the site over time.

The Heytesbury site includes Port Campbell Creek, Wallaby Creek and several unnamed tributaries. These environments were investigated to determine their values for aquatic fauna. The site investigation included aquatic survey at five locations (Table A2.1, Figure 7) both within and in the vicinity of the site. Surveys were targeted towards the capture of several significant species as outlined below.

The following nationally significant aquatic species had previously been recorded from this region and were considered to have potential to occur within waterways on the site or connecting waterways:

- Dwarf Galaxias *Galaxiella pusilla*
- Yarra Pygmy Perch *Nannoperca obscura*
- Australian Grayling *Prototroctes maraena*

The following state significant aquatic species had previously been recorded from this region and were considered to have potential to occur within waterways on the site or connecting waterways:

- Australian Mudfish *Neochanna cleaveri*
- Otway's Cray *Geocharax gracilis*
- Hairy Burrowing Cray *Engaeus sericatus*

Further information regarding survey methodology is provided in Appendix 2.

Fauna records will be submitted to the VBA and VAF.

At the Halladale and Black Watch Proposed Well Site, more intensive survey was undertaken for a number of significant species during the November 2009 surveys. This included:

- Targeted survey for the Growling Grass Frog *Litoria raniformis*, conducted according to Draft EPBC Act Policy Statement 3.14 (DEWHA 2009a).
- Survey of wetlands within the study area for use by significant waterbirds, particularly the Royal Spoonbill *Platalea regia*, Eastern Great Egret *Ardea modesta*, Australasian Shoveler *Anas rhynchotis*, Hardhead *Aythya australis*, Australian Bittern *Botaurus poiciloptilus* and Latham's Snipe *Gallinago hardwickii*.
- Beach surveys to detect the presence of burrowing and nesting birds, particularly the Hooded Plover *Thinornis rubricollis* and Little Penguin *Eudyptula minor*.
- Surveys for threatened ground dwelling fauna, particularly the Southern Brown Bandicoot *Isoodon obesulus obesulus*, Long-nosed Potoroo *Potorous tridactylus* and White-footed Dunnart *Sminthopsis leucopus* using remote cameras.
- Active searching around wetlands to determine the presence of the Glossy Grass Skink *Pseudemoia rawlinsoni* and Swamp Skink *Egernia coventryi*.
- Transect and call census for the Rufous Bristlebird *Dasyornis broadbenti*.

Survey methodology is outlined in Appendix 2.

2.3 Legislation and Policy

The following key pieces of biodiversity legislation and policy were reviewed and the implications for the project assessed:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- *Flora & Fauna Guarantee Act 1988* (FFG Act)
- *Catchment and Land Protection Act 1994* (CaLP Act)
- *Planning and Environment Act 1987* – specifically Clause 52.17, planning overlays and Clause 66.02 in the relevant Planning Scheme.
- Victoria's Native Vegetation Management Framework (NRE 2002).
- *Wildlife Act 1975* and associated Regulations
- *Water Act 1989*

- *Environment Protection Act 1970*: State Environmental Protection Policy (Waters of Victoria) 2003

2.4 Victoria's Native Vegetation Management Framework

There is a three step approach to applying Net Gain as outlined in the Framework (NRE 2002: 23). The steps are:

1. To avoid adverse impacts, particularly through vegetation clearance.
2. If impacts cannot be avoided, to minimise impacts through appropriate consideration in planning processes and expert input to project design or management.
3. Identify appropriate offset options.

Addressing the first two steps is an iterative process that is mainly achieved during the design phase of the project. A key input is the assessment and mapping of vegetation and habitats within the site which is provided in this report. The design should incorporate and respond to this information so that impacts to native vegetation and other biodiversity values are minimised. The current assessment documents the measures taken by the proponent to avoid and minimise vegetation impacts at the Halladale and Black Watch Proposed Well Site, including the proposed undertaking of revision of access routes to avoid impacts to roadside vegetation. Results of this revision will be presented in an additional report at a later date. A full description of the steps taken to avoid and minimise impacts needs to be included in the planning permit application.

Assessment of conservation significance

Conservation significance of areas of native vegetation (habitat zones) is calculated as per the Framework (NRE 2002) and incorporates:

- The conservation status of the EVC
- The quality of the vegetation (habitat score)
- Habitat for threatened species
- Other attributes (e.g. Ramsar sites, sites with National Estate values).

The assessment of habitat value for rare and threatened species involves determining if the habitat represents the 'best 50%' or 'remaining 50%' of habitat for each species. The method for this determination is outlined in the DSE referral guide for planning permit applications (DSE 2007b; Table 2).

2.5 Mapping

Origin supplied aerial photography and site plans.

Mapping is conducted using hand-held (uncorrected) GPS units and aerial photo interpretation. The accuracy of this mapping is therefore subject to the accuracy of the GPS units (generally ± 7 metres) and dependent on the limitations of aerial photo rectification and registration.

Mapping is produced using a Geographic Information System (GIS). Electronic GIS files which contain our flora and fauna spatial data are available to incorporate into design concept plans. However this mapping may not be sufficiently accurate for detailed design purposes.

3.0 RESULTS AND DISCUSSION

3.1 Site Context

3.1.1 Halladale and Black Watch Proposed Well Site

The Halladale and Black Watch Proposed Well Site drilling site is situated on private land at the southern end of Baileys Road, Nirranda. The pipeline route runs within private land north of the drilling site, before crossing Baileys Road and tying in with the Croft #1 gas main. All components are located south of the Great Ocean Road immediately north of the Bay of Islands Coastal Park. Douglas Fenwick Reserve is located off Baileys Road immediately north of the study area.

Access to the drilling site is currently proposed from off the Great Ocean Road via Radfords Road, Borthwicks Road and Baileys Road. Net gain calculations have been completed using this proposed access route. A revision of access routes is currently being undertaken with a view to avoid impacts to native vegetation where possible.

Private farmland within the study area has been largely cleared, consisting of predominantly introduced vegetation although some small areas of remnant native vegetation occur. An excellent quality remnant of Damp Heathy Woodland to the east of Baileys Road is notable as it provides connectivity to the coastal park via adjoining remnant vegetation along Baileys Road.

Public road reserves within the area mostly consist of introduced species with patches of native vegetation and areas of scattered indigenous trees, shrubs and Austral Bracken *Pteridium esculentum*.

The Bay of Islands Coastal Park, running between Peterborough and Lake Gillear near Warrnambool and managed by Parks Victoria, is an example of rapidly eroding limestone cliffs and rock formations. This area supports good quality examples of formerly widespread coastal vegetation types and populations of threatened flora and fauna. Limestone cliffs abut areas of beach in the north-western end of the study area while at the south-eastern end these limestone cliffs dramatically drop off into Bass Strait with no beachhead.

Douglas Fenwick Reserve is located to the north of the study area, off Baileys Road. This remnant area of Heathy Woodland is uncategorised land managed by the Department of Sustainability and Environment (DSE).

Fauna habitat within the local area is limited due to large areas of cleared land. Connectivity between remnant areas, such as Douglas Fenwick Reserve and

areas to the east and west of the study area is provided by the coastal park and is limited to areas immediately adjacent to the park.

3.1.2 Heytesbury Site

The Heytesbury pipeline route alignment runs for approximately 8.7 km from the Heytesbury Gas Plant to the Otway Gas Processing Plant. The pipeline route runs through private land, crosses several roads including North South Road and Cobden-Port Campbell Road and runs parallel with South Cheynes Road. Small remnants of native vegetation, while largely degraded by the abundance introduced species, were identified on private agricultural land and in roadside reserves.

The private farmland within the study area has been largely cleared and developed as exotic pasture for sheep and cattle grazing. Some small patches of remnant Damp Heath Scrub EVC were identified along North South Road. A modified example Lowland Forest EVC was observed to the west of North South Road. An extensive patch of Wattles *Acacia* spp. occurs in patches of Sedgy Riparian Woodland EVC located along the Port Campbell Creek.

Fauna habitat along the Heytesbury pipeline alignment is limited due to the large extent of cleared land. Almost all of the original vegetation has been cleared and the indigenous fauna habitats that are present exist as small, scattered and highly fragmented patches. The fauna habitats that are present include remnant trees, swampy grasslands, tall swamp heath, farm dams, creeks and associated riparian vegetation. There are also a number of wind rows consisting of planted cypress, pine trees, and a mixture of indigenous and non-indigenous *Eucalyptus* species.

3.2 Qualifications

A number of parcels at the Halladale and Black Watch Proposed Well Site and Heytesbury site could not be assessed due to access restrictions. These parcels are discussed below.

Assessment of one property, comprising the drill pad site, could not be undertaken during the November 2009 assessment due to access restrictions:

- Lot 52, Plan 582780.

Surveys of this property were undertaken from Baileys Road and from the Bay of Islands Coastal Park immediately south of this property. Clear views were available from these vantage points and this level of survey is deemed sufficient for the purpose of this report.

Assessment of two properties at eastern end of the Heytesbury site, immediately adjacent to the Otway Gas Plant, could not be undertaken due to access restrictions including:

- 2/TP829292; and
- 9-4/PP3360.

For the purpose of this report aerial photo interpretation of these sites has been undertaken and areas of potential native vegetation have been mapped.

One parcel of land immediately east of the Cobden – Port Campbell Road, comprising two parcel numbers, could not be accessed on the day of survey as no access requirements were listed:

- 1\TP340457 - 1\TP741601.

An additional three properties at the Heytesbury site could not be accessed as they are outside the proposed pipeline corridor and access was not permitted:

- 4\LP218458;
- 1\TP383779; and
- 1\LP218456.

Surveys of these properties were undertaken from the nearest vantage point. The pipeline does not currently run through these properties and this level of survey is deemed sufficient for the purpose of this report.

Some areas along Port Campbell Creek and an area of Swamp Scrub on parcel 3/PS547510, could not be accessed due to the presence of impenetrable vegetation including thickets of Blackberry *Rubus fruticosus* spp. agg..

Ecological surveys and assessments provide a sampling of the flora and fauna at a given time and season. It is always possible that some species are not detected during survey. Some plant species are dormant and/or lack flowering or fruiting material at certain times of year (commonly in winter), making detection and/or identification difficult. In addition, migratory fauna may be seasonally absent. Aquatic species will be temporarily absent if a water body is dry. Other environmental conditions such as drought, grazing and fire will also affect the survey results. In many cases these factors do not present a significant limitation to assessing the overall biodiversity values of a site.

The current flora and fauna assessment was conducted in spring to early summer which is an optimal time for survey. Some frog species are less likely to call during the day and therefore may not have been recorded during the present

survey. The aquatic fauna assessment was conducted over three days in late October, which is considered a suitable time of year to survey for the target species. It should be noted that Port Campbell Creek experienced a flooding event approximately one month prior to surveys being undertaken. This may have impacted on the available instream cover for aquatic fauna. Due to private land access constraints, parts of the alignment routes through private property were not explicitly assessed for aquatic habitat values or surveyed, however information gathered from the aquatic assessment and survey sites is useful in determining the aquatic fauna likely to be encountered within the region of the study site. Biosis Research understands that directional drilling of waterways will be implemented, and there will be no direct impacts to waterways.

Overall the survey effort was sufficient to assess the general values of both sites. A Vegetation Quality Assessment and Net Gain assessment, including calculation of native vegetation losses, were undertaken for the Halladale and Black Watch Proposed Well Site based on the current proposed access routes. Access routes are currently being revised and this revision, including a revised Net Gain assessment, will be presented in an additional report at a later date. A Vegetation Quality Assessment was undertaken for the Heytesbury Pipeline route; however no calculation of native vegetation losses was undertaken as the final pipeline route has not been determined. Calculation of native vegetation losses should be completed once a final concept design is available.

3.3 Flora

3.3.1 Halladale and Black Watch Proposed Well Site

The study area supports at least two ecological vegetation classes (Figure 3). This differs to 2005 DSE modelling for remnant native vegetation as the majority of these areas are cleared with only small patches of native vegetation that, due to the scale of mapping, are not shown on the DSE EVC modelling. The EVCs on site are discussed in detail below.

An additional three EVCs are located in close proximity to the study area (Figure 3); however as these are not proposed to be impacted they are not considered further.

Wetland Vegetation

Wetland vegetation within the study area is characterised by a variety of species which readily colonise wetland environments including Narrow-leaf Cumbungi *Typha domingensis*, Common Water-ribbons *Triglochin procera*, Tall Rush *Juncus procerus*, Pondweed *Potamogeton* spp. and Buttercup *Ranunculus* spp.

Introduced plants are common on the margins of wetlands bordering roadsides, where they dominate the ground layer. These species include Yorkshire Fog *Holcus lanatus*, Water Buttons *Cotula coronopifolia* and Curled Dock *Rumex crispus*.

The floristic composition and quality of wetland vegetation varies within the study area. Wetlands occur on private land, along roadsides and in the coastal park (Figure 3). They were not defined as a particular EVC or assessed as they are unlikely to be directly impacted by the proposed activities.

The EVCs on site are discussed in detail below.

3.3.1.1 Ecological Vegetation Classes

Classification of native vegetation in Victoria is based on ecological vegetation classes (EVCs). An EVC contains one or more floristic (plant) communities, and represents a grouping of broadly similar environments. Definitions of EVCs and benchmarks are provided by DSE: (www.dse.vic.gov.au/DSE/nrence.nsf/LinkView/DED128E11A362A51CA256FFF001CAB6C544ABC860B2506F7CA257004002550CC).

Heathy Woodland EVC 48

Heathy Woodland within the study area is generally dominated by Manna Gum *Eucalyptus viminalis* and Messmate Stringybark *Eucalyptus obliqua* to approximately five metres in height with an understorey tree layer of scattered Blackwood *Acacia melanoxylon*. An open shrub layer is typically present and is composed of Coastal Beard-heath *Leucopogon parviflorus*, Seaberry Saltbush *Rhagodia candolleana* subsp. *candolleana* and Honey-myrtle *Melaleuca* spp. to three metres tall. The ground layer is generally dominated by Austral Bracken of varying density. Other indigenous species include Bidgee-widgee *Acaena novae-zelandiae*, Kidney-weed *Dichondra repens*, Bower Spinach *Tetragonia implexicoma*, Coast Flax-lily *Dianella* sp. aff. *revoluta* and Austral Grass-tree *Xanthorrhoea australis*.

Introduced plants are often common and are most abundant on the margins of the woodland where they often dominate the ground layer. They include grasses such as Brome *Bromus* spp., Cocksfoot *Dactylis glomerata*, Rye-grass *Lolium* spp. and forbs such as Sow Thistle *Sonchus* spp., Flatweed *Hypochoeris radicata* and Clover *Trifolium* spp.

Heathy Woodland is found in patches along Baileys Road in variable condition (Figure 3). Weed levels range from negligible (less than 3 %) to more than 50 % cover. Other differences include the recruitment success of woody species and the diversity of understorey life-forms.

Heathy Woodland is vulnerable within the Warrnambool Bioregion. This EVC does not include any EPBC or FFG listed threatened communities.

Damp Heathy Woodland EVC 793

Damp Heathy Woodland within the study area has a tree canopy to five meters in height, dominated by Manna Gum and Messmate Stringybark. A relatively diverse shrub layer up to two meters in height is composed primarily of Coastal Beard-heath, Seaberry Saltbush, Blackwood, Silver Banksia *Banksia marginata* and Prickly tea-tree *Leptospermum continentale*. The ground layer/understorey vegetation is dominated by Austral Bracken of varying cover. Other ground layer vegetation includes indigenous species such as Spiny-headed Mat-rush *Lomandra longifolia*, Black-anther Flax-lily *Dianella revoluta*, Austral Grass-tree and Kidney-weed.

Cover of introduced plants varies from low to abundant. Immediately adjacent to the roadside, on the margins of the woodland, introduced species dominate the ground layer. They consist primarily of grasses including Sweet Vernal-grass *Anthoxanthum odoratum*, Cocksfoot, Yorkshire Fog and Hare's-tail Grass *Lagurus ovatus*.

Two patches of Damp Heathy Woodland are found along Baileys Road (Figure 3). Damp Heathy Woodland is not listed as occurring within the Warrnambool Plain Bioregion. It is considered vulnerable within the adjacent Victorian Volcanic Plain Bioregion. This EVC does not include any EPBC or FFG listed threatened communities.

Differences in quality between the two habitat zones within the site result from one patch having a more diverse structure with a higher number of species present and negligible weed cover (less than 5 %), compared with the second patch which is composed of less species and has a much higher weed cover of 70 %.

3.3.1.2 Species

Records from the site

A total of 61 indigenous and 41 introduced plant species was recorded from the site (Appendix 3).

Significant species

One rare flora species, Tufted Grass-tree *Xanthorrhoea caespitosa*, was recorded on site in addition to ten DSE protected flora species and 19 species uncommon in the bioregion.

An additional 13 species of state and national significance appear on database searches within 5 km of the site (Appendix 3). One of these has a medium likelihood of occurrence within the site, as discussed below.

- Slender Pink-fingers *Caladenia vulgaris* (DSE Advisory List rare - State significant).
  There is a medium likelihood of this species occurring in Heathy Woodland and Damp Heathy Woodland remnants within the study area. This vegetation was only assessed along roadsides which are fragmented and relatively low-quality (habitat score less than 0.5). It is also possible that this species occurs in the Douglas Fenwick Reserve, which is located north of the study area. The vegetation within this reserve was not floristically assessed as no impact is likely to occur as a result of the proposed project activities.

Consideration of whether habitat represents the 'best or remaining' 50 % of habitat for these species is included in Section 5.2.1.

Best or remaining 50% habitat for rare and threatened flora species

Part of the assessment of conservation significance for Net Gain involves consideration of the value of habitat for threatened species. There is one significant flora species that has medium likelihood of occurrence within the site. This species is considered in the assessment of conservation significance.

Habitat for each species within each habitat zone is assessed against DSE's criteria (DSE 2007, page 13). The pathway for each decision made (in accordance with DSE's Table 2) is outlined in Table 2 below.

Table 2: Determination of best/remaining habitat for rare or threatened flora species.

Species	**Conservation Status**	**Habitat zone** (Figure 3)	**Steps***	**Outcome**	**Conservation Significance** (threatened species rating)	**Notes**
Slender Pink-fingers	Rare	HZ3,4 & 5	A;D-F	Best 50% of habitat	High	Heathy Woodland and Damp Heathy Woodland within habitat zones 3, 4 & 5 along the proposed access route provide good quality suitable habitat for this species.

** Steps taken to determine best or remaining 50 % of habitat. From Table 2 in the Guide for Assessment of Referred Planning Permit Applications (DSE 2007b).*

3.3.2 Heytesbury Site

Vegetation within the Heytesbury gas pipeline corridor consists of predominantly introduced grasses within private farmland and along roadsides. Small and highly modified remnant patches of the following EVCs are present (Figure 4):

- Lowland Forest (EVC 16)
- Swamp Scrub (EVC 53)
- Damp Heath Scrub (EVC 165)
- Sedgy Riparian Woodland (EVC 198); and
- Wetland.

The EVCs present are generally consistent with those mapped on the DSE 2005 extant vegetation mapping; however some areas are not shown by DSE due to the broad scale nature of their mapping. Vegetation now present along Port Campbell Creek is considered in this report to be most consistent with Sedgy Riparian Woodland, rather than Swamp Scrub which is shown in the DSE pre-1750 EVC modelling, and to a minor extent, on the DSE 2005 extant vegetation mapping. The EVCs on site are discussed in detail below.

3.3.2.1 Ecological Vegetation Classes

Lowland Forest EVC 16

Lowland Forest (Plate 1) within the study area is dominated by Swamp Gum *Eucalyptus ovata* and Brown Stringybark *Eucalyptus baxteri* to 6 m in height. These immature trees occur over a ground layer dominated by a single indigenous species, Austral Bracken, which comprises 40 % of cover in the understorey. Introduced plants are abundant, especially on the margins of the woodland where they dominate the ground layer.

Lowland Forest is vulnerable within the Warrnambool Plain Bioregion. This EVC occupies a single small patch (habitat zone 4) at the western end of the study area (Figure 4).

Plate 1. Lowland Forest

Swamp Scrub EVC 53

Swamp Scrub (Plate 2) within the study area is characterised by closed scrub composed of Woolly Tea-tree *Leptospermum lanigerum* and Scented Paperbark *Melaleuca squarrosa* up to approximately 8 m tall. Other species present that are typical of the EVC include Tall Saw-sedge *Gahnia clarkei*, Coast Saw-sedge *Gahnia trifida* and Fireweed *Senecio* sp. Soils in at least part of this habitat zone are inundated by water.

Introduced plants are abundant, especially at the western margin. Introduced plants include Cocksfoot, Toowoomba Canary-grass *Phalaris aquatica*, Mint *Mentha* sp. and Blackberry *Rubus fruticosus* spp. agg. which limited access to some areas of HZ9.

One species of state significance (Port Campbell Guinea-flower *Hibbertia truncata*) was recorded within this EVC. Swamp Scrub occupies habitat zone (HZ9) within the site, to the east of North South Road. This patch of vegetation appears to be associated with a spring which is partly dammed and has been fenced to exclude stock. Swamp Scrub is vulnerable within the Warrnambool Bioregion.

Plate 2. Swamp scrub

Damp Heath Scrub EVC 165

Damp Heath Scrub (Plate 3) within the study area is characterised by shrubland to 3 m tall. Species present typical of the EVC include Prickly Tea-tree, Port Campbell Guinea-flower, Silver Banksia, Swamp Sheoak *Allocasuarina paludosa*, Prickly Moses *Acacia verticillata* and Coast Saw-sedge.

Damp Heath Scrub is present in one habitat zone (HZ5) which includes two 3 m wide patches of road reserve, to the west of North South Road. Damp Heath Scrub is vulnerable within the Warrnambool Bioregion.

Plate 3. Damp Heath Scrub

Sedgy Riparian Woodland EVC 165

DSE pre-1750 vegetation mapping identifies Swamp Scrub as the historically dominant EVC along Port Campbell Creek. However, the vegetation now present, and the creek morphology, which is a narrow and incised channel are considered more consistent with Sedgy Riparian Woodland (Plate 4).

Sedgy Riparian Woodland within the study area comprises Swamp Gum and Messmate to 15 m tall, with scattered shrubs including Prickly Currant-bush *Coprosma quadrifida* and scattered rushes and sedges including Tall Sedge *Carex appressa* and Tall Rush.

This vegetation has high weed levels including Blackberry and White Poplar *Populus alba*.

There are three habitat zones (HZs) of this EVC within the site. Habitat zone 7 comprises Swamp Gum and Messmate as the dominant canopy species. Introduced plants are abundant, especially in the ground layer. Habitat zones 6 and 8 lack a tree canopy. Blackwood dominates the sub canopy in HZ6 while HZ7 is comprised of *Juncus* species and a small number of aquatic herbs. Part of

the mapped vegetation may be planted, however some mature trees are present and a precautionary approach has been taken.

Sedgy Riparian Woodland is endangered within the Warrnambool Bioregion.

Plate 4. Sedgy Riparian Woodland

Records from the site

A total of 61 indigenous and 58 introduced plant species was recorded from the site (Appendix 3). Of the introduced species, three are declared noxious weed species (regionally controlled). These are Spear Thistle *Cirsium vulgare*, Hemlock *Conium maculatum* and Hawthorn *Crataegus monogyna.*

Significant species

Two significant species were recorded within the study area.

- Port Campbell Guinea Flower *Hibbertia truncata* (Walsh & Stasjic rare, DSE Advisory List rare - Nationally significant).
  This species usually occurs in or near coastal heath, woodland or open forest, usually on well drain gravely or sandy soils. Port Campbell Guinea-flower was recorded at two locations within the study area in Damp Heath Scrub (HZ5) on North South Road and Swamp Scrub (HZ9).

- Wavy Swamp Wallaby-grass *Amphibromus sinuatus* (DSE Advisory List vulnerable - State significant).
  Wavy Swamp Wallaby-grass is an aquatic perennial grass to 1.2 m tall but often only the flower head emerges from the water (Walsh & Entwisle 1994). This species is often confined to permanent swamps in cool sites (Walsh & Entwisle 1994) but has been found growing in ephemeral creek and drainage lines. Wavy Swamp Wallaby-grass was recorded at one location within the study area, characterised by occasional native aquatic species in a small wetland dominated by introduced species. The wetland was grazed with high weed levels.

Thirteen additional species of state and national significance appear on database searches within 5 km of the site (Appendix 3). None of these species are considered likely to occur within the study area.

Consideration of whether habitat represents the 'best or remaining' 50 % of habitat for these species is included in Section 5.2.1.

Best or remaining 50 % habitat for rare and threatened flora species

Part of the assessment of conservation significance for Net Gain involves consideration of the value of habitat for threatened species. Two significant flora species, Port Campbell Guinea Flower and Wavy Swamp Wallaby-grass have been recorded within the study area. No EVC likely to support Wavy Swamp Wallaby-grass was recorded within the Heytesbury site. No additional significant flora species are considered to have at least medium likelihood of occurrence within the site. Thus, only Port Campbell Guinea Flower is considered in the assessment of habitat zone conservation significance.

Habitat for each species within each habitat zone is assessed against DSE's criteria (DSE 2007, page 13). The pathway for each decision made (in accordance with DSE's Table 2) is outlined in Table 2 below.

Table 3: Determination of best/remaining habitat for rare or threatened flora species.

Species	**Conservation Status**	**Habitat zone** (Figure 4)	**Steps***	**Outcome**	**Conservation Significance** (threatened species rating)	**Notes**
Port Campbell Guinea Flower	Rare	HZ5	A-B-E-F-Yes	Best 50% of habitat	Medium	This species was recorded in both habitat zones.
		HZ9	A-B-E-F-Yes	Best 50% of habitat	Medium	

** Steps taken to determine best or remaining 50 % of habitat. From Table 2 in the Guide for Assessment of Referred Planning Permit Applications (DSE 2007b).*
HZ 5 = Damp Heath Scrub, habitat zone 5
HZ9 = Swamp Scrub, habitat zone 9

3.4 Fauna

3.4.1 Halladale and Black Watch Proposed Well Site

3.4.1.1 Habitats

Fauna habitats that occur within the study area can be characterised according to vegetation communities and other features such as waterways, rock outcrops etc. The predominate habitat types within the project area include:

- Heathy Woodland
- Heathland
- Scrub
- Introduced vegetation
- Wetland

These habitats are shown in Figure 5 and are described below.

Heathy Woodland

This habitat type is characterised by an overstorey of Manna Gum and Messmate Stringybark with an understorey consisting of mixed native heath species and introduced vegetation.

In some areas such as the Douglas Fenwick Reserve and along Baileys Road the cover of introduced vegetation is low and native vegetation provides a dense cover for native fauna, including threatened mammal species such as the Long-nosed Potoroo *Potorous tridactylus* and Southern Brown Bandicoot *Isoodon obesulus obesulus*. Other areas are dominated by introduced vegetation and these areas provide minimal habitat suitability for these species, however they do provide connectivity between high quality remnant patches.

Heathland

This habitat, occurring in one small area within the Bay of Islands Coastal Park west of Baileys Road and south of the proposed drilling site, is characterised by a low, dense cover of heath species such as Banksia and Tea Tree species.

This dense cover provides refugia and food resources for small mammals, including potential habitat for threatened species such as the Swamp Antechinus *Antechinus minimus* and White-footed Dunnart *Sminthopsis leucopus*.

Scrub

This habitat is characterised by a cover of Coast Beard-heath of varying heights and density. Some areas, defined in Figure 5 as Low Open Scrub, consist of a short (< 50 cm), sparse cover of Coast Beard-heath with space between scrub dominated by native grasses including tussock grass species. Other areas, defined as Tall Closed Scrub in Figure 3, consist of a tall (up to 2 m in some areas) dense cover of Coast Beard-heath with a sparse and open ground cover.

Shrubs within this habitat provide roosting habitat for birds, including the Orange-bellied Parrot *Neophema chrysogaster*. Low Open Scrub provides habitat for small mammals and ground foraging birds, similar to grassland habitat. Tall Closed Scrub provides habitat for a variety of bird species, including the threatened Rufous Bristlebird *Dasyornis broadbenti caryochrous*.

Introduced Vegetation

The majority of the study area has been cleared, is currently grazed and consists of introduced vegetation.

These areas provide minimal fauna habitat other than for grassland specialists such as the Magpie-lark *Grallina cyanoleuca* and exotic species such as the European Skylark *Alauda arvensis*. Pasture grasses are known to provide feeding habitat for the Orange-bellied Parrot. Planted Pines, used as windbreaks in driveways and along roads, provide roosting habitat for species such as the European Goldfinch *Carduelis carduelis*, and provide potential nesting habitat for threatened species such as the Nankeen Night Heron *Nycticorax caledonicus*.

Wetland

Erosion of limestone has created a number of sinkholes within the study area. Some of these sinkholes have become inundated and provide ephemeral freshwater wetlands when wet. During the flora and fauna assessment many of the water bodies were inundated due to above average rainfall through the study area in late 2009.

Vegetation within these water bodies varies in density, from minimal-sparse cover of introduced grasses fringing the water body, to dense cover of native wetland species such as Water Ribbons. Some wetlands have a fringe of emergent vegetation, such as Bulrush, providing cover for waterbirds. The majority of these wetlands are shallow and likely to dry out during hot summer months.

Habitat connectivity

The Bay of Islands Coastal Park provides high value connectivity along the coast. Dense vegetation within the coastal park is also likely to provide a refuge from exotic predators such as the Red Fox *Vulpes vulpes*.

Several remnants of Heathy Woodland occur in areas such as Douglas Fenwick Reserve and within private property to the east of Baileys Road. Roadside vegetation along Baileys Road provides connectivity from the coastal park to these areas. However the cover of native vegetation through roadside areas is patchy and interspersed with areas of open cover that limits this connectivity and may prevent the movement of small mammals.

Water bodies within the study area are located close to one another and likely to provide high value connectivity for frogs dispersing during high rainfall events. This was observed during nocturnal surveys undertaken on 26 November 2009 when high numbers of frogs were observed across the study area during heavy rainfall.

Significant communities

No FFG or EPBC Act listed communities occur within the study area.

3.4.1.2 Species

A total of 85 indigenous and nine introduced fauna species were recorded in the study area during the November 2009 flora and fauna assessment (Appendix 4). Three (European Rabbit, Fallow Deer and Red Fox) are established pest species as defined under the CaLP Act 1994.

Significant species

Five species of state and national significance were recorded within or immediately adjacent to the Halladale and Black Watch Proposed Well Site during the November 2009 survey, or have been recoded previously. These are discussed below.

- Orange-bellied Parrot *Neophema chrysogaster* (EPBC listed critically endangered, FFG Act listed, DSE Advisory list critically endangered – Nationally significant).
  The Orange-bellied Parrot is distributed in Tasmania (breeding) and southern mainland Australia (non-breeding overwintering population). On mainland Australia the species is usually found within 3 km of the coast and inhabits a variety of coastal habitats. Preferred foraging habitat is Coastal Saltmarsh, however they forage amongst seeding grasses and have been observed on open

grassy areas near saltmarsh. This species can make significant use of altered habitats such as pasture. This species was recorded within the Bay of Islands Coastal Park in 2002. The species was recorded feeding on grasses and weeds within the Bay of Islands Coastal Park, adjacent farmland and roadsides near the drilling site during targeted surveys undertaken by Birds Australia in 2002 (C. Tzaros pers. comm.). The Orange-bellied Parrot is likely to make use of grassy areas within the Bay of Islands Coastal Park and pasture in adjacent private land and within roadsides on occasion. Shrubs within the Bay of Islands Coastal Park provide roosting habitat for this species.

- Southern Bent-wing Bat *Miniopteris schreibersii bassanii* (EPBC listed critically endangered, FFG Act listed, DSE Advisory List endangered – Nationally significant).
  The Southern Bent-wing Bat is a cave dwelling insectivorous bat. There are currently only two known breeding sites; Bat Cave at Naracoorte in South Australia and Starlight Cave east of Warrnambool. The species migrates to these locations in August to September, giving birth between October and December. Between March and April the species migrates to overwintering sites throughout south-western Victoria, including crevices in coastal cliffs. The species utilises a wide variety of habitats close to roosting sites for foraging. They begin to go into torpor after reaching these caves in the cooler months, when insect resources are low, where they will enter a deep hibernation. During this period they are susceptible to disturbance. This species was detected on ANABAT during the November 2009 survey, including at one location along Baileys Road. The maternity cave near Warrnambool is located approximately 20km northwest of the study area and crevices in coastal cliffs along Bay of Islands Coastal Park provide roosting habitat for this species. Foraging is likely to occur throughout the study area, but would be focused on patches of treed vegetation.

- Brown Quail *Coturnix ypsilophora* (DSE Advisory List near threatened – State significant).
  The Brown Quail inhabits a wide variety of grasslands and shubland, preferably with tall, rank ground vegetation. When flushed this species explodes noisily from the ground with a distinctive metallic whirring and plunges rapidly into cover, head first. This species was recorded during the November 2009 assessment in rank grasses at the edge of Bay of Islands Coastal Park. Areas with rank vegetation throughout the study area, particularly adjacent to the Bay of Islands Coastal Park, provide suitable habitat for this species.

- Baillon's Crake *Porzana pusilla* (FFG Act listed, DSE Advisory List vulnerable – State significant).
  Baillon's Crake inhabits vegetated permanent and ephemeral wetlands with dense cover of emergent vegetation and often with abundant floating

vegetation. They are often located foraging at the margins of wetlands, gleaning amongst aquatic vegetation for invertebrates and seeds. The species breeds in clumps of vegetation and tussocks at the edges of wetlands. This species was recorded foraging at the margins of the wetland located northeast of the drilling pad and immediately adjacent to Baileys Road. The species is likely to occur at wetlands within the study area that provide a dense cover of emergent vegetation.

- Hardhead *Aythya australis* (DSE List vulnerable – State significant).
  The Hardhead is almost entirely aquatic, inhabiting large deep freshwater wetlands with abundant aquatic vegetation frequenting open water where emergent vegetation is present. This species has previously been recorded within the study area from 2002 in wetlands within the Bay of Islands Coastal Park. It is likely that this species utilises larger wetlands within the study area on occasion, particularly the large wetland located to the east of Baileys Road.

There are 54 additional species of state and national significance that appear on database records within 5 km of the site (Appendix 4). Nineteen of these have at least medium likelihood of occurrence within the study area, as discussed below.

- Australian Painted Snipe *Rostratula australis* (EPBC Listed critically endangered, FFG Act listed, DSE Advisory List critically endangered – Nationally significant).
  The Australian Painted Snipe inhabits shallow terrestrial freshwater wetlands, including temporary wetlands, inundated paddocks and dams. Typically there is a cover of tussock grasses, sedges, rushes or reeds. Breeding habitat appears to be quite specific with shallow wetlands with exposed mud and both upper and canopy cover important. A wetland to the east of Baileys Road within a remnant patch of heathy woodland provides potential breeding habitat for this species and the species may forage within wetlands associated with the study area on occasion.

- Southern Brown Bandicoot *Isoodon obesulus obesulus* (EPBC listed endangered, DSE Advisory List near threatened – Nationally significant).
  Sothern Brown Bandicoots inhabit heath, shrubland, heathy forest and woodland with a dry heath understorey. In south-western Victoria, heath with an overstorey of Brown Stringybark is preferred over the wetter Messmate Stringybark and Scented Paperbark *Melaleuca squarrosa* forests. There is a record located offshore from 1987 that is recorded within the VFD as being "roughly 2 km south of Flaxman". If taken to be 2 km south along the coast this area corresponds with an area of heath within the Bay of Islands Coastal Park. This area is considered suitable habitat along with areas within Douglas Fenwick Reserve. Remote cameras failed to detect this cryptic species during the November 2009 survey. If present, the species may utilise heathy

woodland remnants along Baileys Road to move between Douglas Fenwick reserve and the Bay of Islands Coastal Park.

- Growling Grass Frog *Litoria raniformis* (EPBC listed vulnerable, FFG Act listed, DSE Advisory List endangered – Nationally significant).
  The Growling Grass Frog inhabits shallow water bodies with fringing vegetation and moderate amounts of floating vegetation. Males call from October to March each year. The greatest predictor of the occurrence of this species is the occurrence of a known population within 2 km as the species rapidly colonises new wetlands. Suitable habitat for this species was identified and water bodies within the Bay of Islands Coastal Park and adjacent farmland provide suitable habitat for this species. Targeted surveys undertaken during the current assessment failed to detect them within the local area. There is some potential for the species to occur within water bodies within the Bay of Islands Coastal Park and on Lot 52, Plan 582780.

- Gull-billed Tern *Gelochelidon nilotica* (FFG Act listed, DSE Advisory List endangered – State significant).
  The Gull-billed Tern utilises a range of shallow water bodies particularly those with mudflats and wetlands fringed with grasses, rushes, reeds, woodland or other bushland. Also found foraging on sheltered coasts and occasionally dry land. Breeding usually occurs on large, ephemeral inland lakes. There is a single record of this species from 1998 within 5 km of the Halladale and Black Watch Proposed Well Site, and it is likely that the species utilises wetlands within the study area on occasion.

- Latham's Snipe *Gallinago hardwickii* (DSE Advisory List near threatened – State significant).
  Latham's Snipe inhabits a wide variety of water bodies with nearby cover. This species forages most often in wet margins of water bodies but also within dense vegetation around water bodies. This species is migratory, breeding in Japan and eastern Asia, but is known to occur in Victoria throughout the year. There are recent (2002) records of this species from wetlands in the Bay of Islands Coastal Park. Water bodies within the study area provide suitable habitat for this species.

- Royal Spoonbill *Platalea regia* (DSE Advisory List vulnerable – State significant).
  The Royal Spoonbill inhabits terrestrial wetlands with herbs and emergent vegetation, where their bill limits them to feeding in shallow water. They prefer large water bodies and are generally intolerant to disturbance. There are several recent (2002) records from Mathiesons and Baileys Road immediately adjacent to the Halladale and Black Watch Proposed Well Site, and large wetlands provide suitable habitat for this species

- Little Egret *Egretta garzetta* (FFG Act listed, DSE Advisory List endangered – State significant).
  The Little Egret utilises most wetlands habitat including terrestrial wetlands and watercourses with shallow water, particularly tidal reaches of watercourses and mudflats where they forage amongst aquatic vegetation. This species is more often recorded in saline coastal environments than other white egrets. This species breeds in wetlands with trees nearby for nesting. There is a single record from 1994 within 5 km of the study area, on the Curdies River. Suitable habitat exists within the study area, and a large treed wetland off Baileys Rd also provides suitable habitat for this species.

- Eastern Great Egret *Ardea modesta* (FFG Act listed, DSE Advisory List vulnerable – State significant).
  The Eastern Great Egret inhabits similar habitat to the Little Egret. There are several records of this species from 2002 within 5 km of the Halladale and Black Watch Proposed Well Site. Suitable habitat exists within the study area.

- Nankeen Night Heron *Nycticorax caledonicus* (DSE Advisory List near threatened – State significant).
  The Nankeen Night Heron is a nocturnal species that inhabits the littoral and estuarine habitats and terrestrial wetlands and grasslands, often in areas sheltered by tall emergent and ground vegetation where it shelters. During the day in roosts in dense vegetation. This species nests in dense vegetation of trees and shrubs near water bodies. There are several records for this species within 5 km of the study area from 1994. A densely treed and vegetated water body east of Baileys Road provides suitable nesting habitat for this species and wetlands within the Halladale and Black Watch Proposed Well Site provide foraging habitat when inundated.

- Magpie Goose *Anseranas semipalmata* (FFG Act listed, DSE Advisory List near threatened – State significant).
  The Magpie Goose inhabits terrestrial wetlands and adjacent terrestrial environments. Formerly lost from Victoria by 1911 this species has been introduced since 1963. There are recent records (2006) from near Warrnambool from large deep permanent water bodies. Larger wetlands present within the study area, such as the large wetland west of Baileys Road, provide suitable habitat for this species.

- Australasian Shoveler *Anas rhynchotis* (DSE Advisory List vulnerable – State significant).
  The Australasian Shoveler inhabits large deep permanent lakes with abundant aquatic flora, using their specialised bill for feeding in amongst vegetation or muddy areas. There are two records for this species from 2002 within 5 km of the study area. It is likely that this species forages in larger wetlands within the

study area on rare occasions.

- Grey Goshawk *Accipiter novaehollandiae* (FFG Act listed, DSE List vulnerable – State significant).
  The Grey Goshawk inhabits coastal wooded and forested lands where they hunt within forested area and, less often, adjacent open country. Breeding occurs within mature forest, usually near creeks, where they build a nest in branches of mature tree. There are two records within 5 km of the study area; a record from 1982 within Douglas Fenwick Reserve and a record from near Curdievale in 2002. Habitat for this species is largely restricted to Douglas Fenwick Reserve; however the species may overfly the study area on occasion.

- White-bellied Sea-eagle *Haliaeetus leucogaster* (FFG Act listed, DSE List vulnerable – State significant).
  The White-bellied Sea-eagle inhabits coastal environments as well as large inland wetlands, rivers and lakes. They hunt over large expanses of open water. This species breeds in tall trees near water, coastal cliffs and escarpments. There is a recent record from 2004 located immediately offshore of the Halladale and Black Watch proposed well site. Cliffs within the Bay of Islands Coastal Park provide optimal foraging and breeding habitat for this species and it may overfly the study area on occasion.

- Diamond Firetail *Stagonopleura guttata* (FFG Act listed, DSE Advisory List vulnerable – State significant).
  The Diamond Firetail occurs in lightly wooded environments such as woodlands, open forests and grasslands with scattered trees, often along watercourses. The understorey usually consists of a sparse cover of shrubs or regrowth and a grassy ground cover. This species has been recorded previously within 5 km of the study area and was recorded during the November 2009 assessment adjacent to the study area in the north-western corner of Douglas Fenwick Reserve. Woodland with a grassy understorey along Baileys Road and lightly wooded farmland areas provide suitable habitat for this species within the study area.

- Rufous Bristlebird *Dasyornis broadbenti caryochrous* (FFG Act listed, DSE Advisory List near threatened – State significant).
  The Rufous Bristlebird typically inhabits areas with a low (e.g. 0.5–2 m) dense shrub cover with clear ground that allows the species to forage, including low dense shrubland and heathland on coastal dunes. There are several records of this species within 5 km of the study area (1992–2004), including a previous record from Douglas Fenwick Reserve and the species was recorded from the Bay of Islands Coastal Park during the November 2009 assessment. The majority of records were from areas of scrub 1–2 m in height (Figure 4). These areas had a denser cover than areas with height < 1 m. It is likely that the

species utilises all areas of coastal scrub within Bay of Islands Coastal Park, including areas adjacent to the proposed drilling site, and occurs in low numbers in Douglas Fenwick Reserve.

- White-footed Dunnart *Sminthopsis leucopus* (FFG Act listed, DSE Advisory List near threatened – State significant).
  The White-footed Dunnart occurs in a variety of habitats with a dense (> 50%) cover at ground level, including coastal tussock grasslands, sedgeland, wet heath, woodland and forest. There is a single record of this species from Douglas Fenwick Reserve in 1982, and suitable habitat exists within wet heath along roadsides. Remote cameras failed to detect this cryptic species during November 2009 surveys.

- Glossy Grass Skink *Pseudemoia rawlinsoni* (DSE Advisory List near threatened – State significant).
  The Glossy Grass Skink inhabits densely vegetated areas usually close to freshwater and brackish environments. There are no records for this species within 5 km of the study area. There is a single record from Port Campbell National Park. Freshwater wetlands present within the study area provide suitable habitat for this species, particularly the wetland bordering the Bay of Islands Coastal Park.

- Swamp Skink *Egernia coventryi* (FFG Act listed, DSE Advisory List vulnerable – State significant).
  The Swamp Skink inhabits densely vegetated environments with a permanently damp substrate such as the margins of swamps, salt marshes and other wet environments, as well as damp tea-tree thickets. This species utilises the burrows of Yabbies for shelter. There are no records for this species within 5 km of the study area. Several records exist to the northwest and southeast of the study area. Freshwater wetlands present within the study area provide suitable habitat for this species, particularly the wetland bordering the Bay of Islands Coastal Park.

- Southern Toadlet *Pseudophryne semimarmorata* (DSE Advisory List vulnerable – State significant).
  The Southern Toadlet inhabits a variety of forest, woodland and grassland habitats and is most commonly found in damp areas with abundant leaf litter. There are several records of this species from 1978/79 within 5 km of the study area; however a lack of recent records likely reflects low level of survey rather than a lack of suitable habitat. Low lying areas likely to retain water, ephemeral drainage lines (not permanent waterways), roadside drainage ditches and any other areas with potential to remain moist through the breeding season provide suitable habitat for this species.

Consideration of whether habitat represents the ‘best or remaining’ 50 % of

habitat for these species is included in Section 5.2.1.

Best or remaining 50% habitat for threatened fauna species

Part of the assessment of conservation significance for Net Gain involves consideration of the value of habitat for threatened species. There are 19 threatened fauna species that have at least medium likelihood of occurrence within the Halladale and Black Watch Proposed Well Site. Many of these species are either avifauna likely to overfly the study area, or wetland species whose habitat does not correspond to an EVC. There is one threatened fauna species that has at least medium likelihood of occurrence within habitat zones 1, 2 and 3. This species is considered in the assessment of conservation significance.

Habitat for each species within each habitat zone is assessed against DSE's criteria (DSE 2007b, page 13). The pathway for each decision made (in accordance with DSE's Table 2) is outlined in Table 4 below.

Table 4: Determination of best/remaining habitat for threatened fauna species.

Species	**Conservation Status**	**Habitat zone** (Figure 3)	**Steps***	**Outcome**	**Conservation Significance** (threatened species rating)	**Notes**
Diamond Firetail	Threatened	HZ1	A-D-No	No further consideration required	N/A	The Diamond Firetail, although likely to utilise habitat along Baileys Road on occasion, is unlikely to make significant use of these areas given their scattered nature and the presence of higher quality habitat in Douglas Fenwick Reserve
		HZ2	A-D-No	No further consideration required	N/A	
		HZ3	A-D-No	No further consideration required	N/A	

** Steps taken to determine best or remaining 50 % of habitat. From Table 2 in the Guide for Assessment of Referred Planning Permit Applications (DSE 2007b).*
HZ 1= Heathy Woodland, habitat zone 1,
HZ 2 = Heathy Woodland, habitat zone 2
HZ3 = Damp Heathy Woodland, habitat zone 3

3.4.2 Heytesbury Site

3.4.2.1 Habitats

Fauna habitats that occur within the Heytesbury study area can be characterised according to vegetation communities and other features such as waterways, rock outcrops etc. The main habitat types within the project area include:

- Remnant trees, logs and stags
- Planted and introduced vegetation and trees

- Swamp heath
- Farm Dams, creeks and swampy grasslands

These habitats are shown in Figure 6 and are described below.

Remnant trees, logs and stags

One small patch of remnant trees, dead stags and fallen logs occurs to the west of North South Road near the Gas Pumping Station. Trees are highly scattered, resulting in a lack of canopy cover and there is a lack of native understorey. This patch is connected to a larger group of trees outside the proposed pipe alignment which may offer foraging habitat for significant species. These species may utilise the study area on occasion; however it is unlikely that the study area provides significant habitat.

Introduced and Planted Vegetation

The majority of the Heytesbury site has been highly modified and is of poor quality for native fauna. The site is dominated by introduced grasses and is presently being used for silage production, cattle and sheep grazing (Plate 5). Grassland specialists, including the Australian Magpie *Gymnorhina tibicen*, Australian Pipit *Anthus novaeseelandiae* and Australian Raven *Corvus coronoides* were observed on all properties surveyed during the present assessment.

Planted trees and shrubs were present in scattered linear wind rows. These wind rows generally consist of mixed *Eucalyptus* species (Plate 6), Cypress or Pine (Plate 7). Although some areas contained a shrubby understorey, the majority of planted vegetation lacked an understorey. Planted vegetation provides foraging, nesting and perching habitat for common bird species such as the Grey Shrike-thrush *Colluricincla harmonica,* Superb Fairy Wren *Malurus cyaneus* and Australian Magpie. It also provides potential nesting habitat for raptors, and a Little Eagle *Hieraaetus morphnoides* was observed flying from cypress trees to the west of North South Road. Trees planted as wind breaks can provide potential roosting and nesting habitat for threatened species such as the Nankeen Night Heron *Nycticorax caledonicus.*

Plate 5. Introduced pasture grassland

Plate 6. Planted *Eucalyptus* species

Plate 7. Planted introduced trees

Swamp heath

Two small, isolated patches of swamp heath were present along North South Road and as riparian vegetation surrounding a small farm dam to the east of this road. These patches are very small in size and highly fragmented and as a consequence offer minimal habitat suitability. Yellow-tailed Black Cockatoos *Calyptorhynchus funereus* were observed in the swamp heath located on North South Road.

Farms Dams, creeks and swamps

A variety of aquatic habitats occur within the Heytesbury site, including five dams, a marshy swamp and two creeks (with flowing water). Two of the dams have been fenced off from livestock disturbance and contain dense emergent riparian and floating aquatic vegetation. One dam was in close to the Gas Pumping Station (4~8\PP3360) (Plate 8) to the west of the alignment while the other is close to the North South Road (3\PS547510) (Plate 9). A small ephemeral dam was present approximately 2 km east of North South Road (#14~9\PP3360). This dam supports some floating aquatic vegetation but lacks riparian vegetation.

Dense riparian and aquatic vegetation can increase frog occupancy by offering calling and foraging habitat and cover to avoid predators. This includes the nationally significant Growling Grass Frog. Heard et al. (2004) identified increases in Growling Grass frog occupancy when dense filamentous algae, sub-emergent and emergent vegetation was present. There is potential for Growling Grass Frogs to occupy these dams.

An unknown frog species and tadpoles were observed at the smaller protected dam. A single male Spotted Marsh Frog *Limnodynastes tasmaniensis* was heard calling from the larger dam.

A marshy swamp is located near the confluence of the Port Campbell Creek and one its tributaries (1\TP828439) (Plate 10). Although it has been considerably disturbed by sheep grazing, it is presently covered by dense low vegetation. Male Common Froglet *Crinia signifera* were recorded calling at this swamp. This marshy swamp offers potential habitat for the state significant Southern Toadlet.

Both creeks contained flowing water at the time of the survey. The riparian vegetation along the tributary of Port Campbell Creek consisted mostly of pasture grasses and blackberries. No native riparian vegetation was recorded along this creek. It appears that a patch of large pine trees have been recently removed from the edge of this tributary. Some of the logs and dead stags persist as woody debris along the bank and within the creek itself (Plate 11). These

stags and logs should remain undisturbed due to the potential habitat they provide to a number of aquatic vertebrates, including the state significant Southern Toadlet. They have an important role in slowing water flow and creating pools that provide habitat for a number of fauna species.

The riparian vegetation along both sides of the Port Campbell Creek was continuous and dense in some sections. It consisted mostly of planted Blackwood, *Eucalyptus* species and several exotic trees species, much of which has been recently planted. The understorey is dominated by introduced vegetation and is heavily grazed by sheep. This riparian vegetation offers minimal habitat for terrestrial fauna.

Port Campbell Creek, Wallaby Creek (Plate 12, 13) and an unnamed tributary of Port Campbell Creek were all found to contain habitat which supports native fish and decapod crustaceans, including the state significant Otways Cray *Geocharax gracilis*. These water bodies also provide potential habitat for the state significant Hairy Burrowing Cray *Engaeus sericatus;* however there was a lack of suitable habitat for any other significant aquatic fauna species. Prior to a site inspection, Dwarf Galaxias *Galaxiella pusilla*, Yarra Pygmy Perch *Nannoperca obscura* and Australian Grayling *Prototroctes maraena* were considered to have some potential to occur in the waterways crossed by pipeline. Yarra Pygmy Perch and Australian Grayling have been previously record from the Otways basin, within which the study area is located, while the Dwarf Galaxias has been recorded from the neighbouring Hopkins basin. Following the aquatic habitat assessment and survey, these species were considered to have a low likelihood of occurrence due to a lack of suitable habitat.

A range of habitat data, including basic water quality measurements, were collected during the aquatic habitat assessment (Appendix 4.1.4). All waterways have suffered some form of degradation, with all sites being affected by removal of native, riparian vegetation and increased sedimentation. All sites were relatively low in cover of aquatic macrophytes; however some aquatic vegetation may have been reduced or removed temporarily from sites following recent flooding. Water quality parameters recorded at all sites (Dissolved Oxygen (DO), pH, Electrical Conductivity (EC), temperature and turbidity) were generally good and not likely to preclude any threatened species thought to have potential to occur. Turbidity records within the Port Campbell Creek catchment (sites 2 – 5) appear elevated, potentially as a result of disturbance to banks and substrate caused by recent flooding.

Plate 8. Dam protected from livestock disturbance with good aquatic vegetation.

Plate 9. Dam protected from livestock disturbance with high quality aquatic and riparian vegetation.

Plate 10. The marshy swamp at the confluence of Port Campbell Creek and one of its tributaries.

Plate 11. The logs and dead stags forming woody debris along the bank of the smaller creek.

Plate 12. Wallaby Creek at Curdievale – Port Campbell Creek Rd (Aquatic Assessment and Survey Site 1).

Plate 13. Wallaby Creek at Curdievale – Port Campbell Creek Rd (Aquatic Assessment and Survey Site 1).

3.4.2.2 Species

A total of 31 terrestrial fauna species were recorded during the present assessment. Of these, 26 were indigenous (24 birds and two frogs) and five were introduced (Appendix 3). The most commonly encountered species were those birds adapted to highly modified habitats including the Australian Magpie, Australian Raven, Willy Wagtail *Rhipidura leucophrys*, and the introduced Blackbird *Turdus merula.*

The Spotted Marsh Frog and the Common Froglet were recorded calling during the present survey. Tadpoles were recorded at the smaller dam in the far west of the survey site.

The European Rabbit was recorded within the study area. Rabbits are considered a pest species under the *CaLP Act* 1994.

Significant species

One species of state significant listed species, Otways Cray *Geocharax gracilis*, was recorded during the present assessment. This species is considered endangered within Victoria (DSE 2009). Otways Cray was recorded in relatively high abundance at three of the five aquatic survey sites, including sites on Port Campbell Creek, Wallaby Creek and the unnamed tributary of Port Campbell Creek. It is highly likely that this species will occur within and along the banks of any creeks and drainage lines within the study. This species also potentially occurs in association with any dams or wetlands within the study area.

There are 35 species of state and national significance that appear on database records within 5 km of the site (Appendix 3). Of these, 13 have at least medium likelihood of occurrence. These are discussed in more detail below:

- Growling Grass Frog – (EPBC listed vulnerable, FFG Act listed, DSE Advisory List endangered – Nationally significant).
  The habitat preferences and breeding habits of the Growling Grass Frog are discussed in Section 3.4.1.2. Suitable habitat for Growling Grass Frogs was present in two dams (west of North South Road {4~8\PP3360} and east of North South Road {3\PS547510}). Growling Grass Frogs might also occupy the marshy swamp present near the Port Campbell Creek west of Cobden-Port Campbell Road (1\TP828439).

- Southern Bent-wing Bat - (EPBC listed critically endangered, FFG Act listed, DSE Advisory List endangered – Nationally significant).
  The habitat preferences and breeding habits of the Southern Bent-wing Bat are discussed in Section 3.4.1.2. It is possible that this species will forage above the canopy of the tree patches present within the Heytesbury site. However no roosting habitat is present.

- Whiskered Tern *Chlidonias hybridus* (DSE Advisory List near threatened – State significant).
  Whiskered terns occur in large wetlands, coastal and inland salt field, sewerage ponds, estuaries and coastal waters. This species may occur within the Heytesbury site due to the presence of potential breeding and foraging habitat located at vegetated dams, dense riparian vegetation along the Port Campbell Creek and associated marshy swamp.

- Latham's Snipe *Gallinago hardwickii* (DSE Advisory List near threatened – State significant).
  The habitat preferences, migratory and breeding habits of the Latham's Snipe are discussed in Section 3.4.1.2. This species may occur within the Heytesbury site due to the presence of potential breeding and foraging habitat within vegetated dams on the property near North South Road, dense riparian vegetation along the Port Campbell Creek and associated marshy swamp.

- Royal Spoonbill *Platalea regia regia* (DSE Advisory List vulnerable – State significant).
  The habitat preferences, migratory and breeding habits of the Royal Spoonbill are discussed in Section 3.4.1.2. This species was last recorded within 5 km of the study area in 2002. There is potential foraging habitat within the shallow dams and swamps near North South Road. There is also potential breeding habitat among the dense riparian vegetation along the Port Campbell Creek and associated marshy swamp. Therefore, this species may occur within the Heytesbury pipe alignment.

- Little Egret (FFG Act listed, DSE Advisory List endangered – State significant).
  The habitat preferences, migratory and breeding habits of the Little Egret are discussed in Section 3.4.1.2. This species may occur within the Heytesbury pipe alignment due to the presence of potential breeding and foraging habitat located at shallow dams and swamps present near North South Road. This species may also use the dense riparian vegetation along the Port Campbell Creek and associated marshy swamp.

- Eastern Great Egret (DSE Advisory List near threatened – State significant).
  The habitat preferences, migratory and breeding habits of the Eastern Great Egret are discussed in Section 3.4.1.2. The Eastern Great Egret may occur within the study area in shallow dams, swamps and dense riparian vegetation along the Port Campbell Creek. This species was last officially recorded in the region in 2000.

- Nankeen Night Heron (DSE Advisory List near threatened – State significant).
  The habitat preferences, migratory and breeding habits of the Nankeen Night Heron are discussed in Section 3.4.1.2. This species may nest within densely treed and vegetated riparian vegetation along Port Campbell and utilise wetland habitats for foraging.

- Hardhead (DSE List vulnerable – State significant).
  The habitat preferences, migratory and breeding habits of the Hardhead are discussed in Section 3.4.1.2. It is likely that this species would utilise wetland habitats within the study area such as farm dams or the Port Campbell Creek.

- Spotted Harrier *Circus assimilis* (DSE Advisory List near threatened – State significant).
  This species inhabits open and wooded country hunting in areas with a sparse ground cover and where flight is not obstructed (e.g. open woodlands and cropped areas), usually hunting within 10 m of the ground for small birds, reptiles, rabbits and mice. The Spotted Harrier nests in trees, constructing a flimsy disk of twigs and stems lined with grass. This species may occur within the study area as suitable habitat is provided within the site.

- Grey Goshawk *Accipiter novaehollandiae* (FFG Act listed, DSE Advisory List vulnerable – State significant).
  The Grey Goshawk inhabits coastal wooded and forested lands where they hunt within forested area and, less often, adjacent open country. They disperse over open country during autumn. Breeding occurs within mature forest, usually near creeks, where they build a nest in branches of mature tree. This species may occur within the survey during the autumn dispersal. However, due to an absence of forest and woodlands the study area is unlikely to provide permanent habitat.

- Southern Toadlet (FFG Act listed, DSE Advisory List vulnerable – State significant).
  The habitat preferences, migratory and breeding habits of the Southern Toadlet are discussed in Section 3.4.1.2. The study area provides suitable breeding habitat for the Southern Toadlet, particularly along Port Campbell Creek and its associated tributaries and drainage lines, and this species may occur within the study area.

- Hairy Burrowing Cray (DSE Advisory List vulnerable – State significant).
  This species has been recorded from several locations in the area, including one location near Port Campbell Creek, just south of the study area. This species was not recorded during the current assessment, however there is potential for it to occur in the vicinity of any creek or other water body within and downstream of the study area.

Best or remaining 50% habitat for threatened fauna species

Part of the assessment of conservation significance for Net Gain involves consideration of the value of habitat for threatened species. There are 59 threatened fauna species that have at least medium likelihood of occurrence within the Heytesbury Site. Many of these species are either avifauna likely to overfly the study area, wetland species whose habitat does not correspond to an EVC or fish and decapod crustaceans (e.g. crayfish) whose waterways habitat does not fall within mapped habitat zones. There is one threatened fauna species that has at least medium likelihood of occurrence within habitat zones 4, 6, 7 and 8. This species is considered in the assessment of conservation significance. Habitat for each species within each habitat zone is assessed against DSE's criteria (DSE 2007b, page 13). The pathway for each decision made (in accordance with DSE's Table 2) is outlined in Table 5 below.

Table 5: Determination of best/remaining habitat for threatened fauna species.

Species	**Conservation Status**	**Habitat zone** (Figure 4)	**Steps***	**Outcome**	**Conservation Significance** (threatened species rating)	**Notes**
Southern Toadlet	Vulnerable	HZ4	A-D-F-No	Remaining 50% of habitat	High	The Southern Toadlet may inhabit low-lying areas that remaining moist through the breeding season, particularly those with abundant leaf litter. Lowland Forest and Sedgy Riparian Woodland EVCs provides suitable habitat for this species; however due to the degraded nature of this site it does not represent above average condition.
		HZ 6, 7, 8	A-D-F-No	Remaining 50% of habitat	High	

** Steps taken to determine best or remaining 50 % of habitat. From Table 2 in the Guide for Assessment of Referred Planning Permit Applications (DSE 2007b).*
HZ4 = Lowland Forest, habitat zone 4
HZ6 = Sedgy Riparian Woodland, habitat zone 6
HZ7 = Sedgy Riparian Woodland, habitat zone 7
HZ8 = Sedgy Riparian Woodland, habitat zone 8

3.5 Further survey – flora and fauna

Based on information obtained during the field assessment we recommend the following targeted survey:

Halladale and Black Watch Proposed Well Site

- Targeted searches for Slender Pink-fingers at the Halladale and Black Watch Proposed Well Site are recommended if suitable habitat is proposed for removal in the final access route design. Suitable habitat for this species is present within Heathy Woodland and Damp Heathy Woodland in habitat zones 1, 2 and 3. Targeted surveys should be undertaken during this species flowering time (November - December) to assist in detection and accurate identification.

Heytesbury Site

- If areas of Damp Heath Scrub or Swamp Scrub are proposed for removal, targeted surveys for the Port Campbell Guinea Flower should be undertaken. These surveys should be undertaken during the species flowering period between August and January.

- If permanent swamps, water bodies or ephemeral creeks or drainage lines are likely to be impacted, targeted surveys for Wavy Swamp Wallaby-grass should be undertaken. These surveys should be undertaken during the species flowering period between November and January.

- If water bodies or terrestrial habitat within 200 m of any water bodies, along the Heytesbury Pipeline route are likely to be impacted targeted surveys for the Growling Grass Frog should be undertaken. Targeted surveys must be undertaken according to methodology set out in DEWHA (2009), including two surveys during the active period for the species (October to March).

Note that threatened species with a medium or greater likelihood of occurrence are most likely to occur adjacent to areas of direct impact. Impacts are therefore likely to be indirect and short term and the overall level of impact to these species is likely to be low provided mitigation methods outlined in Section 6.2 are implemented.

3.6 Summary of biodiversity values of the site

3.6.1 Halladale and Black Watch Proposed Well Site

Key values within the site include:

- The recorded presence of one state significant flora species (Tufted Grass-tree) and two nationally significant (Orange-bellied Parrot, Southern Bent-wing Bat) and three state significant fauna species (Brown Quail, Baillon's Crake, Hardhead) within the study area or adjacent to the study area.
- Habitat and potential for occurrence of one additional significant flora species and a further 19 significant fauna species within the study area.
- The presence of 19 flora species uncommon in the bioregion.
- The presence of 10 protected flora species.
- Significant examples of coastal freshwater wetlands created by the erosion of limestone.
- Remnant patches of locally rare fauna habitat, heathy woodland and heathland, within the study area.
- Connectivity of remnant patches with a large area of coastal park, creating a significant fauna corridor.

A large remnant of Damp Heathy Woodland located at the southern end of Baileys Road supports high quality vegetation and contains relatively low weed cover. Scattered remnant patches along roadsides are threatened by weed invasion, fragmentation and isolation as they are surrounded by large areas of cleared agricultural lands, which occupy a large portion of the study area. These roadside areas, even when low quality, provide intermittent connectivity from the Bay of Islands Coastal Park to other good quality habitat areas such as the Douglas Fenwick Reserve.

3.6.2 Heytesbury Site

Key values within the site include:

- The presence of one nationally (Port Campbell Guinea-flower) and one state significant flora species (Wavy Swamp Wallaby-grass) and one state significant fauna species (Otway Cray) within the study area.

- Habitat and potential for occurrence of a further 12 significant fauna species within the study area.
- The presence of 29 flora species uncommon in the bioregion
- Small, remnant patches of vegetation identified along road reserves, on private property and along Port Campbell Creek.
- One state significant aquatic species, Otways Cray *Geocharax gracilis,* was recorded during the current assessment. This species is likely to be found within or along the banks of all permanent and semi-permanent water bodies within the survey site, and downstream of the site.

4.0 BIODIVERSITY LEGISLATION AND GOVERNMENT POLICY

A guide to the Government legislation, policies and strategies relevant to the species and environments identified during this assessment is provided in Appendix 4.

This section provides an assessment of the project against key biodiversity legislation and government policy.

4.1 Commonwealth

4.1.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) applies to developments and associated activities that have the potential to significantly impact on matters protected under the Act.

Any person proposing to take an action that may, or will, have a significant impact on a matter of National Environmental Significance must refer the action to the Australian Government Minister for the Environment, Heritage and the Arts for a determination of whether the action is a 'controlled action' or not.

Table 6 provides an assessment of the relevant matters of National Environmental Significance for the project.

Implications for the project

Halladale and Black Watch Proposed Well Site

No flora species listed under the EPBC Act are considered likely to occur within the study area.

Five fauna species listed under the EPBC Act are considered to have at least a medium likelihood of occurring within or adjacent to the study area.

The Orange-bellied Parrot has been recorded foraging within the Bay of Islands Coastal Park and adjacent pasture. Although there is potential for the species to occur within or adjacent to the study area, the area proposed for impact does not provide optimal habitat for this species and the habitat present (pasture grasses) is not limited within the local area. A low level of impact is expected.

The Southern Bent-wing Bat was recorded during the present assessments. It is likely to forage over the study area regularly. Some short term impacts can be

expected due to noise although this species is likely to avoid the study area during drilling operations as noise can interfere with the ability of microbats to locate prey. However, the study area does not provide optimal habitat for this species and the habitat present is not limited within the local area therefore a low level of impact is expected.

There is potential for the Australia Painted Snipe to forage and breed within wetlands located adjacent to the study area; however the species was not recorded during the current assessment despite nocturnal surveys of wetlands. Some short term impacts due to noise and sedimentation of wetland habitat may occur although these impacts will be indirect and no direct impacts to wetland habitat are expected. While some short term impacts are expected they are unlikely to satisfy criteria outlined in DEWHA (2009a).

The Southern Brown Bandicoot has been recorded adjacent to the study area. This record dates from 1987 and this species was not detected during the current assessment. There is some limited potential for this species to utilise heathy woodland remnants to move between optimal habitat present in the Bay of Islands Coastal Park and Douglas Fenwick Reserve. Potential impacts include removal or degradation of habitat and the potential for this species to become trapped in a trench. However, a low level of impact is expected given the already fragmented nature of this habitat, provided Origin minimises vegetation removal and implements mitigation measures outlined in Section 6.0.

The Growling Grass Frog has not been recorded adjacent to the study area and targeted surveys failed to detect this species. However the lack of records for this species may reflect a lack of survey given the presence of suitable habitat within and adjacent to the study, and recent high rainfall may have enabled the species to recolonise this habitat. If present, some impacts to wetland habitat may occur due to sedimentation and some impacts to breeding may occur due to noise. However the implementation of mitigation measures outlined in Section 6.0 should ensure a short term, low level impact to this species.

Heytesbury Site

No flora species listed under the EPBC Act are considered likely to occur within the study area.

Two fauna species listed under the EPBC Act are considered to have a medium likelihood or greater of occurring within or adjacent to the study area.

The Southern Bent-wing Bat is considered likely to forage within the study area on occasion. However the proposed activities are unlikely to impact on this species in any way.

Suitable habitat for the Growling Grass Frog occurs along the proposed Heytesbury Pipeline. Provided mitigation measures outlined in Section 6.0. can be achieved, specifically avoidance of Growling Grass Frog habitat by a minimum of 200 m, the impacts are unlikely to meet criteria for a significant impact as outlined in DEWHA (2009b).

Conclusion

On the basis of criteria for critically endangered, endangered and vulnerable species outlined in *EPBC Act Policy Statement 1.1 Significant Impact Guidelines: Matters of National Environmental Significance* (DEWHA 2009a), as well as *EPBC Act Policy Statement 3.14* (DEWHA 2009b) and *EPBC Act Policy Statement 3.14* (DEWHA 2009b) we consider that a significant impact is unlikely to occur on matters of NES provided areas of habitat for the Growling Grass Frog along the Heytesbury Pipeline can be avoided and suitable mitigation measures, as outlined in Section 6.0 below, are implemented. If these objectives can be achieved a referral of the proposed activity to the Australian Government Minister for the Environment to determine whether the action requires EPBC approval is not required. However Origin may choose to refer the proposed action for legal certainty.

Table 6: Assessment of the project against the EPBC Act – Halladale and Black Watch Proposed Well Site

Matter of NES	Project issues	Comments
listed threatened species	Eight listed plant species (*Glycine latrobeana, Caladenia brachyscapa, Prasophyllum frenchii, Prasophyllum spicatum, Pterostylis cucullata, Pterostylis tenuissima, Taraxacum cygnorum, Thelymitra epipactoides)* have been recorded or predicted to occur in the project search area.	None of these species were recorded within the study area and none are likely to occur as there is no suitable habitat present.
	Two listed fauna species (Orange-bellied Parrot and the Southern Bent-wing Bat) have been recorded within or adjacent to the study area. A further three species (Australian Painted Snipe, Southern Brown Bandicoot and Growling Grass Frog) are considered to have a medium likelihood of occurrence within the study area.	Although there is potential for these species to occur within or adjacent to the study area, the proposed activity is unlikely to result in the permanent removal or degradation of habitat for these species such that an important population is likely to decline.
ecological communities	No EPBC listed communities are predicted to occur within 5km of the study area. The study area does not support any EPBC listed communities.	Proposed activities are not likely to result in a significant impact to any communities listed under the EPBC Act.
listed migratory species;	Eight migratory species have been recorded within 5 km of the study area and a further 25 species are predicted to occur within 5 km of the study area by the PMST. A number of these migratory species are expected to utilise the study area on occasion.	A significant impact of migratory shorebirds is unlikely to result from the proposed project activities.
wetlands of international importance (Ramsar sites).	No Ramsar sites are predicted to occur within 5 km of the study area. The study area does not drain into any Ramsar site	The proposed activity is not likely to result in a significant impact to a Ramsar site.

Table 7: Assessment of the project against the EPBC Act – Heytesbury site

Matter of NES	Project issues	Comments
listed threatened species	Seven listed plant species *(Glycine latrobeana, Haloragis exalata* subsp. *exalata* var. *exalata, Prasophyllum frenchii, Pterostylis cucullata, Pterostylis tenuissima, Thelymitra epipactoides*) have been recorded or predicted to occur in the project search area.	None of these species were recorded within the study area and none are likely to occur as there is no suitable habitat present.
	Two listed fauna species (Southern Bent-wing Bat and Growling Grass Frog) are considered to have a medium likelihood of occurrence within the study area.	No impact to the Southern Bent-wing Bat is likely to occur as a result of the proposed activities. If areas within 200 m of water bodies cannot be avoided there is potential for a significant impact to the Growling Grass Frog. Detailed design and/or targeted surveys will further inform whether a referral to the federal minister is required.
ecological communities	No EPBC listed communities are predicted to occur within 5 km of the study area. The study area does not support any EPBC listed communities.	Proposed activities are not likely to result in a significant impact to any communities listed under the EPBC Act.
listed migratory species;	A total of 14 migratory species have been recorded within 5 km of the study area and a further 5 species are predicted to occur within 5 km of the study area by the PMST. A number of these migratory species are expected to utilise the study area on occasion.	A significant impact of migratory shorebirds is unlikely to result from the proposed project activities.
wetlands of international importance (Ramsar sites).	No Ramsar sites are predicted to occur within 5 km of the study area. The study area does not drain into any Ramsar site	The proposed activity is not likely to result in a significant impact to a Ramsar site.

4.2 State

4.2.1 Flora and Fauna Guarantee Act 1988

The *Flora and Fauna Guarantee Act 1988* (FFG Act) provides for the conservation of threatened species and communities and for the management of potentially threatening processes.

A permit is required from DSE to 'take' protected flora species from public land. A permit is generally not required for removal of protected flora from private land.

Consideration of relevant potentially threatening processes listed under the FFG Act should be made and steps should be taken to manage the impacts of such processes where identified to be present on site.

Implications for the project

Native vegetation at either site is not a listed community. However, native vegetation (habitat zones) identified along roadsides is located on public land. This vegetation contains one state significant and 10 protected flora species and

habitat for one listed rare species (Halladale and Black Watch Proposed Well Site, Appendix 3), two state significant and three protected flora species (Heytesbury site) (Appendix 3).

A protected flora permit from DSE will be required if any of these species will be removed or destroyed as a result of the proposed activities.

Movement of earthmoving equipment during the proposed works could potentially result in the introduction of Phytophthora Dieback *Phytophthora cinnamomi*. The spread of this pathogen is listed as a potentially threatening process under the FFG Act. A hygiene policy should be in place for all vehicles to prevent the introduction or spread of the pathogen (Section 6.1).

4.2.2 Catchment and Land Protection Act 1994

The *Catchment and Land Protection Act 1994* (CaLP Act) identifies and classifies certain species as noxious weeds or pest animals, and sets up a system of controls on noxious species. Under the Act, land owners, which may include public authorities in the case of Crown Land, must take all reasonable steps to eradicate regionally prohibited weeds and prevent the growth and spread of regionally controlled weeds; and prevent the spread of, and as far as possible eradicate, established pest animals. The State is responsible for eradicating State prohibited weeds from all land in Victoria. Established pest animals in Victoria include foxes, hares and rabbits.

Implications for the project

Three established pest animals (European Rabbit, Fallow Deer and Red Fox) were recorded within the Halladale Black Watch Proposed Well Site and one (European Rabbit) was recorded at the Heytesbury site. Three regionally controlled weeds (Spear Thistle, Hemlock and Hawthorn) occur within the Heytesbury site (Appendix 3). The proponent must ensure project activities do not result in the spread of these controlled weeds, in accordance with the provisions of the CaLP Act outlined above.

4.2.3 Planning and Environment Act 1987

The *Planning and Environment Act 1987* controls the planning and development of land in Victoria, and provides for the development of planning schemes for all municipalities. Standard sections are contained in all planning schemes - the Victoria Planning Provisions (VPP). These State sections include the State Planning Policy Framework (SPPF Clauses 10 to 19), Particular Provisions (Clauses 51 to 56) and General Provisions (Clauses 60 to 67).

Of particular relevance to development proposals are the native vegetation provisions, which are contained in several sections of the State sections of all Planning Schemes, and may also be included in the local section (zoning and overlays). Clause 52.17 requires a planning permit to remove, destroy or lop native vegetation including dead native vegetation, however certain exemptions may apply. Decision guidelines are contained in Clause 52.17-5.

The decision guidelines require the responsible authority to consider a variety of biodiversity and other information including Net Gain policy, biodiversity values and conservation, the land protection role of native vegetation, the quality, condition, location and significance of native vegetation and the impact of vegetation removal. The Planning Scheme defines 'native vegetation' as "Plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses" (Clause 72).

The need for a permit to remove native vegetation may be also be triggered by overlays.

Implications for the project

Halladale and Black Watch Proposed Well Site

The current access route design for the Halladale and Black Watch Proposed Well Site proposes to remove native vegetation. It appears that none of the exemptions identified in Clause 52.17-6 apply, and that removal of native vegetation as proposed may require a permit under Clause 52.17 of the SPPF.

The provisions of the following overlays apply:

Significant Landscape Overlay Schedule 3 (SLO3)

SLO3 covers the cliff top dunes within the Bay of Islands Coastal Park. The specific objectives of the overlay are to:

- Increase the coverage of native and indigenous vegetation, particularly in corridors that link to coastal vegetated areas associated with the Bay of Islands Coastal Park.
- Protect indigenous vegetation within the coastal area.
- Increase indigenous vegetation inland, particularly to highlight landscape features such as waterways and valleys.
- Retain clear views of the coastal cliffs and formations from the coastal area.
- Ensure that long stretches of the coastal strip remain free of development.

- Retain the dominance of an indigenous natural landscape in the coastal area around Peterborough, particularly when viewed from the Great Ocean Road.
- Ensure that buildings and structures inland do not dominate views from the Great Ocean Road and that the outlook from the Great Ocean Road towards the hinterland is dominated by the rural landscape.
- Improve the appearance of residential and rural residential development located on the fringes of Peterborough.
- Increase the use of shelter belts and indigenous planting in the hinterland.
- Retain the dominance of the natural landscape within the coastal strip, and views to the ocean.
- Protect landscape character and attributes that are consistent with the Aboriginal cultural heritage values of the area.
- Recognise, and protect, the landscape of the Great Ocean Road and the coastal cliffs area west of Peterborough as a place of significant Aboriginal cultural heritage value.

A permit is required to remove, destroy or lop any vegetation except environmental weeds as recognised by the DSE

Environmental Significance Overlay Schedule 1 (ESO1)

ESO1 covers the Bay of Islands Coastal Park including beach vegetation and the Douglas Fenwick Reserve on Baileys Road. The specific objectives of the overlay are to:

- Protect and enhance flora and fauna habitat of the coast, estuaries, associated wetlands and indigenous native vegetation from the impacts of development.
- Protect and enhance the stability and environmental quality of sand dunes and coastal cliffs from the impacts of development.
- Protect the physical, biological and water quality integrity and functioning of estuaries from development within or adjoining an estuary including:
    - avoiding the interference of environmental flows, natural flooding regimes and tidal flows;
    - the avoidance of interfering with the appropriate management of artificial river mouth openings of estuaries that minimises detrimental effects on the estuarine environment;

- the avoidance of concentrated stormwater flows and filtering of stormwater, nutrients and other pollutants;
- the prevention of soil erosion and sedimentation;
- the prevention of the disturbance of acid sulphate soils associated with estuaries and low lying coastal areas; and
- the recharge and discharge of ground waters.

- Encourage development including infrastructure to locate away from the sea, estuaries and wetlands through the use of buffer zones. Buffer zones can assist in protecting development from sea level rise hazards, mitigate the impacts of development and permit wetland vegetation to migrate as a result of predicted sea level rise associated with climate change.

A permit is not required to carry out activities unless such activities:

- Are located within 100 m of the coast, estuary or wetland;
- Involves the construction of levee banks, raised access tracks, channel banks, drain banks or other activities which would alter the natural topography of the land or changes the natural rate or direction of flow of water towards the sea, an estuary or a wetland;
- Involves the removal or destruction of native indigenous vegetation.
- Other exceptions apply which are not relevant to the proposed activities.

Heytesbury Pipeline

The extent of native vegetation removal resulting from the construction of the Heytesbury Pipeline is not defined at this stage. Origin should attempt to avoid all impacts to native vegetation where possible. However, if a licence is issued under the *Pipelines Act 2005*, an exemption is provided for the requirement of a permit for the proposed construction of a gas pipeline under Clause 52.17 of the SPPF.

The Heytesbury Pipeline may seek to remove native vegetation. The provisions of the following overlays apply:

<u>Vegetation Protection Overlay Schedule 2 (VPO2)</u>

VPO2 covers the areas of road reserve along North South Road. The specific objectives of the overlay are:

- A permit is not required to remove, destroy or lop any vegetation which is not native vegetation.
- An application to remove native vegetation must:
    - Indicate the total extent of native vegetation on the subject land and the extent of proposed clearing, destruction or lopping, the location of any river, stream, watercourse, wetland or channel on the subject land, and if relevant the location of areas with a slope exceeding 20%.
    - Specify the purpose of the proposed clearing.
    - Demonstrate that the need for removal, destruction or lopping of remnant native vegetation has been reduced to the maximum extent that is reasonable and practicable.
    - Specify proposals for revegetation following disturbance or restoration of an alternate site, including proposed species and ground stabilisation.
    - If the area of proposed clearing exceeds 0.4 ha, include a report on the vegetation and habitat significance of the area subject to the permit, to the satisfaction of the Responsible Authority.

Comments on any application to remove, destroy or lop any native vegetation land may be obtained from DSE.

4.2.4 Pipelines Act 2005

The *Pipelines Act 2005* applies to laws relating to the construction and operation to pipelines in Victoria. The Act applies to specific pipelines including those for the conveyance of petroleum, oxygen, carbon dioxide, hydrogen, nitrogen and compressed air. This does not include pipelines for water supply, drainage or sewerage.

A licence must be obtained from the Minister for the construction of a pipeline under the *Pipelines Act 2005*. The Act specifies pre-licence consultation and surveys and decision guidelines require the Minister to consider information including the potential environmental and cultural heritage impacts of a proposed pipeline.

A licence issued under the *Pipelines Act 2005* for the construction and operation of a pipeline provides an exemption from the requirement of a permit under the *Planning and Environment Act 1987*.

Implications for the project

If a licence is issued under the *Pipelines Act 2005*, the removal of native vegetation is exempt from the requirement of a permit for the proposed gas pipeline under Clause 52.17 of the SPPF. This exemption applies solely to the construction and operation of the gas Pipeline to which the licence applies. However, offsets for vegetation losses as per the Framework (NRE 2002) are required as is an Environmental Management Plan.

4.2.5 Native Vegetation Management Framework

Victoria's Native Vegetation Management – A Framework for Action (the Framework) provides State Government policy for the protection, enhancement and revegetation of native vegetation in Victoria (NRE 2002) and is an incorporated document in all planning schemes. The primary goal of the Framework is:

a reversal, across the whole landscape, of the long-term decline in the extent and quality of native vegetation, leading to a Net Gain (NRE 2002).

There is a three step approach to applying Net Gain as outlined in the Framework (NRE 2002: 23). The steps are:

1. *To avoid adverse impacts, particularly through vegetation clearance.*
2. *If impacts cannot be avoided, to minimise impacts through appropriate consideration in planning processes and expert input to project design or management.*
3. *Identify appropriate offset options.*

Where an application is made under clause 52.17 to remove, destroy or lop native vegetation, the applicant must explain (Clause 52.17-3) the steps that have been taken to:

- Avoid the removal of native vegetation, where possible.
- Minimise the removal of native vegetation.
- Appropriately offset the loss of native vegetation, if required.

Regional Native Vegetation Plans (e.g. GHCMA 2000) provide a strategic and co-ordinated approach to the management of native vegetation within a given Catchment Management Authority region, and complement the Native Vegetation Management Framework.

Implications for the project

This report establishes the extent, distribution and quality of native vegetation within the site. An assessment against Victoria's Net Gain policy is included in Section 5.0.

4.2.6 Wildlife Act 1975 and associated Regulations

The *Wildlife Act 1975* is the primary legislation in Victoria providing for protection and management of wildlife.

The Wildlife Regulations 2002 of the Act prescribe penalties for certain activities relevant to wildlife including disturbance of habitat without appropriate authorisation (Section 9).

Authorisation to destroy or possess wildlife may be required (Sections 41– 47) if wildlife needs to be moved or destroyed during development.

Implications for the project

A permit is required to remove native vegetation at both sites. If permission for removal of vegetation is granted under provisions of other Victorian legislation, a separate permit under the *Wildlife Act 1975* is not required for removal of vegetation that constitutes habitat for fauna. If project activities are likely to result in the death of wildlife or the need to remove it, a permit will be required.

If inspection of trenches is to be implemented, and fauna species are to be removed from trenches a Wildlife Management Authorisation may be required.

4.2.7 Water Act 1989

The primary purpose of this Act is to provide a framework for the allocation and management of surface water and groundwater throughout Victoria. It provides a principal mechanism for maintenance of ecosystem functions including those of aquatic ecosystems. Any construction or maintenance activity that affects beds and banks of waterways, riparian vegetation, quality or quantity of water, requires a licence, permit or approval from the relevant authority.

The relevant authority for the proposal is Corangamite Catchment Management Authority (CMA).

Implications for the project

The proposed development requires a Works on Waterways Permit from the Corangamite Catchment Management Authority. Guidelines and application forms are available online (http://ccmavicgovau.ozstaging.com/What-we-do/Water/Works-on-Waterways/Application-Forms.aspx).

4.2.8 Environment Protection Act 1970: State Environmental Protection Policy (Waters of Victoria) 2003

The Environment Protection Act underpins the *State Environmental Protection Policies (SEPP)* which provides a legal framework for the protection and rehabilitation of Victoria's surface water environments. The uses and values of the water environment are known as 'beneficial uses'. Environmental quality objectives and indicators are defined to protect beneficial uses and an attainment

program provides guidance on protection of the beneficial uses. The key beneficial use of relevance to biodiversity is 'Aquatic ecosystems'. The Policy requires that aquatic ecosystems be protected.

Impacts to surface water quality must not result in changes that exceed water quality objectives specified to protect beneficial uses. Proponents and land managers need to ensure that direct and indirect (e.g. runoff) impacts to surface water quality do not exceed the water quality objectives.

The SEPP provides recommendations to ensure that beneficial uses are protected.

Implications for the project

The project may directly and/or indirectly impact upon Port Campbell Creek, Wallaby Creek and associated tributaries. Relevant actions identified in the applicable policy clauses have been incorporated into the mitigation measures (Section 1.1).

4.2.9 Regional Catchment Strategy and River Health Strategy

State Planning Policy Framework Clause 15.01 (Protection of catchments, waterways and groundwater) states that planning and responsible authorities must have regard for the objectives of the *Corangamite Regional Catchment Strategy* (CCMA, 2004). The *Corangamite River Health Strategy* (CCMA, 2006) provides further recommendations on the protection of existing high-value rivers and creeks that are in good condition and strategic improvement of other rivers and creeks.

Implications for the project

The key biodiversity objectives of the above Strategies with respect to the aquatic environment will be met if the mitigation measures outlined in this report are implemented.

5.0 ASSESSMENT AGAINST VICTORIA'S NATIVE VEGETATION MANAGEMENT FRAMEWORK (NET GAIN)

5.1 Three-step approach

The primary mechanism for mitigating ecological impacts is through adherence to Net Gain policy. The 3-step process to achieving Net Gain (Section 4.3.4) should be followed.

5.1.1 Avoiding and minimising impacts on native vegetation

Halladale and Black Watch Proposed Well Site

The current access route at the Halladale and Black Watch Proposed Well Site proposes removal of a strip of vegetation up to 2.5 m wide along both edges of the roadside of Radfords, Borthwicks and Baileys Roads, Nirranda South, to allow mobilisation of a drilling rig and associated equipment to access private property (Lot 52, Plan 582780, see Figure 3). Additional clearing to create a turning circle with a 4 m radius may be required on the south-east corner of Borthwicks and Baileys road to accommodate large vehicles. This turning circle will not impact on any Ecological Vegetation Class although it is possible that scattered indigenous flora species will be impacted. Line of sight bypass lanes are also required along Borthwicks and Baileys Roads. The impact of these bypass lanes on native vegetation cannot be determined as their exact location is undecided. The extent of native vegetation present along these roadsides was previously assessed by Biosis Research (2010). Roadside vegetation in this area primarily consists of introduced species with patches of three EVCs present.

The proposed removal of native vegetation along these roadsides does not include removal of any large trees. However, it is possible that medium old and small trees may need to be removed. Once the final access route and location of bypass lanes is finalised, the total amount of vegetation proposed for removal, if any, will need to be assessed on site.

The proponent has addressed the avoid and minimise provisions of the Framework's 3-step process to achieve Net Gain by proposing to use a less direct access route and avoiding Baileys Road, north of Radfords Road. This route has reduced the extent of native vegetation removal required. Further to this, the proponent is undertaking a revision of access routes in an attempt to further reduce impacts on native vegetation. The results of this redesign will be will be presented in an additional report at a later date. It is proposed to clear the minimum extent of vegetation required for safe access.

Heytesbury Site

This assessment documents the extent and quality of native vegetation within 100 m of the base case and alternate pipeline routes between the Heytesbury and Otway Gas Plants. This information should be used to avoid impacts to native vegetation through siting of the pipeline, including all works areas, away from areas of native vegetation.

Specific areas at the Heytesbury study area which should be considered for avoidance include the habitat zones identified along Port Campbell Creek. Remnant Lowland Forest as well as scattered trees and Damp Heath Scrub to the west, including the road reserve at North South Road. Finally, a remnant patch of Swamp Scrub and a known location of Wavy Swamp Wallaby-grass to the east of North South Road (Figure 4d) should be avoided if possible.

Boring underneath Port Campbell creek, if feasible, is suggested to minimise impacts to surrounding habitat and vegetation. The current alignment through the area of Port Campbell creek will potentially impact an area of vegetation of lower conservation significance relative to other areas along the creek within the study area.

Two patches of Damp Heath Scrub were identified (HZ5) in the road reserve along North South Road (Figure 4b). This road reserve is covered by Vegetation Protection Overlay Schedule 2 (VPO2) and supports the presence of the nationally significant Port Campbell Guinea-flower.

Plans should avoid a patch of Swamp Scrub (HZ9) which supports the presence of Port Campbell Guinea-flower in an area to the east of North-South Road (Figure 4c). This can be achieved by re-aligning the pipeline to the south or north of HZ9.

Any re-alignment should also take into account the known location of state significant Wavy Swamp Wallaby-grass in a wetland in a property to the east of HZ9.

A full explanation of efforts to avoid and/or minimise vegetation losses should be included in the planning permit application.

5.1.2 Offsetting vegetation losses

An assessment of vegetation losses and offset targets based on the current proposed access route has been undertaken for the Halladale and Black Watch Proposed Well Site. A re-assessment of total native vegetation losses and net gain requirements will be required following the revision of access routes and once works plans are finalised and unavoidable losses are decided for both sites.

5.2 Quantifying native vegetation on site

Patches of remnant vegetation and scattered indigenous canopy trees were mapped and assessed (Figure 3, Figure 4). Areas of uniform quality for each EVC within the patches are termed 'habitat zones' and assessed separately.

All remaining areas that are not EVC patches or scattered remnant canopy trees are termed Degraded Treeless Vegetation (DTV; DSE 2007b).

The EVC benchmarks for Heathy Woodland, Damp Heathy Woodland, Lowland Forest, Damp Heath Scrub, Swamp Scrub and Sedgy Riparian Woodland are provided in Appendix 5.

5.2.1 Patches of native vegetation

Each habitat zone is assessed in terms of habitat hectares and number of Large Old Trees (LOTs). Smaller trees are not considered separately as their presence is incorporated into the assessment of habitat hectares.

Three habitat zones (or polygons) are identified within the Halladale and Black Watch Proposed Well Site (Figure 3) and a further six are identified within the Heytesbury study area (Figure 4). The results of the vegetation quality assessment are provided in Table 8. Each habitat zone is assigned an overall habitat score, which is multiplied by its area to provide the number of habitat hectares. The conservation significance of each zone is also shown at the bottom of Table 8 and this is discussed more in the following section.

Table 8: Quantification and significance of patches of native vegetation within the study area.

			Halladale and Black Watch Proposed Well Site			Heytesbury Site					
Habitat Zone			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Bioregion			WP	WP	WP	WP	WP	WP	WP	WP	WP
EVC #: Name			HW	HW	DHW	LF	DHS	SRW	SRW	SRW	SS
EVC Bioregional Conservation Status			V	V	V	V	V	E	E	E	V
		Max Score	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**
Site Condition	Large Old Trees	10	0	0	0	0	N/A	0	3	0	N/A
	Canopy Cover	5	4	0	2	0	N/A	0	2	0	N/A
	Lack of Weeds	15	4	0	11	0	4	0	0	0	7
	Understorey	25	15	15	15	5	5	10	10	5	15
	Recruitment	10	6	6	6	0	3	6	6	0	6
	Organic Matter	5	5	5	3	3	3	3	3	3	3
	Logs	5	4	4	2	2	N/A	4	5	0	N/A
	Total Site Score		38	30	39	10	15	23	29	8	31
	EVC standardiser (x 75/55)		1	1	1	1	1.36	1	1	1	1.36
	Adjusted Site Score		38	30	39	10	20.4	23	29	8	42.16
Landscape Value	Patch Size	10	1	1	1	1	1	1	1	1	1
	Neighbourhood	10	0	0	0	0	0	0	0	0	0
	Distance to Core	5	3	3	3	3	1	1	1	1	1
	Total Landscape Score		4	4	4	4	2	2	2	2	2
HABITAT SCORE		**100**	42	34	43	14	22	25	31	10	44
Habitat points = #/100		**1**	**0.42**	**0.34**	**0.43**	**0.14**	**0.22**	**0.25**	**0.31**	**0.10**	**0.44**
Habitat Zone area (ha)			0.43	0.77	0.21	0.03	0.06	0.6	0.49	0.49	0.09
Habitat Hectares (Hha)			**0.18**	**0.26**	**0.09**	**0.00**	**0.01**	**0.15**	**0.15**	**0.05**	**0.04**
Conservation Significance	Conservation Status x Hab Score		High	High	High	Medium	Medium	High	High	High	High
	Threatened Species Rating		High	High	High	N/A	High	N/A	N/A	N/A	N/A
	Other Site Attribute Rating		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Overall Conservation Significance (highest rating)		**High**	**High**	**High**	**Medium**	**High**	**High**	**High**	**High**	**High**
Number of Large Old Trees present			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**

WP=Warrnambool Plain
HW = Heathy Woodland; DHW = Damp Heathy Woodland; LF = Lowland Forest; DHS = Damp Heath Scrub; SRW = Sedgy Riparian Woodland; SS = Swamp Scrub
E = Endangered; V = Vulnerable

Conservation significance for threatened species

Part of the assessment of conservation significance involves consideration of the value of habitat for threatened species. There are two significant species that

have at least medium likelihood of occurrence within the Halladale and Black Watch Proposed Well Site and two significant species that have at least medium likelihood of occurrence within the Heytesbury site. The conservation significance of each habitat zone for each of these species is determined in Sections 3.3.1.2 and 3.4.1.2.

The overall threatened species rating for each habitat zone is given by the highest threatened species rating scored for any one species. This result is presented in Table 8.

Summary

Halladale and Black Watch Proposed Well Site

The study area contains a total of 1.41 hectares of native vegetation, which comprises **0.53 habitat hectares.** All habitat zones are of high conservation significance (Table 8).

Heytesbury Site

The Heytesbury (base case) alignment contains a total of 0.78 hectares of native vegetation, which comprises **0.21 habitat hectares**, while the Heytesbury (alternate) alignment contains a total of 1.16 hectares of native vegetation, which comprises **0.26 habitat hectares**. The habitat score for the habitat zones ranges from 0.03 to 0.6. Habitat zones 6, 7 and 8 represent the most intact areas of native vegetation. All habitat zones are of high conservation significance except for habitat zone HZ4 and HZ5 which are of medium conservation significance (Table 8).

One Large Old Tree is present within the habitat zone 8 (see Table 8 above, raw data is presented in Appendix 7).

5.2.2 Scattered Trees

No scattered trees occur outside of the defined patches at the Halladale and Black Watch Proposed Well Site.

At the Heytesbury site 19 small indigenous canopy trees are present outside patches of native vegetation (previous section).

Raw data is presented in Appendix 7.

Conservation significance

Scattered small trees within the study area are assigned a conservation significance of ‘Low.’

5.3 Assessing loss of native vegetation

Impacts for the Halladale and Black Watch proposed well site are assessed in accordance with the current access route design. A revision of the access route is currently being undertaken to avoid impacts to native vegetation. The results of this revision will be presented in an additional report at a later date.

A preferred alignment for the Heytesbury Pipeline, with a Right of Way of 50 m, has been provided for assessment. This alignment could potentially result in a loss of a maximum of 0.26 habitat hectares of native vegetation. However measures to avoid and minimise losses of native vegetation will be incorporated into the concept design. At this stage explicit calculation of vegetation losses associated with this project have not been undertaken.

5.3.1 Patches of native vegetation

The current proposed Halladale design will result in the loss of 0.24 hectares (0.09 habitat hectares) of native vegetation (Table 9, Figure 3). This includes:

- 0.03 ha (0.01 habitat hectares) of High conservation significance Damp Heathy Woodland EVC,
- 0.21 ha (0.08 habitat hectares) of High conservation significance Heathy Woodland EVC and
- Less than 0.01 ha (less than 0.01 habitat hectares) of wetland vegetation if only 2.5m vegetation required for removal. In the case that draining of the wetland is required, 0.12 ha (0.05 habitat hectares) of wetland vegetation (see Appendix 1.2).

Table 9: Impacts to vegetation patches at the Halladale and Black Watch Proposed Well Site (Warrnambool Plain Bioregion)

Habitat Zone	1	2	3	Total
EVC	HW	HW	DHW	
Habitat score (/100)	0.42	0.34	0.43	
Area to be cleared	0.09	0.12	0.03	0.24
Habitat hectares to be cleared:	0.04	0.04	0.01	0.09
High Conservation Significance	0.04	0.04	0.01	0.09

5.4 Gain targets

Offset requirements for identified losses are summarised below. The like-for-like requirements are outlined in the Native Vegetation Management Framework (NRE 2002: Table 6).

Table 10: Gain targets for clearing patches of native vegetation (Warrnambool Plain Bioregion)

						Habitat Hectares Target			
Target No.	**Habitat Zones**	**EVC #: Name**	**Conservation Significance**	**Min Habitat score for target***	**Other Like-for-like reqts***	**Total Losses (ha)**	**Total Losses (Hha)**	**Net outcome ratio**	**Gain Target (Hha)**
H1	HZ1	48: Heathy Woodland	High	23	N/A	0.09	0.04	1.5	0.06
H2	HZ2	48: Heathy Woodland	High	29	N/A	0.12	0.04	1.5	0.06
H3	HZ3	793: Damp Heathy Woodland	High	35	N/A	0.03	0.01	1.5	0.02
TOTAL							**0.09**		**0.14**

** Based on the quality objectives for the offset specified in Table 6 of the Framework (NRE 2002).*

In summary, the offsets for the loss of vegetation under the current access route are to generate 0.14 habitat hectares of High conservation significance vegetation through sourcing, permanent protection and management of another area of vegetation.

No potential offsets have been identified at this stage. Once the impact of the proposed works has been identified and the offset prescription finalised, the proponent is responsible for sourcing, protection and the first 10 years of management of offset sites and an Offset Management Plan would need to be prepared to the satisfaction of the responsible authority.

6.0 POTENTIAL IMPACTS AND MITIGATION

The assessment of potential impacts is based on current information. The assessment of impacts may change following targeted survey.

6.1 Potential impacts

Activities at the Halladale and Black Watch Proposed Well Site will be largely restricted to private land that has been heavily modified and currently supports little to no native vegetation outside of wetland areas. At this location construction of a drilling pad, well head and pipeline are currently proposed. Some vegetation removal is likely to occur as a result of the proposed access route and the access of the gas pipeline between the well site and the Croft #1 gas main; however a revision of access route is currently being undertaken to avoid impacts to native vegetation.

The Heytesbury Pipeline will involve the construction of a pipeline between the Heytesbury and Otway Gas Plants. This will include a Right of Way (ROW) of 30-50 m, with a smaller right of way in sensitive areas. Direct impacts to waterways will be avoided through the use of Horizontal Directional Drilling (HDD). Crossing of high traffic volume roads will be achieved through the use of HDD.

Potential impacts to biodiversity values include:

Halladale and Black Watch Proposed Well Site

- Removal of 0.24 hectares (0.09 habitat hectares) of High conservation significance vegetation for construction of the proposed access route associated with the Halladale and Black Watch Proposed Well Site.
- Removal of vegetation of High conservation significance in habitat zone 2 as a result of the construction of the pipeline between the well site and the Croft #1 gas main at the Halladale and Black Watch Proposed Well Site.
- Short term disruption of fauna species, including nationally and state significant species, through increases in noise, dust and lighting associated with drilling operations (see Section 6.1.1 below).
- Impacts to habitat for aquatic species, including frogs and waterbirds, through sedimentation.
- Potential increases in collisions with fauna species due to increased traffic associated with drilling activities.

- Potential introduction of Phytophthora Dieback *Phytophthora cinnamomi* by movement of earthmoving equipment.

- Impacts to native vegetation and fauna habitat resulting from dust resulting from construction traffic.

- Impacts to fauna, particularly to breeding related activities, due to lighting.

- Impacts to fauna species through animals getting caught in trenches left open overnight.

Heytesbury Site

- Potential loss of up to 1.16 hectares (0.26 habitat hectares) of vegetation (Heytesbury Pipeline alternate alignment) and removal of one Medium Old Tree and 19 Small Trees at the Heytesbury site.

- Removal of state and nationally significant flora species, including the Port Campbell Guinea Flower and Wavy Swamp Wallaby-grass.

- Impacts to aquatic fauna species, including fish, crayfish, frogs and waterbirds, through direct impacts, including removal of habitat, and indirect impacts such as sedimentation. Flowing waterways are particularly susceptible to impacts. Port Campbell Creek is the only waterway within the study area exhibiting substantial flows and providing permanent aquatic habitat. The pipeline will also cross two waterways with ephemeral/low flows and supporting less permanent aquatic habitat. For these reasons, the potential for impacts to these waterways is lower.

- Fracture of stream beds resulting from HDD.

- Degradation or loss of downstream riparian and instream habitat as a result of sedimentation, water quality degradation, altered hydrology and barriers to fish passage resulting from trenching through waterways.

- Potential introduction of Phytophthora Dieback *Phytophthora cinnamomi* by movement of earthmoving equipment.

- Impacts to native vegetation and fauna habitat resulting from dust resulting from construction traffic.

- Potential increases in collisions with fauna species due to increased traffic associated with construction activities.

- Impacts to fauna species through animals getting caught in trenches left open overnight.

A summary of potential impacts on species listed as having a medium likelihood or higher of occurrence within the study area is provided in Table 11 below.

Table 11: Potential impacts on threatened species with a medium likelihood or higher of occurring within the study area

Australian status:

CR	Critically Endangered (EPBC Act)
EN	Endangered (EPBC Act)
VU	Vulnerable (EPBC Act)
R	Rare (Walsh & Stajsic 2007)

Victorian status:

v	vulnerable (FIS)
r	rare (FIS)
cr	critically endangered (DSE 2007, 2009)
en	endangered (DSE 2007, 2009)
vu	vulnerable (DSE 2007, 2009)
nt	near threatened (DSE 2007, 2009)
L	listed as threatened under FFG Act

Level of Potential Impact:

Negligible	No noticeable impacts to identified threatened species
Low	Some minor or indirect impacts to identified threatened species. Impacts are expected to affect a small number of individuals of, or habitat for the species, be short term and reversible.
Moderate	Potential for direct or indirect impacts to identified threatened species. Impacts are expected to affect a small to medium number of individuals of, or habitat for the species, and be reversible in short to medium term.
High	Direct and indirect impacts to identified threatened species. Impacts are expected to effect a significant number of individuals or, or habitat for the species, and are likely to be long lasting or permanent.

Scientific Name	Common Name	Status	Potential Impacts	Level of Potential Impact following implementation of mitigation measures
Halladale and Black Watch Proposed Well Site				
Flora				
Caladenia vulgaris	Slender Pink-fingers	r	Removal of individual plants resulting in a decrease in the extent or distribution of the species, removal and/or fragmentation suitable habitat	Low (provided removal of habitat is avoided)
Fauna				
Rostratula australis	Australian Painted Snipe	VU/cr/L	Short term disruption to breeding and/or foraging activities due to noise and lighting, sedimentation of wetland habitat	Low
Neophema chrysogaster	Orange-bellied Parrot	CR/cr/L	Short term disruption of foraging activities due to noise.	Low
Isoodon obesulus obesulus	Southern Brown Bandicoot	EN/nt	Injury or mortality due to becoming trapped in a trench	Low
Miniopteris schreibersii bassanii	Southern Bent-wing Bat	CR/en/L	Short term disruption to foraging behaviour due to noise	Low
Litoria raniformis	Growling Grass Frog	VU/en/L	Short term disruption to breeding activities due to noise and lighting, sedimentation of wetland habitat, injury or mortality due to becoming trapped in a trench	Low
Coturnix ypsilophora	Brown Quail	nt	Short term disruption to foraging activities due to noise, short term impacts to habitat due to pipeline construction	Low
Porzana pusilla	Baillon's Crake	vu/L	Short term disruption to breeding and/or foraging activities due to noise and lighting, sedimentation of wetland habitat	Low

Scientific Name	Common Name	Status	Potential Impacts	Level of Potential Impact following implementation of mitigation measures
Gelochelidon nilotica	Gull-billed Tern	en/L	Short term disruption to breeding and/or foraging activities due to noise and lighting, sedimentation of wetland habitat	Low
Gallinago hardwickii	Latham's Snipe	nt	Short term disruption to breeding and/or foraging activities due to noise and lighting, sedimentation of wetland habitat	Low
Platalea regia	Royal Spoonbill	vu	Short term disruption to breeding and/or foraging activities due to noise and lighting, sedimentation of wetland habitat	Low
Egretta garzetta	Little Egret	en/L	Short term disruption to breeding and/or foraging activities due to noise and lighting, sedimentation of wetland habitat	Low
Ardea modesta	Eastern Great Egret	vu/L	Short term disruption to breeding and/or foraging activities due to noise and lighting, sedimentation of wetland habitat	Low
Nycticorax caledonicus	Nankeen Night Heron	nt	Short term disruption to breeding and/or foraging activities due to noise and lighting, sedimentation of wetland habitat	Low
Anseranas semipalmata	Magpie Goose	nt/L	Short term disruption to breeding and/or foraging activities due to noise and lighting, sedimentation of wetland habitat	Low
Anas rhynchotis	Australasian Shoveler	vu	Short term disruption to breeding and/or foraging activities due to noise and lighting, sedimentation of wetland habitat	Low
Aythya australis	Hardhead	vu	Short term disruption to breeding and/or foraging activities due to noise and lighting, sedimentation of wetland habitat	Low
Accipiter novaehollandiae	Grey Goshawk	vu/L	Short term disruption to foraging behaviour due to noise	Negligible

Scientific Name	Common Name	Status	Potential Impacts	Level of Potential Impact following implementation of mitigation measures
Haliaeetus leucogaster	White-bellied Sea-Eagle	vu/L	Short term disruption to foraging behaviour due to noise	Negligible
Stagonopleura guttata	Diamond Firetail	vu/L	Removal of habitat, disruption to breeding and/or foraging behaviour due to noise	Low
Dasyornis broadbenti caryochrous	Rufous Bristlebird (Otways ssp.)	nt/L	Short term disruption to breeding and/or foraging activities due to noise and lighting	Low
Sminthopsis leucopus	White-footed Dunnart	nt/L	Removal of habitat, disruption to breeding and/or foraging behaviour due to noise and lighting	Low
Pseudemoia rawlinsoni	Glossy Grass Skink	nt	Short term disruption to breeding and/or foraging activities due to noise and lighting, sedimentation of wetland habitat	Low
Egernia coventryi	Swamp Skink	vu/L	Short term disruption to breeding and/or foraging activities due to noise and lighting, sedimentation of wetland habitat	Low
Pseudophryne semimarmorata	Southern Toadlet	vu	Removal of dispersal habitat, short term disruption to breeding and/or foraging activities due to noise and lighting	Low
<u>Heytesbury Site</u>				
Flora				
Hibbertia truncata	Port Campbell Guinea-flower	R/r	Removal of individual plants resulting in a decrease in the extent or distribution of the species, removal and/or fragmentation suitable habitat	Low
Amphibromus sinuatus	Wavy Swamp-wallaby Grass	v	Loss of a single individual plant	Low
Fauna				
Miniopteris schreibersii bassanii	Southern Bent-wing Bat	CR/en/L	Short term disruption to foraging behaviour due to noise	Negligible

Scientific Name	Common Name	Status	Potential Impacts	Level of Potential Impact following implementation of mitigation measures
Litoria raniformis	Growling Grass Frog	VU/en/L	Removal or degradation of habitat, sedimentation of wetland habitat, injury or mortality due to becoming trapped in a trench	Low
Chlidonias hybridus	Whiskered Tern	nt	Removal or degradation of habitat, sedimentation of wetland habitat	Low
Gallinago hardwickii	Latham's Snipe	nt	Removal or degradation of habitat, sedimentation of wetland habitat	Low
Platalea regia	Royal Spoonbill	vu	Removal or degradation of habitat, sedimentation of wetland habitat	Low
Egretta garzetta	Little Egret	en/L	Removal or degradation of habitat, sedimentation of wetland habitat	Low
Ardea modesta	Eastern Great Egret	vu/L	Removal or degradation of habitat, sedimentation of wetland habitat	Low
Nycticorax caledonicus	Nankeen Night Heron	nt	Removal or degradation of habitat, sedimentation of wetland habitat	Low
Circus assimilis	Spotted Harrier	nt	Impacts unlikely to occur	Negligible
Accipiter novaehollandiae	Grey Goshawk	vu/L	Impacts unlikely to occur	Negligible
Pseudophryne semimarmorata	Southern Toadlet	vu	Removal or degradation of habitat	Moderate
Engaeus sericatus	Hairy Burrowing Cray	vu	Mortality and habitat loss due to construction in the vicinity of water bodies.	Moderate
Geocharax gracilis	Otways Cray	en/L	Mortality and habitat loss due to construction within terrestrial habitat adjacent to water bodies and within water bodies.	Moderate

The level of potential impact assumes mitigation measures listed below are implemented, including the use of horizontal directional drilling of waterways. Should these mitigation measures not be adopted this will alter the outcome.

Table 11: Potential impacts on threatened species with a medium likelihood or higher of occurring within the study area

Australian status:

CR	Critically Endangered (EPBC Act)
EN	Endangered (EPBC Act)
VU	Vulnerable (EPBC Act)
R	Rare (Walsh & Stajsic 2007)

Victorian status:

v	vulnerable (FIS)
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vu	vulnerable (DSE 2007, 2009)
nt	near threatened (DSE 2007, 2009)
L	listed as threatened under FFG Act

Level of Potential Impact:

Negligible	No noticeable impacts to identified threatened species
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High	Direct and indirect impacts to identified threatened species. Impacts are expected to effect a significant number of individuals or, or habitat for the species, and are likely to be long lasting or permanent.

Scientific Name	Common Name	Status	Potential Impacts	Level of Potential Impact following implementation of mitigation measures
Halladale and Black Watch Proposed Well Site				
Flora				
Caladenia vulgaris	Slender Pink-fingers	r	Removal of individual plants resulting in a decrease in the extent or distribution of the species, removal and/or fragmentation suitable habitat	Low (provided removal of habitat is avoided)
Fauna				
Rostratula australis	Australian Painted Snipe	VU/cr/L	Short term disruption to breeding and/or foraging activities due to noise and lighting, sedimentation of wetland habitat	Low
Neophema chrysogaster	Orange-bellied Parrot	CR/cr/L	Short term disruption of foraging activities due to noise.	Low
Isoodon obesulus obesulus	Southern Brown Bandicoot	EN/nt	Injury or mortality due to becoming trapped in a trench	Low
Miniopteris schreibersii bassanii	Southern Bent-wing Bat	CR/en/L	Short term disruption to foraging behaviour due to noise	Low
Litoria raniformis	Growling Grass Frog	VU/en/L	Short term disruption to breeding activities due to noise and lighting, sedimentation of wetland habitat, injury or mortality due to becoming trapped in a trench	Low
Coturnix ypsilophora	Brown Quail	nt	Short term disruption to foraging activities due to noise, short term impacts to habitat due to pipeline construction	Low
Porzana pusilla	Baillon's Crake	vu/L	Short term disruption to breeding and/or foraging activities due to noise and lighting, sedimentation of wetland habitat	Low
Gelochelidon nilotica	Gull-billed Tern	en/L	Short term disruption to breeding and/or foraging activities due to noise and lighting, sedimentation of wetland habitat	Low

Scientific Name	Common Name	Status	Potential Impacts	Level of Potential Impact following implementation of mitigation measures
Gallinago hardwickii	Latham's Snipe	nt	Short term disruption to breeding and/or foraging activities due to noise and lighting, sedimentation of wetland habitat	Low
Platalea regia	Royal Spoonbill	vu	Short term disruption to breeding and/or foraging activities due to noise and lighting, sedimentation of wetland habitat	Low
Egretta garzetta	Little Egret	en/L	Short term disruption to breeding and/or foraging activities due to noise and lighting, sedimentation of wetland habitat	Low
Ardea modesta	Eastern Great Egret	vu/L	Short term disruption to breeding and/or foraging activities due to noise and lighting, sedimentation of wetland habitat	Low
Nycticorax caledonicus	Nankeen Night Heron	nt	Short term disruption to breeding and/or foraging activities due to noise and lighting, sedimentation of wetland habitat	Low
Anseranas semipalmata	Magpie Goose	nt/L	Short term disruption to breeding and/or foraging activities due to noise and lighting, sedimentation of wetland habitat	Low
Anas rhynchotis	Australasian Shoveler	vu	Short term disruption to breeding and/or foraging activities due to noise and lighting, sedimentation of wetland habitat	Low
Aythya australis	Hardhead	vu	Short term disruption to breeding and/or foraging activities due to noise and lighting, sedimentation of wetland habitat	Low
Accipiter novaehollandiae	Grey Goshawk	vu/L	Short term disruption to foraging behaviour due to noise	Negligible
Haliaeetus leucogaster	White-bellied Sea-Eagle	vu/L	Short term disruption to foraging behaviour due to noise	Negligible
Stagonopleura guttata	Diamond Firetail	vu/L	Removal of habitat, disruption to breeding and/or foraging behaviour due to noise	Low

Scientific Name	Common Name	Status	Potential Impacts	Level of Potential Impact following implementation of mitigation measures
Dasyornis broadbenti caryochrous	Rufous Bristlebird (Otways ssp.)	nt/L	Short term disruption to breeding and/or foraging activities due to noise and lighting	Low
Sminthopsis leucopus	White-footed Dunnart	nt/L	Removal of habitat, disruption to breeding and/or foraging behaviour due to noise and lighting	Low
Pseudemoia rawlinsoni	Glossy Grass Skink	nt	Short term disruption to breeding and/or foraging activities due to noise and lighting, sedimentation of wetland habitat	Low
Egernia coventryi	Swamp Skink	vu/L	Short term disruption to breeding and/or foraging activities due to noise and lighting, sedimentation of wetland habitat	Low
Pseudophryne semimarmorata	Southern Toadlet	vu	Removal of dispersal habitat, short term disruption to breeding and/or foraging activities due to noise and lighting	Low
Heytesbury Site				
Flora				
Hibbertia truncata	Port Campbell Guinea-flower	R/r	Removal of individual plants resulting in a decrease in the extent or distribution of the species, removal and/or fragmentation suitable habitat	Low
Amphibromus sinuatus	Wavy Swamp-wallaby Grass	v	Loss of a single individual plant	Low
Fauna				
Miniopteris schreibersii bassanii	Southern Bent-wing Bat	CR/en/L	Short term disruption to foraging behaviour due to noise	Negligible
Litoria raniformis	Growling Grass Frog	VU/en/L	Removal or degradation of habitat, sedimentation of wetland habitat, injury or mortality due to becoming trapped in a trench	Low
Chlidonias hybridus	Whiskered Tern	nt	Removal or degradation of habitat, sedimentation of wetland habitat	Low

Scientific Name	Common Name	Status	Potential Impacts	Level of Potential Impact following implementation of mitigation measures
Gallinago hardwickii	Latham's Snipe	nt	Removal or degradation of habitat, sedimentation of wetland habitat	Low
Platalea regia	Royal Spoonbill	vu	Removal or degradation of habitat, sedimentation of wetland habitat	Low
Egretta garzetta	Little Egret	en/L	Removal or degradation of habitat, sedimentation of wetland habitat	Low
Ardea modesta	Eastern Great Egret	vu/L	Removal or degradation of habitat, sedimentation of wetland habitat	Low
Nycticorax caledonicus	Nankeen Night Heron	nt	Removal or degradation of habitat, sedimentation of wetland habitat	Low
Circus assimilis	Spotted Harrier	nt	Impacts unlikely to occur	Negligible
Accipiter novaehollandiae	Grey Goshawk	vu/L	Impacts unlikely to occur	Negligible
Pseudophryne semimarmorata	Southern Toadlet	vu	Removal or degradation of habitat	Moderate
Engaeus sericatus	Hairy Burrowing Cray	vu	Mortality and habitat loss due to construction in the vicinity of water bodies.	Moderate
Geocharax gracilis	Otways Cray	en/L	Mortality and habitat loss due to construction within terrestrial habitat adjacent to water bodies and within water bodies.	Moderate

The level of potential impact assumes mitigation measures listed below are implemented, including the use of horizontal directional drilling of waterways. Should these mitigation measures not be adopted this will alter the outcome.

6.1.1 An assessment of the potential impacts of noise from drilling operations at Halladale on fauna

Animals rely on environmental acoustics for a variety of behaviours, including foraging, mating and territorial defence. Increases in noise can reduce the detectability of these acoustic cues for many animals and is known as acoustic interference or masking. This acoustic masking effect can result in habitat shift (Rabanal et al. 2010; Larkin 1991) and impediments to communication, which in turn can influence breeding success (Parris et al. 2009; Lengagne 2008; McNabb 2004), territorial defence and foraging ability (Schaub et al. 2008; Mackey & Barclay 1988).

The majority of research into the effects of noise on fauna has focused on impacts of chronic, long-term noise, such as noise resulting from increased traffic densities (Parris et al. 2009; Parris & Schneider 2009; Jones 2008; Lengagne 2008), energy production (Bayne et al. 2008) or urbanisation (Nemeth & Brumm 2009). Very little research has looked at the effects of noise over the short to medium term.

In response to noise animals exhibit a variety of behavioural adaptations. Some of these adaptations, such as frequency shift or habituation, allow animals to continue to exploit noisy areas, while others result in animals moving to areas with lower levels of noise to allow them to avoid any impediment.

Species subject to increases in noise levels, such as noise resulting from traffic, often show an adaptation to this noisy environment by shifting the frequency at which they call (Nemeth & Brumm 2009; Parris et al. 2009; Parris & Schneider 2009; Tessler & Smotherman 2009; Leonard & Horn 2008; Penna et al. 2005). Some species also illustrate an increase in the sound pressure level of their call in response to acoustic masking (Brumm et al. 2009). This change in frequency or sound pressure level appears to be an adaptation to acoustic masking, whereby a change in frequency or decibel level increases the detectability of the acoustic cue, particularly in areas with masking from low frequency noise.

In response to increases in noise many animals will actively avoid areas (Rabanal et al. 2010; Bayne et al. 2008; Jones 2008; Schaub et al. 2008). This adaptation, often referred to as habitat shift, can result from the impacts of noise on foraging behaviour, particularly in species that are dependant on acoustic cues for successful foraging, such as nocturnal species (Jones 2008; Schaub et al. 2008). However this effect is not restricted to species that rely on acoustic cues for foraging and also appears to impact species that rely on acoustic cues for mating or territory defence (Parris & Schneider 2009; Bayne et al. 2008). There is also some evidence to suggest that some species avoid high levels of noise (200 dB)

as an artefact, rather than because of any acoustic masking (Rabanal et al. 2010). Avoidance of areas due to increases in noise can result in changes to species composition and diversity (Francis et al. 2009; Bayne et al. 2008).

Some species also illustrate a decreased responsiveness to repeated noises such as aircraft noise or bomb blasts, often after initially exhibiting other behavioural responses such as decreased foraging and increased alert behaviour (Conomy et al. 1998, Larkin 1991). This habituation allows these animals continue to exploit resources in noisy areas.

Fauna species present within, or in close proximity to, the study area are likely to display adaptive behavioural changes to increases in noise resulting from drilling operations. The most likely adaptation will be habitat shift or avoidance, with the majority of species actively avoiding habitat in close proximity to the drilling site.

There is potential for impacts to significant species to occur. Noise is likely to have a localised negative impact on foraging success for the Southern Bent-wing Bat, due to interference with the species echolocation ability and the species may actively avoid areas of high noise. Noise may also mask the call of the Rufous Bristlebird, although this species was not detected within close proximity to the drilling site. Waterbirds are likely to avoid water bodies located in close proximity to the drilling site.

The majority of habitat for fauna, and thus fauna diversity and abundance, is located within the BOICP, which is located approximately 200 m from the drilling rig. At this distance noise levels will be attenuated when compared to areas in close proximity to drilling operations, and the impacts to fauna can be expected to be correspondingly reduced. In addition any impacts will be restricted to the term of drilling operations and will not result in the impacts illustrated in studies of chronic noise.

Overall the impacts of noise resulting from drilling operations for the HBWP can be expected to be minimised by the lack of high quality habitat in close proximity to drilling operations, the attenuation of noise in areas of high quality habitat (BOICP) as a result of their distance from the drilling rig, and the fact that any impacts will be restricted to the term of operations.

6.2 Mitigation Measures

The biodiversity values identified in the current survey should be considered during the design phase of the project. There may be opportunities to reduce potential impacts through alterations to the design or management following review of this assessment.

The following measures are intended to minimise the ecological impact of development. Relevant points should be incorporated into a Construction Environmental Management Plan to ensure that the significant risk of adverse environmental impacts is minimised.

The primary measure to minimise impacts to biodiversity values on the site is to minimise removal of native vegetation and habitats. To retain these values they need to be avoided in the design process, protected and managed in designated reserves. Allowance must be made for all construction works (including road batters, footpaths and all services) outside the nominated reserves so they can be treated as no-go zones. Construction in the vicinity of flowing waterways should be conducted when waterways are dry or not flowing, with HDD methods being preferable to trenching through waterways.

Design and pre-construction

- Avoid and minimize removal of native vegetation, in accordance with Net Gain policy. This could be done by;
    - Where practical, vegetation should be preferentially removed in areas supporting primarily introduced vegetation, not native vegetation. At the Halladale and Black Watch Proposed Well Site vegetation should be preferentially removed in areas not mapped as an Ecological Vegetation Class (Figure 3). We understand that a revision of access routes is currently being undertaken to achieve this goal.
    - Line of site passing bays should also be located in areas of primarily introduced vegetation. Suitable areas include, but are not limited to those indicated on Figure 3.
    - Implementation of HDD underneath habitat zone 2 during construction of the gas pipeline between the drilling site and the Croft #1 gas main.
    - Undertake a detailed design of the Heytesbury Gas Pipeline to avoid impacts to native vegetation as mapped in Figure 4.

- Avoid impacts to HZ9 through the use of HDD or the siting of the pipeline outside of this habitat zone.

- Undertake design based on the use of the base case pipeline route at the Heytesbury site. This route is a preferred option as it will result in the need to remove less native vegetation, and impacts to HZ6 can be easily avoided through the use of HDD or siting of the pipeline within the southern part of the pipeline corridor (Figure 4).

- Implementation of HDD underneath areas of native vegetation at the Heytesbury site. This is restricted to North South Road, where two patches of Damp Heath Scrub (HZ5) are present and the nationally significant Port Campbell Guinea Flower was recorded; the Port Campbell Creek crossing, where several patches of Sedgy Riparian Woodland (HZ6, 7 and 8) were identified and a small road reserve to the east of the Cobden - Port Campbell Road that could not be assessed due to access restriction. This area appears to support native vegetation.

- Ensure entry and exit points for HDD of creeks are located a minimum of 15 m from riparian vegetation.

- Design of the Heytesbury Gas Pipeline to avoid impacts to areas of native vegetation as mapped in Figure 4 by siting the pipeline, including the construction corridor, away from areas of native vegetation. Tree should be avoided by a distance of 12 x the Diameter at Breast Height (DBH) to allow for their retention during construction (DSE 2010).

- Protect all areas of retained native vegetation through by means of temporary fencing. Fencing must be installed prior to any works commencing.

- Avoid removal of significant flora species located along the Heytesbury Pipeline corridor, as mapped in Figure 4.

- Avoid impacts to fauna habitat. This can be achieved through:

  - Fencing all access tracks within 200 m of wetlands at the Halladale and Black Watch Proposed Well Site. This should include use of sediment fencing, acting as fauna proof fencing as well, buried into the ground and secured at regular intervals. This fencing should be constructed prior to commencement of construction works and should be regularly maintained.

- Ensure the pipeline corridor, including all works, are located a minimum of 200 m from water bodies at the Heytesbury site, particularly those identified as potential habitat for the nationally significant Growling Grass Frog.

- Implement HDD under Port Campbell creek as a means to minimise impacts to surrounding habitat and vegetation. The current alignment through the area of Port Campbell creek poses an area of lower conservation significance in terms of vegetation significance relative to other areas along the creek within the study area.

- Ensure bell holes associated with HDD under creeks are fenced using sediment fencing to prevent run-off into nearby creeks. Sediment fencing should be placed in a "U", with the bottom of the "U" parallel to any creeks. This should be undertaken at the entry and exit holes. Entry and exit holes should be located a minimum of 20 m from the edge of creeks.

- All stream banks and riparian zones around creek crossing have some potential for threatened burrowing crayfish to occur. There is limited knowledge on the depth at which relevant species burrow to, however conducting HDD at a minimum depth of 2.5 m should avoid the tunnels of these crayfish species.

- Geological testing of stream beds subject to HDD should be undertaken to ensure the substrate is stable and will not fracture during HDD.

- Locate line of sight passing bays in areas of primarily introduced vegetation. Suitable areas for the Halladale and Black Watch Proposed Well Site include, but are not limited to those indicated in Figure 3.

- Identify, source and secure appropriate offsets for vegetation losses. Offsets for High conservation significance vegetation need to be initiated as soon as possible after loss occurs and within one year.

- Develop and implement an Offset Management Plan for identified offsets.

- Protect all areas of retained native vegetation, including scattered trees, during construction by means of temporary fencing. Fencing must be installed **before** construction work commences.

  - Scattered trees have been identified predominantly in private property to the north-west end of the Heytesbury site and within the road reserve on

North South road. These were identified as being easily avoidable when considering the current pipeline projection.

- Implement a Tree Retention Zone (TRZ) around all trees during construction. The TRZ should be 12 X the Diameter at Breast Height (DBH) of the tree with a minimum of 2 m and a maximum of 15 m. This tree retention zone should be fenced using parawebbing and access restricted.

- On private land, fencing is to be erected around all wetlands and sinkholes to avoid entrance by vehicles, machinery and personnel and prevent impacts to these areas of fauna habitat through sedimentation or run-off. Again, fencing is to be installed prior to works commencing.

- Minimise the removal of native vegetation within or adjacent to water bodies and watercourses. Protect waterways by inclusion of appropriate buffers into design. Road batters and all services should be excluded from waterways and their buffers.

Construction

- Keep the construction footprint to a minimum and ensure areas of retained vegetation or fauna habitat that have been fenced are maintained.

- Locate entry and exit point outside of areas of native vegetation.

- Protect areas of retained native vegetation and areas of environmental sensitivity. These areas should be fenced and treated as no-go zones.

- Ensure topsoil (usually the top 15 cm of soil) is graded off the ROW prior to any construction activities being undertaken. This topsoil should be wind rowed separately to subsoils.

- Undertake construction to avoid wetter periods, reducing sedimentation and run-off.

- Manage construction works to minimise discharge of sediments and other pollutants. Suitable measures are provided in *Environmental Guidelines for Major Construction Sites* (EPA 1996, amended) and *Construction Techniques for Sediment Pollution Control* (EPA 1991) and *Guideline for Environmental Management. Doing it right on subdivisions. Temporary environmental protection measures for subdivision construction sites*. (EPA 2004).

- Ensure refuelling of vehicles and storage of chemicals and other equipment occurs on stable surfaces and does not occur within 30-50 m of a waterway or associated water bodies and should not occur within a floodplain or land subject to inundation.
- Ensure measures to control dust are implemented.
- Implement a reduced speed limit along sections of road to and from construction sites to prevent collisions with fauna species.
- Ensure all lighting is directed into areas of construction and activity and spilling of light onto adjacent fauna habitats is limited.
- Ensure all open trenches are either backfilled or closed each night or egress points are located in all open trenches overnight to allow animals to escape. Trench inspection should be undertaken on a daily basis at first light, by a qualified zoologist. A Wildlife Management Authorisation, issued under the *Wildlife Act 1975*, may be required.
- Ensure all soil piles, stockpiles and wind rows are kept within the designated ROW and away from areas of native vegetation and fauna habitat.
- Ensure hygiene measures, including soil hygiene and inspection measures, are implemented to avoid introduction and spread of Phytophthora Dieback.

Phytophthora cinnamomi is a soil-borne plant pathogen that is listed as a Key Threatening Process in Schedule X to the *EPBC Act* (1995) and a Potentially Threatening process under the *FFG Act* (1988). This pathogen is listed as a threatening process because of its ability to devastate native plant communities and fauna habitat. A hygiene policy recognised as "clean on entry" should be in place for all vehicles (See Colquhoun and Hardy 2000). This involves washing down all vehicles (earthmoving and light) prior to entering any construction site. High pressure spray containing a water and fungicide chemicals of either Phytoclean or Coolacide mix should be used to remove potentially infested soil and plant material from all vehicles (see http://www.environment.gov.au/biodiversity/invasive/publications/p-cinnamomi/pubs/sa-deh2003a.pdf). All soil and vegetation removed should be disposed at a safe location to avoid infesting other areas.

- Implement weed control measures at all sites. Weed control measures should include, but not be limited to:
    - Wash-down using a high pressure hose for all construction equipment when being moved between areas.

- Wash-down points at all entry and exit point to private land for light construction vehicles such as four wheel drives and cars. Wash-down procedures should include removal loose debris, particularly soils, from vehicles, and removal of vegetative matter. Spray down of vehicles using a high pressure hose should be undertaken regularly.

Post-construction

- Ensure backfilling includes placement of subsoils back into the trench first. Topsoil, windrowed separately during construction, should be left in wind rows until all related construction activities have ceased in an area and then placed back over the ROW. This will allow any natural to seed bank to contribute to natural regeneration.

- Ensure the ROW associated with pipeline construction is rehabilitated, and areas of native vegetation and fauna habitat are restored. Revegetation of native flora species should be undertaken using stock of local provenance. Monitoring of any revegetation works may be required.

- Ensure weed monitoring is undertaken, particularly in areas of or adjacent to native vegetation, to ensure increased weed invasion does not result from the proposed activities.

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APPENDICES

APPENDIX 1

Sources of Criteria for Significance

The common language meaning of significance is 'importance; consequence' (Macquarie Dictionary). While the general meaning of this is clear, the term is further defined in ecological significance assessment.

Following is a list of the information sources used in this report that provide advice on significance of flora and fauna species and communities.

A1.1 Species and Communities

A taxon or community has national significance when it is listed as threatened (critically endangered, endangered, vulnerable or conservation dependent) under the ***Environment Protection and Biodiversity Conservation Act 1999*.**

A taxon has national significance when it is listed as rare in Australia (R) in **A Census of the Vascular Plants of Victoria (Walsh & Stajsic 2007).**

A taxon or community has state significance when it is listed as threatened under the ***Flora and Fauna Guarantee Act 1988.***

A taxon or community has State significance when it is listed as threatened (critically endangered, endangered or vulnerable); or rare or poorly known for flora species, in Victoria on a **DSE Advisory List** (DSE 2005a, 2007a). Fauna species listed as near threatened or data deficient are listed in Appendix 4.2, however in accordance with advice from DSE they are not considered to be at the same level of risk as higher categories of threat. These species are generally not discussed in detail in this report.

A taxon or community also has national or state significance when it is considered to be threatened at that level by **Biosis Research** using IUCN criteria (IUCN 2001).

Biosis Research considers flora species to have significance at the bioregional level when they are recorded from a small percentage of records in the bioregion, as follows:

Threshold for bioregional significance	**Bioregions**	
< 1% of records in the bioregion (bioregions that support more remnant vegetation)	Bridgewater East Gippsland Lowlands East Gippsland Uplands Greater Grampians Highlands – Far East Highlands – Northern Fall	Highlands – Southern Fall Lowan Mallee Otway Ranges Victorian Alps Wilsons Promontory
< 5% of records in the bioregion (bioregions that have been more cleared)	Central Victorian Uplands Dundas Tablelands Gippsland Plain Glenelg Plain Goldfields Monaro Tablelands Murray Fans Murray Mallee Murray Scroll Belt	Northern Inland Slopes Otway Plain Robinvale Plain Strzelecki Ranges Victorian Riverina Victorian Volcanic Plain Warrnambool Plain Wimmera

A1.2 Sites

Patches of native vegetation have conservation significance (very high, high, medium or low) according to the criteria for significance in **Victoria's Native Vegetation Management – A Framework for Action** (NRE 2002). This assessment is calculated at the bioregional scale.

Areas of conservation significance are documented in the **DSE Victorian biosite database.** The database rates sites as significant at national, state and regional levels. These ratings are undertaken at varying geographic scales and are thus not directly comparable to the categories defined by the Framework (NRE 2002).

APPENDIX 2

Fauna survey methods

A2.1 Fauna Survey Methods

Aquatic survey

Detailed aquatic fauna survey was required because the opportunity for incidental aquatic fauna observation and active searching is limited. Subsequently, there is a relative scarcity of aquatic fauna records. Thus habitat assessment was deemed to be only of limited use.

The aquatic assessment, undertaken between the 25 and 27 October 2010, incorporated aquatic habitat assessment (including *in situ* water quality measurement) and targeted survey at five sites located on Port Campbell Creek, Wallaby Creek and associated tributaries in the vicinity and downstream of the study area. Survey site selection was based on suitability for target species, water depth/permanence, waterway connectivity, accessibility and location relative to the study area. Standard fish sampling techniques (i.e. electrofishing, bait traps, fyke nets, seine nets, dip nets) were utilised.

Fish survey techniques utilised at each site were varied in order to maximise sampling efficacy in accordance with site characteristics such as stream conductivity (similar to salinity), depth, width, and vegetation cover. High turbidity readings and excessive water depth (Sites precluded the use of backpack electrofishing at all sites.

Eight bait traps were set overnight at all sites. A glow stick was placed inside all bait traps to serve as an attractant. Between one and four fyke nets were set overnight at Sites 2 – 5. Small water body width and shallow depth at Site 1 precluded the use of fyke netting, however bait trapping was supplementing with dip netting (10 minutes).

In situ measurements of Dissolved Oxygen (DO), pH, Electrical Conductivity (EC), temperature and turbidity were made at all sites using a calibrated Horiba U22-XD Water Quality Monitor. All water quality measurements were taken in accordance with EPA publications 604.1 (2003) and 441 (2000).

Table A2.1. Port Campbell Creek, Wallaby Creek and unnamed tributary of Port Campbell Creek aquatic survey and habitat assessment sites (25-26 October 2010) including details of methods used.

Site code	Site location description	Zone	Easting	Northing	Sampling Method: BT=Bait trap, FN=Fyke net, DN=Dip net,
1	Wallaby Creek at Curdievale-Port Campbell Rd, Heytesbury Lower.	54	668849	5728862	8xBT, DN (10 min.)
2	Port Campbell Creek at Smokey Point Rd, Port Campbell.	54	674729	5726680	8xBT, 2xDN
3	Port Campbell Creek at upstream of Tregas Rd, Newfield.	54	674822	5729164	8xBT, 1xFN
4	Port Campbell Creek at upstream of Camerons Hill Rd, Newfield.	54	674559	5730311	8xBT, 4xFN
5	Unnamed tributary of Port Campbell Creek at Cobden-Port Campbell Rd, Newfield.	54	675677	5730769	8xBT, 2xFN

Growling Grass Frog *Litoria raniformis*

Two experienced zoologists familiar with the identification of the Growling Grass Frog and its preferred habitats undertook a detailed nocturnal survey on the 25 and 26 November 2009. Survey was undertaken of water bodies present within the study area, including farm dams, wet depressions and other water bodies within the Bay of Islands Coastal Park. Water bodies considered to provide optimal habitat for the Growling Grass Frog were targeted.

A roadside survey was conducted throughout the study area to detect calling males. Roadsides within the study area were traversed in a vehicle. The vehicle was stopped at water bodies identified in aerial photographs and diurnal assessment and a five minute listening period commenced. This was followed by a five minute period of call playback in an attempt to elicit a response from male frogs that might be in the area.

Several water bodies identified in the desktop assessment (Biosis Research 2009) and during diurnal surveys as having higher habitat potential for this species were assessed in greater detail. An initial 15 minute period of passive listening was undertaken at each waterbody to detect the advertisement call of male Growling Grass Frogs. This was followed by a five minute period of call playback in an attempt to elicit a response from male frogs that might be in the area. The water bodies were then carefully searched for active frogs using hand-held spotlights for a minimum period of 30 minutes per dam. Surveys were timed to detect calling males during the breeding season. No attempt was made to locate Growling Grass Frog tadpoles.

Other species of frogs were observed during the survey and their locations were recorded.

Waterbirds

Several larger water bodies suitable for threatened waterbirds were identified by Biosis Research (2009). These water bodies were surveyed six times each between the 23 and 29 November 2009, with each waterbody being surveyed twice in the early morning (before 10 am), middle of the day (10 am to 4 pm) and in late afternoon/evening (4 pm to 8 pm). All birds observed at each waterbody were recorded.

Threatened Ground Dwelling Fauna

Survey for threatened ground dwelling fauna was undertaken within five broad habitats (grassland, scrub, sedgeland, heathland and woodland) identified throughout the study area.

Eight Reconyx® remote cameras were attached to the trunks of trees at a height of between 0.5 m and 1 m above the ground. Tea strainers filled with a bait of peanut butter, honey and oats were attached to the top of small (40 cm) star pickets were used as an attractant.

Cameras were placed out for four nights between the 24 and 28 November 2009.

Threatened Skinks

Targeted surveys for the Glossy Grass Skink *Pseudemoia rawlinsoni* and Swamp Skink *Egernia coventryi* were undertaken opportunistically between the 23 and 29 November 2009 in areas considered to be suitable habitat for these species, such as close to freshwater water bodies located throughout the Bay Of Islands Coastal Park.

Shelter such as rocks, pieces of wood or other artificial shelters were rolled to search for reptiles.

Where reptile activity was noted but skinks could not be caught a survey was undertaken using binoculars. Observers watched the area where the skink had sought refuge and waited for the animal to come out and bask.

A total of 10.3 hours of reptile searching was undertaken throughout the study.

Rufous Bristlebird *Dasyornis broadbenti caryochrous*

Targeted surveys for the Rufous Bristlebird were undertaken daily between the 23 and 29 November 2009. Vehicle access tracks through the Bay of Islands Coastal Park and Douglas Fenwick Reserve were traversed on foot by observers

and the distinctive call of the species was noted. Locations were recorded using handheld GPS.

A total of 5.2 hours of observation was undertaken.

APPENDIX 3

Flora Results

A3.1 Flora species recorded from the study area

Australian status:

R Rare (Walsh & Stajsic 2007)

Victorian status:

v vulnerable (FIS)
r rare (FIS)
p protected under the FFG Act (public land only)

Native species outside natural range

Noxious weed status:

RC Regionally controlled species

Species uncommon in the bioregion (recorded from less than 5% of sites) are highlighted in **bold**

Table A3.1.1. Flora species recorded from the Halladale and Black Watch Proposed Well Site during the November 2009 flora assessment.

FIS List S1360300 - HW: Species recorded in Heathy Woodland; **DHW**: Species recorded in Damp Heathy Woodland; **RD**: Species recorded along roadsides but not in EVC vegetation
FIS List S1360200 – WL: Species recorded within wetland areas throughout the study area.

Status	Scientific name	Common Name	HW	DHW	RD	WL
Indigenous species:						
p	*Acacia longifolia* subsp. *sophorae*	Coast Wattle	+			
	Acacia melanoxylon	Blackwood	+	+		
p	*Acacia verticillata*	Prickly Moses	+			
	Acaena novae-zelandiae	Bidgee-widgee	+			
p	*Acrotriche serrulata*	Honey-pots	+	+		
	***Allocasuarina* spp.**	**Sheoak**		+		
	Alternanthera spp.	Joyweed				+
	Azolla spp.	Azolla				+
	Banksia marginate	Silver Banksia	+	+		
	Baumea juncea	Bare Twig-sedge				+
	Callitriche spp.	Water Starwort				+
	Carex breviculmis	Common Grass-sedge	+			
	Cassytha spp.	Dodder Laurel	+	+		
	Coprosma spp.	Coprosma		+		
	Crassula helmsii	**Swamp Crassula**				+
	Dampiera spp.	Dampiera	+	+		
	***Dianella* sp. aff. *revoluta* (Coastal)**	**Coast Flax-lily**	+	+	+	
	Dichondra repens	Kidney-weed	+			
	Epilobium billardierianum	**Variable Willow-herb**	+			
	***Epilobium* spp.**	**Willow Herb**				+
	Eucalyptus obliqua	Messmate Stringybark	+	+		
	Eucalyptus viminalis	Manna Gum	+	+		
	Ficinia nodosa	Knobby Club-sedge	+		+	
	***Gahnia* spp.**	**Saw Sedge**	+			
	Geranium spp.	Crane's Bill	+	+	+	
	Gonocarpus tetragynus	Common Raspwort		+		
	Hibbertia sericea var. *sericea*	Silky Guinea-Flower		+		

Status	Scientific name	Common Name	HW	DHW	RD	WL
	Hydrocotyle laxiflora	**Stinking Pennywort**		+		
	Hypericum gramineum	Small St John's Wort	+			
	Juncus procerus	**Tall Rush**				+
	Juncus spp.	Rush		+		
	Lemna spp.	Duckweed				+
	Lepidosperma laterale	Variable Sword-sedge		+	+	
	Leptospermum continentale	Prickly Tea-tree	+	+		
p	*Leucopogon parviflorus*	Coast Beard-heath	+	+		
	Lobelia spp.	Lobelia		+		
	Lomandra longifolia	Spiny-headed Mat-rush	+	+		
	Lythrum hyssopifolia	**Small Loosestrife**				+
	Melaleuca spp.	Honey-myrtle	+	+		
	Muehlenbeckia adpressa	**Climbing Lignum**		+		
	Neopaxia asutralasica	**White Purslane**				+
	Oxalis spp.	Wood Sorrel	+			
p	*Ozothamnus ferrugineus*	Tree Everlasting		+		
p	*Ozothamnus* spp.	Everlasting		+		
	***Patersonia* spp**	**Purple Flag**	+			
	Pimelea humilis	**Common Rice-flower**	+			
	Poa labillardierei	Common Tussock-grass	+	+		
	Poa spp.	Tussock Grass	+			
	Potamogeton tricarinatus	**Floating Pondweed**				+
	Pteridium esculentum	Austral Bracken	+	+	+	
	Ranunculus spp.	Buttercup				+
	Rhagodia candolleana subsp. *candolleana*	Seaberry Saltbush	+	+	+	
p	***Senecio glomeratus***	**Annual Fireweed**		+		
p	***Senecio linearifolius***	**Fireweed Groundsel**		+		
	Solanum laciniatum	Large Kangaroo Apple	+			
	Tetragonia implexicoma	Bower Spinach	+	+		
	Triglochin procera	**Common Water-ribbons**				+
	Typha domingensis	**Narrow-leaf Cumbungi**				+
	Typha spp.	Bulrush				+
p	*Xanthorrhoea australis*	Austral Grass-tree	+	+		
p, r	***Xanthorrhoea caespitosa***	**Tufted Grass-tree**	+			
Introduced species:						
	Acetosella vulgaris	Sheep Sorrel			+	
	Anagallis arvensis	Pimpernel	+			+
	Anthoxanthum odoratum	Sweet Vernal-grass	+	+	+	
	Briza minor	Lesser Quaking-grass				
	Bromus catharticus	Prairie Grass	+	+		
	Bromus diandrus	Great Brome	+	+	+	
	Bromus hordeaceus subsp. *hordeaceus*	Soft Brome	+		+	
	Centaurium erythraea	Common Centaury		+		
	Cerastium glomeratum	Sticky Mouse-ear Chickweed		+	+	
	Conyza bonariensis	Flaxleaf Fleabane				
	Coprosma repens	Mirror Bush	+	+		
	Cotula coronopifolia	Water Buttons				+
	Cynosurus echinatus	Rough Dog's-tail	+	+	+	
	Dactylis glomerata	Cocksfoot	+	+	+	
	Genista spp.	Broom		+		
	Holcus lanatus	Yorkshire Fog		+		+
	Hordeum vulgare	Barley	+		+	

Status	Scientific name	Common Name	HW	DHW	RD	WL
	Hypochoeris radicata	Flatweed	+	+	+	
	Lagurus ovatus	Hare's-tail Grass	+	+	+	
	Lolium spp.	Rye Grass	+		+	
	Lotus subbiflorus	Hairy Bird's-foot Trefoil		+	+	
	Malva parviflora	Small-flower Mallow	+			
	Medicago spp.	Medic	+	+	+	
	Parentucellia viscosa	Yellow Bartsia				
	Paspalum distichum	Water Couch				+
	Pennisetum spp.	Feather Grass		+		
	Plantago coronopus	Buck's-horn Plantain	+		+	
	Plantago lanceolata	Ribwort			+	
	Romulea rosea	Onion Grass			+	
	Rumex crispus	Curled Dock			+	+
	Salvia verbenaca	Wild Sage				
	Senecio elegans	Purple Groundsel				
	Silene gallica	French Catchfly				
	Sisyrinchium iridifolium	Striped Rush-leaf				
	Sonchus asper subsp. *asper*	Rough Sow-thistle	+		+	
	Sonchus oleraceus	Common Sow-thistle	+			
	Sporobolus africanus	Rat-tail Grass	+	+	+	
	Stellaria media	Chickweed				
	Trifolium spp.	Clover	+			
	Vicia sativa	Common Vetch	+			
	Vulpia spp.	Fescue	+			

Table A3.1.2. Flora species recorded from the Heytesbury site during the current assessment

FIS Lists S1439300, S1439400, S1439500, S1439600 and S1439700

Status	Scientific name	Common name
Indigenous species		
	Acacia melanoxylon	Blackwood
p	*Acacia verticillata*	Prickly Moses
	Acaena novae-zelandiae	Bidgee-widgee
	Allocasuarina paludosa	Scrub Sheoak
v	*Amphibromus sinuatus*	Wavy Swamp Wallaby-grass
	Banksia marginata	Silver Banksia
	Bolboschoenus caldwellii	**Salt Club-sedge**
	Carex appressa	**Tall Sedge**
	Carex fascicularis	**Tassel Sedge**
	Carex inversa	**Knob Sedge**
	Carex gunniana	**Swamp Sedge**
	Carex spp.	Sedge
	Clematis aristata	Mountain Clematis
	Coprosma quadrifida	Prickly Currant-bush
	Crassula helmsii	**Swamp Crassula**
	Eleocharis acuta	Common Spike-sedge
	Epilobium billardierianum* subsp. *billardierianum	**Smooth Willow-herb**
	Eucalyptus aff. willisii (south west Victoria)	**Narrow-leaf Peppermint**
	Eucalyptus baxteri	Brown Stringybark
	Eucalyptus obliqua	Messmate Stringybark
	Eucalyptus ovata	Swamp Gum
	Eucalyptus ovata* var. *ovata	**Swamp Gum**
	Eucalyptus viminalis	Manna Gum
	Gahnia clarkei	**Tall Saw-sedge**
	Gahnia trifida	Coast Saw-sedge
	Glyceria australis	**Australian Sweet-grass**
	Hedycarya angustifolia	**Austral Mulberry**
	Hemarthria uncinata* var. *uncinata	**Mat Grass**
R, r	*Hibbertia truncata*	Port Campbell Guinea-flower
	Isolepis cernua* var. *platycarpa	**Broad-fruit Club-sedge**
	Isolepis spp.	Club Sedge
	Juncus amabilis	Hollow Rush
	Juncus bufonius	**Toad Rush**
	Juncus flavidus	Gold Rush
	Juncus gregiflorus	**Green Rush**
	Juncus pallidus	**Pale Rush**
	Juncus procerus	**Tall Rush**
	Juncus spp.	Rush
	Lachnagrostis filiformis	Common Blown-grass
	Lepidosperma laterale var. *majus*	Variable Sword-sedge
	Leptospermum continentale	Prickly Tea-tree
	Leptospermum lanigerum	**Woolly Tea-tree**
	Linum marginale	**Native Flax**
	Lythrum hyssopifolia	**Small Loosestrife**
	Lythrum salicaria	**Purple Loosestrife**
	Melaleuca squarrosa	Scented Paperbark
	Notelaea ligustrina	Privet Mock-olive

Status	Scientific name	Common name
	Oxalis spp.	Wood Sorrel
p	*Ozothamnus ferrugineus*	Tree Everlasting
	Persicaria decipiens	**Slender Knotweed**
	Pomaderris aspera	**Hazel Pomaderris**
	Pteridium esculentum	Austral Bracken
	Ranunculus amphitrichus	**Small River Buttercup**
	Rubus parvifolius	**Small-leaf Bramble**
p	*Senecio* spp.	Groundsel
	Schoenus apogon	Common Bog-sedge
	Schoenus nitens	**Shiny Bog-sedge**
	Solanum laciniatum	**Large Kangaroo Apple**
	***Triglochin procera* s.l.**	**Water Ribbons**
	Typha orientalis	Broad-leaf Cumbungi
	Typha spp.	Bulrush
Introduced species		
p , #	***Acacia longifolia* subsp. *longifolia***	**Sallow Wattle**
	Agrostis gigantea	Red-top Bent
	Alopecurus pratensis	Meadow Fox-tail
	Anagallis arvensis	Pimpernel
	Anthoxanthum odoratum	Sweet Vernal-grass
	Arctotheca calendula	Cape Weed
	Bellis perennis	English Daisy
	Bromus hordeaceus subsp. *hordeaceus*	Soft Brome
	Callitriche stagnalis	Common Water-starwort
	Carduus pycnocephalus	Slender Thistle
	Cerastium glomeratum s.s.	Sticky Mouse-ear Chickweed
RC	*Cirsium vulgare*	Spear Thistle
RC	*Conium maculatum*	Hemlock
	Cotula coronopifolia	Water Buttons
RC	*Crataegus monogyna*	Hawthorn
	Cynodon dactylon var. dactylon	Couch
	Dactylis glomerata	Cocksfoot
	Festuca arundinacea	Tall Fescue
	Galium aparine	Cleavers
	Gaudinia fragilis	Fragile Oat
	Helminthotheca echioides	Ox-tongue
	Holcus lanatus	Yorkshire Fog
	Hordeum marinum	Sea Barley-grass
	Hypochaeris radicata	Flatweed
	Isolepis levynsiana	Tiny Flat-sedge
	Juncus articulatus	Jointed Rush
	Leontodon taraxacoides subsp. *taraxacoides*	Hairy Hawkbit
	Lolium perenne	Perennial Rye-grass
	Lotus angustissimus	Slender Bird's-foot Trefoil
	Lythrum junceum	Mediterranean Loosestrife
	Medicago spp.	Medic
	Melilotus indicus	Sweet Melilot
	Nasturtium officinale	Watercress
	Parentucellia viscosa	Yellow Bartsia
	Paspalum distichum	Water Couch
	Pennisetum clandestinum	Kikuyu
	Phalaris aquatica	Toowoomba Canary-grass
	Plantago lanceolata	Ribwort

Status	Scientific name	Common name
	Poa annua	Annual Meadow-grass
	Populus alba	White Poplar
	Ranunculus repens	Creeping Buttercup
	Ranunculus trilobus	Large Annual Buttercup
	Rosa rubiginosa	Sweet Briar
	Rubus fruticosus spp. agg.	Blackberry
	Rumex spp.	Dock
	Rumex conglomeratus	Clustered Dock
	Salix cinerea subsp. *cinerea*	Grey Sallow
	Setaria parviflora	Slender Pigeon Grass
	Solanum nigrum	Black Nightshade
	Sonchus asper	Rough Sow-thistle
	Sonchus oleraceus	Common Sow-thistle
	Taraxacum officinale spp. agg.	Garden Dandelion
	Trifolium fragiferum var. *fragiferum*	Strawberry Clover
	Trifolium repens var. *repens*	White Clover
	Trifolium subterraneum	Subterranean Clover
	Vicia sativa	Common Vetch
	Vulpia bromoides	Squirrel-tail Fescue
	Watsonia meriana var. *bulbillifera*	Bulbil Watsonia

A3.2 Significant flora species

Includes national and state significant species from the following sources:

- DSE Flora Information System 2009 Version
- DSEWPC database (PMST accessed on 17.11.2010)
- Current survey

Search area is 5 km radius.

Australian status:

EX	Extinct (EPBC Act)
CR	Critically Endangered (EPBC Act)
EN	Endangered (EPBC Act)
VU	Vulnerable (EPBC Act)
R	Rare (Walsh & Stajsic 2007)

Victorian status:

x	extinct (FIS)
e	endangered (FIS)
v	vulnerable (FIS)
r	rare (FIS)
k	poorly known (FIS)
L	listed as threatened under FFG Act
p	protected flora under the FFG Act (permit to take required on public land)

Most recent record:

#	species predicted to occur by the PMST (not recorded on FIS unless dated)
Year	recorded on the VBA
2010	recorded during current survey

Likelihood of occurrence: – refer to section 2.1.2

Table A3.2.1 Flora of national or state significance recorded or predicted to occur within 5 km of the study area, Halladale and Black Watch Proposed Well Site

Scientific name	Common name	Aust. status	Vic. status	Most recent record	Likelihood of occurrence in study area
Nationally Significant					
Glycine latrobeana	Clover Glycine	VU	v/L	2006/#	Low
Prasophyllum frenchii	Maroon Leek-orchid	EN	e/L	#	Low
Pterostylis cucullata	Leafy Greenhood	VU	v/L	#/1984	Low
Pterostylis tenuissima	Swamp Greenhood	VU	v/L	##	Low
Taraxacum cygnorum	Coast Dandelion	VU	e/L	##	Low
Thelymitra epipactoides	Metallic Sun-orchid	EN	e/L	2006/#	Low
Caladenia brachyscapa	Short Spider-orchid	EX	x/L	1959	Negligible
Prasophyllum spicatum	Dense Leek-orchid	VU	e	#	Low
State significant					
Diuris palustris	Swamp Diuris		v/L	1991	Low
Zygophyllum billardierei	Coast Twin-leaf		r	1999	Low
Caladenia vulgaris	Slender Pink-fingers		r	2000	Medium
Lasiopetalum schulzenii	Drooping Velvet-bush		r	1996	Low
Monotoca glauca	Currant-wood		r	1998	Low

Table A3.2.2 Flora of national or state significance recorded or predicted to occur within 5 km of the study area, Heytesbury site

Scientific name	Common name	Aust. status	Vic. status	Most recent record	Likelihood of occurrence in study area
National Significance					
Glycine latrobeana	Clover Glycine	VU	v/L	#	Low
Haloragis exalata subsp. *exalata* var. *exalata*	Square Raspwort	VU	v	1966	Low
Prasophyllum frenchii	Maroon Leek-orchid	EN	e/L	#	Negligible
Pterostylis cucullata	Leafy Greenhood	VU	v/L	#	Low
Pterostylis tenuissima	Swamp Greenhood	VU	v	#	Low
Thelymitra epipactoides	Metallic Sun-orchid	EN	e/L	#	Low
Prasophyllum spicatum	Dense Leek-orchid	VU	e	#	Low
Hibbertia truncata	Port Campbell Guinea-flower	R	r	2010	Recorded
State Significance					
Amphibromus sinuatus	Wavy Swamp Wallaby-grass		V	2010	Recorded
Logania ovata	Oval-leaf Logania		r	1986	Low
Orthrosanthus multiflorus	Morning Flag		r	1966	Negligible
Cardamine papillata	Forest Bitter-cress		r	1966	Low
Xanthorrhoea caespitosa	Tufted Grass-tree		r	2003	Low
Eucalyptus willisii subsp. *falciformis*	Grampians Peppermint		r	2003	Low
Lachnagrostis scabra subsp. *curviseta*	Rough Blown-grass		e	1966	Negligible

APPENDIX 4

Fauna Results

A4.1 Fauna species recorded from study area

Australian status:

CR	Critically Endangered (EPBC Act)

Victorian status:

en	endangered (DSE 2009a, 2009)
vu	vulnerable (DSE 2009a, 2009)
nt	near threatened (DSE 2009a, 2009)
L	listed as threatened under FFG Act
*	introduced species

Table A4.1.1. Vertebrate fauna recorded from the Halladale and Black Watch Proposed Well Site during the November 2009 fauna assessment (listed in taxonomic order)

Status	Scientific Name	Common Name
	Birds	
	Eudyptula minor	Little Penguin
	Coturnix pectoralis	Stubble Quail
nt	*Coturnix ypsilophora*	Brown Quail
	Phaps chalcoptera	Common Bronzewing
vu/L	*Porzana pusilla*	Baillons Crake
	Gallinula ventralis	Black-tailed Native-hen
	Porphyrio porphyrio	Purple Swamphen
	Poliocephalus poliocephalus	Hoary-headed Grebe
	Phalacrocorax carbo	Great Cormorant
nt/L	*Morus serrator*	Australasian Gannet
	Chroicocephalus novaehollandiae	Silver Gull
nt	*Haematopus fuliginosus*	Sooty Oystercatcher
	Vanellus miles	Masked Lapwing
vu/L	*Thinornis rubricollis*	Hooded Plover
	Threskiornis molucca	Australian White Ibis
	Threskiornis spinicollis	Straw-necked Ibis
	Platalea flavipes	Yellow-billed Spoonbill
	Egretta novaehollandiae	White-faced Heron
	Ardea pacifica	White-necked Heron
	Cygnus atratus	Black Swan
	Tadorna tadornoides	Australian Shelduck
	Anas superciliosa	Pacific Black Duck
	Anas castanea	Chestnut Teal
	Anas gracilis	Grey Teal
	Circus approximans	Swamp Harrier
	Elanus axillaris	Black-shouldered Kite
	Falco peregrinus	Peregrine Falcon
	Falco berigora	Brown Falcon
	Falco cenchroides	Nankeen Kestrel
	Calyptorhynchus funereus	Yellow-tailed Black-Cockatoo
	Cacatua galerita	Sulphur-crested Cockatoo
	Cacatua tenuirostris	Long-billed Corella

Status	Scientific Name	Common Name
	Eolophus roseicapilla	Galah
	Platycercus elegans elegans	Crimson Rosella
	Platycercus eximius	Eastern Rosella
	Neophema chrysostoma	Blue-winged Parrot
	Dacelo novaeguineae	Laughing Kookaburra
	Chrysococcyx basalis	Horsfield's Bronze-Cuckoo
	Hirundo neoxena	Welcome Swallow
	Rhipidura albiscarpa	Grey Fantail
	Rhipidura leucophrys	Willie Wagtail
	Colluricincla harmonica	Grey Shrike-thrush
	Grallina cyanoleuca	Magpie-lark
	Epthianura albifrons	White-fronted Chat
	Acanthiza pusilla	Brown Thornbill
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill
	Sericornis frontalis	White-browed Scrubwren
	Cincloramphus cruralis	Brown Songlark
nt/L	*Dasyornis broadbenti*	Rufous Bristlebird
	Malurus cyaneus	Superb Fairy-wren
	Zosterops lateralis	Silvereye
	Melithreptus lunatus	White-naped Honeyeater
	Lichenostomus virescens	Singing Honeyeater
	Lichenostomus chrysops	Yellow-faced Honeyeater
	Lichenostomus leucotis	White-eared Honeyeater
	Lichenostomus penicillatus	White-plumed Honeyeater
	Phylidonyris novaehollandiae	New Holland Honeyeater
	Anthochaera chrysoptera	Little Wattlebird
	Anthochaera carunculata	Red Wattlebird
	Anthus novaeseelandiae	Australasian Pipit
	Neochmia temporalis	Red-browed Finch
v/L	*Stagonopleura guttata*	Diamond Firetail
	Strepera versicolor	Grey Currawong
	Cracticus torquatus	Grey Butcherbird
	Gymnorhina tibicen	Australian Magpie
	Corvus coronoides	Australian Raven
	Corvus mellori	Little Raven
*	*Turdus merula*	Common Blackbird
*	*Alauda arvensis*	European Skylark
*	*Passer domesticus*	House Sparrow
*	*Carduelis carduelis*	European Goldfinch
*	*Carduelis chloris*	European Greenfinch
*	*Sturnus vulgaris*	Common Starling
	Mammals	
	Tachyglossus aculeatus	Short-beaked Echidna
	Pseudocheirus peregrinus	Common Ringtail Possum
	Wallabia bicolor	Black Wallaby
	Tadarida australis	White-striped Freetail Bat
CR/en/L	*Miniopterus schreibersii bassanii*	Southern Bent-wing Bat
	Rattus lutreolus	Swamp Rat
*	*Oryctolagus cuniculus*	European Rabbit
*	*Cervus dama*	Fallow Deer

Status	Scientific Name	Common Name
*	*Vulpes vulpes*	Red Fox
	Reptiles	
	Lampropholis guichenoti	Garden Skink
	Tiliqua scincoides	Common Blue-tongued Lizard
	Drysdalia coronoides	White-lipped Snake
	Notechis scutatus	Tiger Snake
	Eulamprus tympanum tympanum	Southern Water Skink
	Austrelaps superbus	Lowland Copperhead
	Pseudemoia pagenstecheri	Tussock Skink
	Frogs	
	Limnodynastes dumerilii	Southern Bullfrog
	Limnodynastes peronii	Striped Marsh Frog
	Limnodynastes tasmaniensis	Spotted Marsh Frog
	Crinia signifera	Common Froglet
	Litoria ewingii	Southern Brown Tree Frog

Table A4.1.2. Terrestrial fauna recorded from the Heytesbury site during the current assessment (listed in taxonomic order)

Status	Scientific name	Common name
	Birds	
	Falco berigora	Brown Falcon
	Hieraaetus morphnoides	Little Eagle
	Calyptorhynchus funeres	Yellow-tailed Black Cockatoo
	Cactua galerita	Sulphur crested Cockatoo
	Cactua roseicapilla	Galah
	Neophema chrysostoma	Blue Winged Parrot
	Colluricincla harmonica	Grey Shrike Thrush
	Tadorna tadornoides	Australian Shelduck
	Threskiornis molucca	White Ibis
	Malurus cyaneus	Superb Fairy Wren
	Rhipidura albiscarpa	Grey Fan Tail
	Anthochaera carunculata	Red Wattle Bird
	Hirundo neoxena	Welcome Swallow
	Rhipidura leucophrys	Willie Wagtail
	Petroica phoenicea	Flame Robin
	Grallina cyanoleuca	Magpie-lark
	Gymnorhina tibicen	Australian Magpie
	Corvus coronoides	Australian Raven
	Platycercus elegans	Crimson Rosella
	Anas superciliosa	Pacific Black Duck
	Alauda arvensis	Eurasian Skylark
	Egretta novaehollandiae	White Faced Herron
	Anthus novaeseelandiae	Richards Pipit
	Petroica rosea	Pink Robin
*	*Turdus merula*	Common Blackbird
*	*Alauda arvensis*	Skylark
*	*Sturnus vulgaris*	Common Starling
	Frogs	
	Limnodynastes tasmaniensis	Spotted Marsh Frog
	Crinia signifera	Common Froglet
	Mammals	
*	*Oryctolagus cuniculus*	Rabbit
*	*Vulpes vulpes*	Red Fox

Table A4.1.3. Aquatic fauna recorded from each survey location, Heytesbury site, during the current assessment

Status	Scientific Name	Common Name	Site Code				
			1	**2**	**3**	**4**	**5**
	Fish						
	Anguilla australis	Southern Shortfin Eel		3	11	23	13
	Galaxias maculatus	Common Galaxias		59	41	53	130
	Galaxias truttaceous	Spotted Galaxias				1	
	Nannoperca australis	Southern Pygmy Perch	59	11			12
	Pseudophritis urvilli	Tupong		2		1	
	Decapod Crustaceans						
en	*Geocharax gracilis*	Otways Cray	27		9		14
	Paratya australiensis	Freshwater Shrimp		8			

Table A4.1.4. Aquatic habitat assessment data recorded from each survey location, Heytesbury site, during the current assessment

	SITE CODE				
HABITAT CHARACTERISTICS	**1**	**2**	**3**	**4**	**5**
Water body type	Stream	Stream	Stream	Stream	Stream
Mean waterbody width (m)	2	4.5	2.5	2.5	2.25
Max. waterbody depth (m)	1.5	1.5	1.25	1.5	1.5
Land type/use	Agriculture	Agriculture	Agriculture	Agriculture	Agriculture
Water Quality					
pH (units)	8.06	8.28	8.29	7.43	8.3
Turbidity (NTU)	6.9	33.1	27.5	79.1	35
Temperature (˚C)	14.46	14.6	13.7	12.85	17.16
Electrical Conductivity (µS/cm)	0.953	0.817	0.761	0.712	0.884
Dissolved Oxygen (mg/L)	11.54	8.85	11.31	7.43	10.69
Substrate (% composition)					
Bedrock					
Boulder					
Cobble	5				
Pebble	10				
Gravel	10		5		
Sand	5	5	10	5	5
Silt/Clay	70	95	85	95	95
Flow type (=100%)					
Rapid/cascade					
Run		10	10	10	10
Riffle	20				5
Glide		35	50	60	30
Pool	80	55	40	30	50
Backwater					5
Dam/Wetland/Lake					
Tidal					
Other					
Instream cover (% wetted area)					
Substrate (Rock, etc)					
Logs	2	5	5	5	5
Log jams			5		
Branches	5	10	5	5	5
Branch piles		5	5		5
Leaves, organic debris	15	15	15	20	20
Overhanging bank	5	5	5	5	5
Overhanging vegetation	10	5	5	10	5
Urban rubbish					
Aquatic vegetation	5	10	10	5	10
Willow roots	20	10			
Other					

HABITAT CHARACTERISTICS	*SITE CODE* 1	2	3	4	5
Width of Riparian Zone (m)	11	4.5	1.5	20	3
Structural composition (% cover)					
Trees	20-50	50-80	20-50	50-80	20-50
Shrubs	20-50	<20	<20	20-50	20-50
Ground Cover	50-80	50-80	>80	20-50	50-80
Exotic vegetation (%)					
Trees	41-60	11-40	41-60	1-10	11-40%
Shrubs	41-60	>60	>60	>60	11-40%
Ground Cover	>60	>60	>60	>60	>60
Shading of waterbody (%)	26-50	26-50	6-25 %	6-25%	6-25%
Aquatic Vegetation (%)					
Submerged	5		5	30	5
Floating					
Emergent	60	95	85	70	90
Filamentous algae	35	5	10		5
Charaphyte					
Flow Status	Suboptimal	Suboptimal	Suboptimal	Suboptimal	Suboptimal
Disturbance					
Disturbance Rating	High	High	High	High	High
Major forms of disturbance	Sedimentation, Exotic Vegetation, Culvert, Riparian Vegetation Clearance.	Riparian Vegetation Clearance, Invasive exotic vegetation.	Bank Erosion, Riparian Vegetation Clearance	Invasive exotic vegetation.	Riparian Vegetation clearance, Bank Erosion, Invasive exotic vegetation

A4.2 Significant fauna species

Includes national and state significant species from the following sources:

- DSE Victorian Biodiversity Atlas
- DSEWPC database (PMST accessed on 17.11.2010)
- Birds Australia data search
- VAF data search
- Current survey

Search area is 5 km radius. .

Australian status:

CR	Critically Endangered (EPBC Act)
EN	Endangered (EPBC Act)
VU	Vulnerable (EPBC Act)

Victorian status:

cr	critically endangered (DSE 2007, 2009)
en	endangered (DSE 2007, 2009)
vu	vulnerable (DSE 2007, 2009)
nt	near threatened (DSE 2007, 2009)
L	listed as threatened under FFG Act

Most recent record:

#	species predicted to occur by the PMST (not recorded on other databases unless dated)
##	species predicted to occur based on natural distributional range and suitable habitat despite lack of records in the databases searched
Year	recorded on databases listed above
2009/10	recorded during current survey

Likelihood of occurrence: – refer to section 2.1.2

Table A4.2.1. Fauna of national or state significance recorded, or predicted to occur, within 5km of the study area, Halladale and Black Watch Proposed Well Site (listed in taxonomic order)

Scientific Name	Common Name	Aust. status	Vic. status	Most recent record	Likelihood of occurrence in study area
National Signficance					
Pterodroma mollis	Soft-plumaged Petrel	VU		#	Negligible
Halobaena caerulea	Blue Petrel	VU		#	Negligible
Pachyptila turtur	Fairy Prion	VU	vu	2002	Negligible
Diomedea exulans	Wandering Albatross	VU	en/L	1999/#	Negligible
Thalassarche chrysostoma	Grey-headed Albatross	VU	vu/L	#	Negligible
Thalassarche cauta	Shy Albatross	VU	vu/L	#	Negligible
Rostratula australis	Australian Painted Snipe	VU	cr/L	#	Medium
Neophema chrysogaster	Orange-bellied Parrot	CR	cr/L	#	Recorded (previous)
Lathamus discolor	Swift Parrot	EN	en/L	#	Negligible
Diomedea exulans gibsoni	Gibson's Albatross	VU		#	Negligible
Macronectes giganteus	Southern Giant-Petrel	EN	vu/L	#	Negligible
Diomedea bulleri	Buller's Albatross	VU	L	#	Negligible
Macronectes halli	Northern Giant-Petrel	VU	nt/L	#	Negligible
Diomedea epomophora	Royal Albatross	VU	vu/L	#	Negligible
Dasyurus maculatus	Spot-tailed Quoll	EN	en/L	#	Negligible
Isoodon obesulus obesulus	Southern Brown Bandicoot	EN	nt	#/1987	Medium
Potorous tridactylus	Long-nosed Potoroo	VU	en/L	#/1982	Low

Scientific Name	Common Name	Aust. status	Vic. status	Most recent record	Likelihood of occurrence in study area
Pteropus poliocephalus	Grey-headed Flying-fox	VU	vu/L	#/1966	Low
Miniopteris schreibersii bassanii	Southern Bent-wing Bat	CR	en/L	#	Recorded
Pseudomys fumeus	Smoky Mouse	EN	cr/L	#	Negligible
Eubalaena australis	Southern Right Whale	EN	cr/L	1985	Negligible
Caretta caretta	Loggerhead Turtle	EN		#	Negligible
Dermochelys coriacea	Leathery Turtle	VU	cr/L	#/1989	Negligible
Litoria raniformis	Growling Grass Frog	VU	en/L	#	Medium
Thalassarche salvini	Salvin's Albatross	VU		#	Negligible
Diomedea sanfordi	Northern Royal Albatross	EN	vu	#	Negligible
Diomedea amsterdamensis	Amsterdam Albatross	EN		#	Negligible
Diomedea dabbenena	Tristan Albatross	EN		#	Negligible
Diomedea exulans amsterdamensis	Amsterdam Albatross	EN		#	Negligible
Diomedea exulans exulans	Tristan Albatross	EN		#	Negligible
State Significance					
Coturnix ypsilophora	Brown Quail		nt	2009	Recorded
Porzana pusilla	Baillon's Crake		vu/L	2009	Recorded
Morus serrator	Australasian Gannet		nt/L	2009	Negligible
Gelochelidon nilotica	Gull-billed Tern		en/L	1998	High
Sternula albifrons	Little Tern		vu/L	#	Negligible
Haematopus fuliginosus	Sooty Oystercatcher		nt	2009	Negligible
Thinornis rubricollis	Hooded Plover		vu/L	2009/#	Negligible
Gallinago hardwickii	Latham's Snipe		nt	#	High
Platalea regia	Royal Spoonbill		vu	2002/#	High
Egretta gazetta	Little Egret		en/L	1994	High
Ardea modesta	Eastern Great Egret		vu/L	2002	High
Nycticorax caledonicus	Nankeen Night Heron		nt	1994	High
Botaurus poiciloptilus	Australasian Bittern		en/L	2002	Low
Anseranas semipalmata	Magpie Goose		nt/L	#	Medium
Anas rhynchotis	Australasian Shoveler		vu	2002	Medium
Aythya australis	Hardhead		vu	2002	Recorded previously
Accipiter novaehollandiae	Grey Goshawk		vu/L	1980	High
Haliaeetus leucogaster	White-bellied Sea-Eagle		vu/L	2004/#	High
Alcedo azurea	Azure Kingfisher		nt	1999	Negligible
Stagonopleura guttata	Diamond Firetail		vu/L	2000	High
Dasyornis broadbenti caryochrous	Rufous Bristlebird (Otways ssp.)		nt/L	2009	Medium
Sminthopsis leucopus	White-footed Dunnart		nt/L	1980	Medium
Antechinus minimus	Swamp Antechinus		nt/L	##	Low
Pseduemoia rawlinsoni	Glossy Grass Skink		nt	##	Medium
Egernia coventryi	Swamp Skink		vu/L	##	Medium
Pseudophryne semimarmorata	Southern Toadlet		vu	1979	High
Acrodipsas brisbanensis	Large Ant Blue		en/L	1760	Negligible

Table A4.2.2. Fauna of national or state significance recorded, or predicted to occur, within the local area, Heytesbury site (listed in taxonomic order)

Scientific name	Common name	Aust. status	Vic. status	Most recent record	Likelihood of occurrence in study area
National significance					
Thalassarche cauta	Shy Albatross	VU	vu/L	1979	Negligible
Rostratula australis	Australian Painted Snipe	VU	cr/L	#	Low
Neophema chrysogaster	Orange-bellied Parrot	CR	cr/L	1999/#	Negligible
Lathamus discolour	Swift Parrot	EN	en/L	#	Negligible
Dasyurus maculatus	Spot-tailed Quoll	EN	en/L	#	Negligible
Isoodon obesulus obesulus	Southern Brown Bandicoot	EN	nt	#	Low
Potorous tridactylus	Long-nosed Potoroo	VU	en/L	#	Negligible
Pteropus poliocephalus	Grey-headed Flying-fox	VU	vu/L	#	Low
Miniopteris schreibersii bassanii	Southern Bent-wing Bat	CR	en/L	#	High
Pseudomys fumeus	Smoky Mouse	EN	cr/L	#	Negligible
Litoria raniformis	Growling Grass Frog	VU	en/L	#	Medium
Prototroctes maraena	Australian Grayling	VU	vu/L	#	Low
Galaxiella pusilla	Dwarf Galaxias	VU	vu/L	#	Low
Nannoperca obscura	Yarra Pygmy Perch	VU	nt/L	##	Low
State Significance					
Phalacrocorax fuscescens	Black-faced Cormorant		nt	1979	Negligible
Phalacrocorax varius	Pied Cormorant		nt	1977	Negligible
Morus serrator	Australasian Gannet		nt/L	1980	Negligible
Chlidonias hybridus	Whiskered Tern		nt		Medium
Hydroprogne caspia	Caspian Tern		nt/L	1979	Unlikely
Thalaseus bergii	Crested Tern		nt	1980	Unlikely
Actitis hypoleucos	Common Sandpiper		vu	1979	Unlikely
Gallinago hardwickii	Latham's Snipe		nt	#	High
Grus rubicunda	Brolga		vu/L	1978	Unlikely
Platalea regia	Royal Spoonbill		vu	2002	Medium
Egretta garzetta	Little Egret		en/L		Medium
Ardea modesta	Eastern Great Egret		vu/L	2000/#	Medium
Nycticorax caledonicus	Nankeen Night Heron		nt	2003	Medium
Aythya australis	Hardhead		vu		Unlikely
Oxyura australis	Blue-billed Duck		en/L	1978	Unlikely
Circus assimilis	Spotted Harrier		nt	2003	High
Accipiter novaehollandiae	Grey Goshawk		vu/L	2006	High
Haliaeetus leucogaster	White-bellied Sea-Eagle		vu/L	#	Negligible
Dasyornis broadbenti caryochrous	Rufous Bristlebird (Otways ssp.)		nt/L	2005	Unlikely
Pseudophryne semimarmorata	Southern Toadlet		vu		High
Neochanna cleaveri	Australian Mudfish		cr	##	Low
Engaeus sericatus	Hairy Burrowing Cray		vu	1982	Medium
Geocharax gracilis	Otways Cray		en/L	2010	Recorded

A4.3. Migratory species

Includes records from the following sources:

- DSE Victorian Biodiversity Atlas
- DSEWPC database (PMST accessed on 17.11.2010)
- Birds Australia data search
- Current survey

Search area is 5 km radius.

Most recent record:

#	species predicted to occur by the PMST (not recorded on other databases unless dated)
Year	recorded on databases listed above
2010	recorded during current survey

Table A4.3.1. Migratory fauna species recorded, or predicted to occur, within 5 kilometres of the Halladale and Black Watch Proposed Well Site

Scientific Name	Common Name	Most recent record
Scientific Name	**Common Name**	
Ardenna tenuirostris	Short-tailed Shearwater	#/1978
Diomedea exulans	Wandering Albatross	1999/#
Thalassarche chrysostoma	Grey-headed Albatross	#
Thalassarche cauta	Shy Albatross	#
Sternula albifrons	Little Tern	#
Gallinago hardwickii	Latham's Snipe	#
Rostratula australis	Australian Painted Snipe	#
Ardea modesta	Eastern Great Egret	2002/#
Haliaeetus leucogaster	White-bellied Sea-Eagle	2004/#
Neophema chrysogaster	Orange-bellied Parrot	#
Merops ornatus	Rainbow Bee-eater	#
Hirundapus caudacutus	White-throated Needletail	#
Apus pacificus	Fork-tailed Swift	#
Rhipidura rufifrons	Rufous Fantail	#
Myiagra cyanoleuca	Satin Flycatcher	#
Diomedea exulans gibsoni	Gibson's Albatross	#
Macronectes giganteus	Southern Giant-Petrel	#
Diomedea bulleri	Buller's Albatross	#
Macronectes halli	Northern Giant-Petrel	#
Diomedea epomophora	Royal Albatross	#
Ardea ibis	Cattle Egret	#
Eubalaena australis	Southern Right Whale	1985
Physeter macrocephalus	Sperm Whale	1998
Orcinus orca	Killer Whale	1988
Caretta caretta	Loggerhead Turtle	#
Dermochelys coriacea	Leathery Turtle	#/1989
Diomedea sanfordi	Northern Royal Albatross	#
Thalassarche salvini	Salvin's Albatross	#
Diomedea amsterdamensis	Amsterdam Albatross	#
Diomedea dabbenena	Tristan Albatross	#
Diomedea exulans amsterdamensis	Amsterdam Albatross	#
Diomedea exulans exulans	Tristan Albatross	#
Thalassarche impavida	Campbell Albatross	#

Table A4.3.2. Migratory fauna species recorded, or predicted to occur, within 5 kilometres of the Hetesbury site

Scientific Name	Common Name	Most recent record
Ardenna tenuirostris	Short-tailed Shearwater	1979
Thalassarche cauta	Shy Albatross	1979
Hydroprogne caspia	Caspian Tern	1979
Stercorarius parasiticus	Arctic Jaeger	1979
Charadrius bicinctus	Double-banded Plover	
Actitis hypoleucos	Common Sandpiper	1979
Calidris ruficollis	Red-necked Stint	
Gallinago hardwickii	Latham's Snipe	#
Rostratula australis	Australian Painted Snipe	#
Ardea modesta	Eastern Great Egret	2000/#
Haliaeetus leucogaster	White-bellied Sea-Eagle	#
Neophema chrysogaster	Orange-bellied Parrot	1999/#
Merops ornatus	Rainbow Bee-eater	#
Hirundapus caudacutus	White-throated Needletail	2004/#
Apus pacificus	Fork-tailed Swift	2001/#
Rhipidura rufifrons	Rufous Fantail	#
Myiagra cyanoleuca	Satin Flycatcher	2004/#
Acrocephalus stentoreus	Clamorous Reed Warbler	1981
Ardea ibis	Cattle Egret	2004/#

APPENDIX 5

Legislation, Government Policy & Strategies

Following is an outline of the Government legislation and policies directly relevant to this assessment.

Commonwealth

Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) applies to developments and associated activities that have the potential to significantly impact on matters protected under the Act.

Under the Act, unless exempt, actions require approval from the Australian Government Minister for Environment, Heritage and the Arts if they are likely to significantly impact on a 'matter of national environmental significance' (NES). Matters of NES are:

- World Heritage properties;
- National Heritage places;
- Listed threatened species and ecological communities;
- Listed migratory species;
- Wetlands of international importance (Ramsar sites);
- The Commonwealth marine environment; and
- Nuclear actions (including uranium mining).

The EPBC Act also applies to the environment in general if actions are taken on Commonwealth land, or if actions that are taken outside Commonwealth land will impact on the environment of Commonwealth land.

Any person proposing to take an action that may, or will, have a significant impact on a matter of NES must refer the action to the Commonwealth Government Minister for Environment, Heritage and the Arts for determination as to whether or not the action is a 'Controlled Action.' 'Significant impacts' are defined in *Matters of National Environmental Significance: Significant Impact Guidelines 1.1* (DEWHA 2009).

State

Flora and Fauna Guarantee Act 1988

The primary legislation dealing with biodiversity conservation and sustainable use of native flora and fauna is the *Flora and Fauna Guarantee Act 1988* (FFG Act).

The FFG Act provides for the listing of taxa (genera, species, subspecies, varieties) and communities of flora and fauna which are threatened, and of potentially threatened processes. The Act includes a list of Protected Flora, to which flora taxa and species of listed communities are added. The Act contains powers over the taking, trading and keeping of listed fish.

The protected flora list has three sources:

- plant taxa (species, subspecies or varieties) listed as threatened under the Flora and Fauna Guarantee Act 1988;
- plant taxa belonging to communities listed as threatened under the Flora and Fauna Guarantee Act 1988;
- plant taxa which are not threatened but require protection for other reasons.

Critical Habitat on private land can be declared under the Act for either a species or an ecological community. In areas of Critical Habitat, the Minister for Sustainability and Environment can impose an Interim Conservation Order (ICO). However, there have been no areas of Critical Habitat identified in Victoria. and consequently there are no ICOs.

A permit is required from DSE to 'take' (kill, injure, disturb or collect) protected flora species, including members of listed communities, from public land, or from areas of defined Critical Habitat on private land.

A permit is required from DSE to 'take' listed fish species.

A permit is not required to ‘take’ listed fauna or members of a listed fauna community under the FFG Act. Controls in relation to protection of fauna are provided under the *Wildlife Act* 1975 and the Wildlife Regulations 2002 (see below).

Catchment and Land Protection Act 1994

The *Catchment and Land Protection Act 1994* (CaLP Act) identifies and classifies certain species as noxious weeds or pest animals, and sets up a system of controls on noxious species. It identifies the responsibilities of land owners (Section 20), which may include public authorities in the case of Crown Land.

Section 58 provides for the classification and declaration of pest plants (state prohibited weeds, regionally prohibited weeds, regionally controlled weeds or restricted weeds) and prohibited, controlled, regulated or established pest animals.

Landowners must take all reasonable steps to eradicate regionally prohibited weeds, prevent the growth and spread of regionally controlled weeds; and

prevent the spread of, and as far as possible eradicate, established pest animals on their land.

Except in some circumstances, a land owner must take all reasonable steps to prevent the spread of regionally controlled weeds and established pest animals on a roadside that adjoins the land owner's land.

Landowners include registered proprietors and owners of private land; occupiers of Crown land; Roads Corporation if the land is an arterial road or freeway; Director of National Parks if the land is managed under the National Parks Act, and for other Crown Land, the Minister or public authority if they are the managers of that land.

In addition to the duties imposed on the Secretary of DSE as a land owner, the Secretary must:

"(1) take all reasonable steps to eradicate State prohibited weeds from all land in the State".

(2) In relation to roadsides on Crown land the Secretary must take all reasonable steps to eradicate regionally prohibited weeds, except for freeways and arterial roads; and Crown land held under a lease or licence.

Planning and Environment Act 1987

The *Planning and Environment Act 1987* controls the planning and development of land in Victoria. The Act provides for the development of a planning scheme for all municipalities. Planning schemes follow a standard format and contain state and local components. The Victoria Planning Provisions (VPP) comprise the standard State sections - the State Planning Policy Framework (SPPF Clauses 10 to 19), Particular Provisions (Clauses 51 to 56) and General Provisions (Clauses 60 to 67).

The planning authority provides the local planning policy content, and applies the relevant zones and overlays to particular areas for a particular planning scheme.

Municipal planning schemes include controls over the removal of native vegetation, including permit requirements, as follows:

Clause 15 contains higher order objectives, strategies and implementation measures for the conservation of the environment, including waterways, flora and fauna. Clause 15.09 states that "*Planning and responsible authorities must have regard to Victoria's Native Vegetation Management – A Framework for Action (Department of Natural Resources and Environment 2002).*

Clause 52.17 requires a planning permit to remove, destroy or lop native vegetation including dead native vegetation. This does not apply (to the removal of native vegetation to the minimum extent necessary) if any item in the table of exemptions (Clause 52.17-6) is applicable, or to specific native vegetation or a specific area as specified in a schedule to Clause 52.17, or if clearance is in accordance with a native vegetation precinct plan.

Clause 65.02 requires consideration of native vegetation retention in subdivision applications.

Additional permit requirements may apply under overlays introduced into an individual planning scheme, such as a Vegetation Protection Overlay, or Environmental Significance Overlay.

DSE is a mandatory referral authority in some circumstances involving permit applications for native vegetation removal. Under Clause 66.02, the removal of more than 0.5 hectares of endangered, vulnerable or rare vegetation types or more than 1.0 hectare of a depleted or least concern vegetation type must be referred to the Department. DSE is also a referral authority if the removal of more than 5 trees of greater than 40 cm DBH OR more than 15 trees of less than 40 cm DBH is proposed.

Native Vegetation Management Framework

The *Native Vegetation Management Framework* (NRE 2002) is State Government policy for the protection, enhancement and revegetation of native vegetation in Victoria. Native vegetation provisions were introduced to all planning schemes in 1989 and the Framework was incorporated into the Victoria Planning Provisions in 2003. The primary goal of the Framework is:

> *a reversal, across the whole landscape, of the long-term decline in the extent and quality of native vegetation, leading to a Net Gain* (NRE 2002).

There is a three step approach to applying Net Gain (NRE 2002: 23) as outlined in the Framework. The steps are:

1. To avoid adverse impacts, particularly through vegetation clearance.
2. If impacts cannot be avoided, to minimise impacts through appropriate consideration in planning processes and expert input to project design or management.
3. Identify appropriate offset options.

Where an application is made to remove native vegetation, a proponent for a development must provide information about the site, topography and land

features and vegetation proposed to be removed, and explain the steps that have been taken to:

- Avoid the removal of native vegetation, where possible
- Minimise the removal of native vegetation.
- Appropriately offset the loss of native vegetation, if required.

A proponent for a development must demonstrate that the option to avoid and minimise vegetation clearance has been fully explored before considering offsets

An offset may be achieved by improvements in the quality or extent of native vegetation in a selected 'offset area', either within a project area or off-site. An area that is revegetated and protected or set aside for natural regeneration may provide some, or all, of the required offset. The conservation significance of vegetation to be removed is also taken into account when offsets are determined.

Regional Native Vegetation Plans

Native Vegetation Plans have been prepared to develop a strategic and co-ordinated approach to the management of native vegetation within a given Catchment Management Authority region. The plans are designed to complement the Native Vegetation Management Framework and contains specific information and objectives relating to the region.

The Native Vegetation Plans outline strategic directions including:

- Retaining the quantity of native vegetation by minimising clearing;
- Protecting native vegetation with reservation and management agreements;
- Maintaining and improve the quality of native vegetation; and
- Increasing the quantity of native vegetation.

Responses and offset requirements for clearing native vegetation are outlined. Tree offsets that are not covered by the Framework replacement ratios are calculated using the Regional Native Vegetation Plan where available.

Wildlife Act 1975 and associated Regulations

The *Wildlife Act 1975* is the primary legislation in Victoria providing for protection and management of wildlife. For the purposes of the Act, wildlife means indigenous vertebrate species (except those declared as pest animals), invertebrate species listed under the FFG Act, and some introduced game species.

The *Wildlife Regulations 2002* of the Act prescribe the penalties for certain activities relevant to wildlife. These include penalties for persons who wilfully damage, disturb or destroy any wildlife habitat without appropriate authorisation (Section 9 of the *Wildlife Regulations 2002*). Authorisation for habitat removal may be obtained under the Wildlife Act; through a licence granted under the *Forests Act 1958*; or under any other Act.

Authorisation to destroy or possess wildlife may be required (Sections 41– 47) if wildlife needs to be moved or destroyed during development.

Water Act 1989

The primary purpose of this Act is to provide a framework for the allocation and management of surface water and groundwater throughout Victoria. The Act and its amendments provide for the integrated management of all elements of the terrestrial phase of the water cycle, ensures the conservation and sustainable management of water resources, and provides a formal means for the protection and enhancement of the environmental qualities of waterways and their in-stream uses throughout Victoria. The Act also provides the basis for Rural Water Authorities and Catchment Management Authorities to undertake management of works on waterways, as well as floodplain management and regional drainage functions.

Any construction or maintenance activity that affects beds and banks of waterways, riparian vegetation, quality or quantity of water, requires a licence in accordance with Section 67 (and related sections) of the Act, or a permit or approval from the relevant authority under By Laws established in accordance with Sections 160 and 219 of the Act. Permit /approvals are required as follows:

1. The Corangamite Catchment Management Authority operates a Works on Waterways Permit scheme. Works on waterways guidelines and application forms are available online (insert links). Guidelines and application forms are available online: (http://ccmavicgovau.ozstaging.com/What-we-do/Water/Works-on-Waterways/Application-Forms.aspx).

Environment Protection Act 1970

State Environment Protection Policies (SEPPs) are subordinate legislation made under the provisions of the Environment Protection Act 1970 and provide more detailed requirements and guidance for the application of the Act to Victoria (http://www.epa.vic.gov.au).

State Environmental Protection Policy (Waters of Victoria) 2003.

The SEPP Waters of Victoria details the uses and values of surface water environments (beneficial uses), identifies indicators (environmental quality objectives) and outlines actions required to protect them (attainment program). The policy provides a legal framework for state and local government agencies, businesses and communities to work together to protect and rehabilitate Victoria's surface water environments. Waters of Victoria incorporates schedules for particular water bodies and catchments, for example, the Yarra River and its tributaries. These provide additional requirements.

Aquatic ecosystems is the key beneficial use of relevance to biodiversity.

Impacts to surface water quality must not result in changes that exceed water quality objectives specified to protect beneficial uses. In the case of modified systems or where natural variation precludes this attainment, the background level becomes the objective.

Key policy clauses relevant to land development are:

- 43 - Surface water management and works. Key aspects of this clause are:
  - Minimise unnatural erosion, sediment re-suspension and other risks to aquatic habitat.
  - Ensure that existing and new in situ structures do not pose a barrier to fish movement.

- 53 – Aquatic and riparian vegetation protection and rehabilitation. Key aspects of this clause are:
  - Minimise the removal of, and rehabilitate native vegetation within or adjacent to surface waters.

- 56 - Construction activities. Key aspects of this clause are:
  - Minimise soil erosion, land disturbance and discharge of sediment and other pollutants to surface waters.
  - Where construction activities impinge on surface waters, construction managers need to monitor affected surface waters to assess whether beneficial uses are being protected.

Relevant clauses of the Attainment Program must also be adhered to. Of particular relevance to this project is:

- 18 – Environmental management of activities.
  - Requires effective environmental management to be applied to all stages of planning and operating new and existing activities to ensure that the significant risk of adverse environmental impacts is minimised.

Regional Catchment Strategies

Corangamite Regional Catchment Strategy (2004)

State Planning Policy Framework Clause 15.01 (Protection of catchments, waterways and groundwater) states that planning and responsible authorities must have regard for the objectives of the *Corangamite Regional Catchment Strategy* (CCMA, 2004), such as:

- *By 2020 nitrogen, phosphorous and sediment loads at the end of valley target sites in the four river basins will be 30% less than 2003 levels.*
- *Ensure that land management practices are not degrading surface water supplies by 2020.*

River Health Strategies

Corangamite River Health Strategy

This Regional River Health Strategy (2007)-sits under the Regional Catchment Strategy (PPWCMA, 2004).

The *Corangamite River Health Strategy* (CCMA, 2006) provides further recommendations on the protection of existing high-value rivers and creeks that are in good condition and strategic improvement of other rivers and creeks, including:

- *Reduction in nutrient loads at key monitoring sites within catchments Reduction in sediment loads at key monitoring sites within the catchments*

APPENDIX 6

EVC Benchmarks

(http://www.dse.vic.gov.au/dse/nrence.nsf/)

Department of Sustainability and Environment

EVC/Bioregion Benchmark for Vegetation Quality Assessment

Warrnambool Plain bioregion

EVC 48: Heathy Woodland

Description:
Spans a variety of geologies but is generally associated with nutrient-poor soils including deep uniform sands (aeolian or outwash) and Tertiary sand/clay which has been altered to form quartzite gravel. Eucalypt-dominated low woodland to 10 m tall lacking a secondary tree layer and generally supporting a diverse array of narrow or ericoid-leaved shrubs except where frequent fire has reduced this to a dense cover of bracken. Geophytes and annuals can be quite common but the ground cover is normally fairly sparse.

Large trees:

Species	DBH(cm)	#/ha
Eucalyptus spp.	60 cm	15 / ha

Tree Canopy Cover:

%cover	Character Species	Common Name
15%	*Eucalyptus obliqua*	Messmate Stringybark

Understorey:

Life form	#Spp	%Cover	LF code
Immature Canopy Tree		5%	IT
Medium Shrub	7	30%	MS
Small Shrub	4	5%	SS
Prostrate Shrub	2	1%	PS
Medium Herb	4	10%	MH
Small or Prostrate Herb	1	1%	SH
Large Tufted Graminoid	1	5%	LTG
Large Non-tufted Graminoid	1	1%	LNG
Medium to Small Tufted Graminoid	3	5%	MTG
Medium to Tiny Non-tufted Graminoid	1	5%	MNG
Ground Fern	2	5%	GF
Bryophytes/Lichens	na	10%	BL
Soil Crust	na	10%	S/C
Total understorey projective foliage cover		**75%**	

EVC 48: Heathy Woodland - Warrnambool Plain bioregion

LF Code	Species typical of at least part of EVC range	Common Name
MS	*Leptospermum continentale*	Prickly Tea-tree
MS	*Banksia marginata*	Silver Banksia
MS	*Epacris impressa*	Common Heath
MS	*Leptospermum myrsinoides*	Heath Tea-tree
SS	*Tetratheca ciliata*	Pink-bells
SS	*Platylobium obtusangulum*	Common Flat-pea
SS	*Dillwynia glaberrima*	Smooth Parrot-pea
SS	*Amperea xiphoclada var. xiphoclada*	Broom Spurge
PS	*Acrotriche serrulata*	Honey-pots
PS	*Xanthosia dissecta s.l.*	Cut-leaf Xanthosia
MH	*Gonocarpus tetragynus*	Common Raspwort
MH	*Viola hederacea sensu Willis (1972)*	Ivy-leaf Violet
MH	*Drosera peltata ssp. peltata*	Pale Sundew
MH	*Burchardia umbellata*	Milkmaids
SH	*Goodenia lanata*	Trailing Goodenia
LTG	*Xanthorrhoea australis*	Austral Grass-tree
LNG	*Tetrarrhena juncea*	Forest Wire-grass
MTG	*Poa sieberiana*	Grey Tussock-grass
MTG	*Patersonia fragilis*	Short Purple-flag
MTG	*Lepidosperma concavum*	Sandhill Sword-sedge
MTG	*Dianella revoluta s.l.*	Black-anther Flax-lily
MNG	*Empodisma minus*	Spreading Rope-rush
MNG	*Tetrarrhena distichophylla*	Hairy Rice-grass
MNG	*Hypolaena fastigiata*	Tassel Rope-rush
GF	*Pteridium esculentum*	Austral Bracken
GF	*Lindsaea linearis*	Screw Fern
SC	*Cassytha glabella*	Slender Dodder-laurel

Recruitment:
Episodic/Fire. Desirable period between disturbances is 20 years.

Organic Litter:
40 % cover

Logs:
15 m/0.1 ha.

Weediness:
There are no consistent weeds in this EVC.

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Department of Sustainability and Environment

EVC/Bioregion Benchmark for Vegetation Quality Assessment

Victorian Volcanic Plain bioregion

EVC 793: Damp Heathy Woodland

Description:
Woodland to 10 m tall with tall dense heathy understorey which becomes tall scrub if long unburnt in high rainfall areas. The ground layer consists of grasses, herbs, small shrubs and tough-leaved monocots. Developed on sandy soils of moderate to low fertility, typically wet in winter due to impeding layer in soil and dry in summer.

Large trees:

Species	DBH(cm)	#/ha
Eucalyptus spp.	60 cm	10 / ha

Tree Canopy Cover:

%cover	Character Species	Common Name
10%	*Eucalyptus viminalis*	Manna Gum
	Eucalyptus ovata	Swamp Gum
	Eucalyptus willisii	Jimmy's Shining Peppermint

Understorey:

Life form	#Spp	%Cover	LF code
Immature Canopy Tree		5%	IT
Medium Shrub	6	40%	MS
Small Shrub	2	10%	SS
Prostrate Shrub	2	1%	PS
Large Herb	3	5%	LH
Medium Herb	6	10%	MH
Small or Prostrate Herb	4	5%	SH
Large Tufted Graminoid	3	5%	LTG
Large Non-tufted Graminoid	2	5%	LNG
Medium to Small Tufted Graminoid	11	20%	MTG
Medium to Tiny Non-tufted Graminoid	3	15%	MNG
Bryophytes/Lichens	na	10%	BL

LF Code	Species typical of at least part of EVC range	Common Name
MS	*Leptospermum continentale*	Prickly Tea-tree
MS	*Epacris impressa*	Common Heath
MS	*Acacia verticillata ssp. verticillata*	Prickly Moses
MS	*Allocasuarina paludosa*	Scrub Sheoak
SS	*Leucopogon virgatus*	Common Beard-heath
SS	*Hibbertia riparia*	Erect Guinea-flower
PS	*Astroloma humifusum*	Cranberry Heath
PS	*Bossiaea prostrata*	Creeping Bossiaea
MH	*Viola hederacea sensu Willis (1972)*	Ivy-leaf Violet
SH	*Opercularia varia*	Variable Stinkweed
SH	*Lobelia pratioides*	Poison Lobelia
SH	*Lobelia pedunculata s.l.*	Matted Pratia
SH	*Dichondra repens*	Kidney-weed
LTG	*Deyeuxia quadriseta*	Reed Bent-grass
LTG	*Xanthorrhoea minor ssp. lutea*	Small Grass-tree
LNG	*Lepidosperma longitudinale*	Pithy Sword-sedge
LNG	*Gahnia radula*	Thatch Saw-sedge
MTG	*Dianella tasmanica*	Tasman Flax-lily
MTG	*Schoenus apogon*	Common Bog-sedge
MTG	*Austrodanthonia racemosa var. racemosa*	Stiped Wallaby-grass
MTG	*Lepidosperma laterale var. laterale*	Variable Sword-sedge
MNG	*Lepyrodia muelleri*	Common Scale-rush
MNG	*Microlaena stipoides var. stipoides*	Weeping Grass

Recruitment:
Episodic/Fire. Desirable period between disturbances is 30 years.

Organic Litter:
20 % cover

Logs:
10 m/0.1 ha.

Weediness:

LF Code	Typical Weed Species	Common Name	Invasive	Impact
LH	*Cirsium vulgare*	Spear Thistle	high	high
MH	*Hypochoeris radicata*	Cat's Ear	high	low
MH	*Centaurium erythraea*	Common Centaury	high	low
LNG	*Holcus lanatus*	Yorkshire Fog	high	high
MTG	*Briza minor*	Lesser Quaking-grass	high	low
MTG	*Anthoxanthum odoratum*	Sweet Vernal-grass	high	high

Published by the Victorian Government Department of Sustainability and Environment May 2004

EVC/Bioregion Benchmark for Vegetation Quality Assessment

Warrnambool Plain bioregion

EVC 16: Lowland Forest

Description:
Open forest to 25 m tall characterised by the diversity of species and lifeforms in each stratum. Includes a variety of heathy understorey shrubs. It grows on a wide variety of geology and soils.

Large trees:

Species	DBH(cm)	#/ha
Eucalyptus spp.	70 cm	20 / ha

Tree Canopy Cover:

%cover	Character Species	Common Name
30%	*Eucalyptus baxteri* s.l.	Brown Stringybark
	Eucalyptus obliqua	Messmate Stringybark
	Eucalyptus ovata	Swamp Gum

Understorey:

Life form	#Spp	%Cover	LF code
Immature Canopy Tree		5%	IT
Understorey Tree or Large Shrub	2	10%	T
Medium Shrub	8	25%	MS
Small Shrub	3	5%	SS
Prostrate Shrub	1	1%	PS
Large Herb	2	1%	LH
Medium Herb	6	10%	MH
Small or Prostrate Herb	2	5%	SH
Large Tufted Graminoid	2	5%	LTG
Large Non-tufted Graminoid	1	5%	LNG
Medium to Small Tufted Graminoid	3	5%	MTG
Medium to Tiny Non-tufted Graminoid	2	5%	MNG
Ground Fern	2	10%	GF
Scrambler or Climber	2	1%	SC
Bryophytes/Lichens	na	10%	BL
Total understorey projective foliage cover		**80%**	

EVC 16: Lowland Forest - Warrnambool Plain bioregion

LF Code	Species typical of at least part of EVC range	Common Name
T	*Acacia melanoxylon*	Blackwood
MS	*Leptospermum continentale*	Prickly Tea-tree
MS	*Banksia marginata*	Silver Banksia
MS	*Acacia verticillata*	Prickly Moses
MS	*Acacia mucronata* ssp. *longifolia*	Narrow-leaf Wattle
SS	*Tetratheca ciliata*	Pink-bells
SS	*Amperea xiphoclada* var. *xiphoclada*	Broom Spurge
PS	*Acrotriche serrulata*	Honey-pots
LH	*Pterostylis longifolia* s.l.	Tall Greenhood
LH	*Dipodium punctatum* s.l.	Hyacinth Orchid
MH	*Viola hederacea* sensu Willis (1972)	Ivy-leaf Violet
MH	*Drosera peltata* ssp. *auriculata*	Tall Sundew
MH	*Gonocarpus tetragynus*	Common Raspwort
MH	*Helichrysum scorpioides*	Button Everlasting
SH	*Goodenia lanata*	Trailing Goodenia
LTG	*Lomandra longifolia*	Spiny-headed Mat-rush
LTG	*Gahnia sieberiana*	Red-fruit Saw-sedge
LTG	*Lepidosperma elatius*	Tall Sword-sedge
LNG	*Tetrarrhena juncea*	Forest Wire-grass
MTG	*Lomandra filiformis*	Wattle Mat-rush
MTG	*Poa sieberiana*	Grey Tussock-grass
MTG	*Lepidosperma laterale*	Variable Sword-sedge
MNG	*Microlaena stipoides* var. *stipoides*	Weeping Grass
GF	*Pteridium esculentum*	Austral Bracken
GF	*Lindsaea linearis*	Screw Fern
SC	*Cassytha pubescens* s.s.	Downy Dodder-laurel
SC	*Billardiera scandens*	Common Apple-berry
SC	*Clematis aristata*	Mountain Clematis

Recruitment:
Continuous

Organic Litter:
40% cover

Logs:
20 m/0.1 ha.

Weediness:
There are no consistent weeds in this EVC.

Published by the Victorian Government Department of Sustainability and Environment May 2004

Department of Sustainability and Environment

EVC/Bioregion Benchmark for Vegetation Quality Assessment

Warrnambool Plain bioregion

EVC 53: Swamp Scrub

Description:

Closed scrub to 8 m tall at low elevations on alluvial deposits along streams or on poorly drained sites with high nutrient and water availability. Soils vary from organic loams to fine silts and peats which are inundated during the wetter months of the year and is dominated by either Woolly Tea-tree *Leptospermun lanigerum* and/or Paperbarks *Melaleuca* species which often form a dense impenetrable thicket, out-competing other species. Emergent trees (e.g. Swamp Gum *Eucalyptus ovata*) may some times be present. Where light penetrates to ground level, a moss/lichen/liverwort herbaceous ground cover is often present.

Canopy Cover:

% cover	Character Species	Common Name
50%	*Leptospermum lanigerum*	Woolly Tea-tree
	Melaleuca squarrosa	Scented Paperbark
	Acacia melanoxylon	Blackwood

Understorey:

Life form	# Spp	% Cover	LF code
Medium Shrub	2	10%	MS
Large Herb	3	5%	LH
Medium Herb	1	5%	MH
Small or Prostrate Herb	1	5%	SH
Large Tufted Graminoid	3	30%	LTG
Large Non-tufted Graminoid	1	10%	LNG
Medium to Tiny Non-tufted Graminoid	2	5%	MNG
Ground Fern	2	5%	GF
Scrambler or Climber	1	5%	SC
Bryophytes/Lichens	na	20%	BL

LF Code	Species typical of at least part of EVC range	Common Name
MS	*Leptospermum scoparium*	Manuka
MS	*Melaleuca decussata*	Totem-poles
SS	*Leucopogon virgatus*	Common Beard-heath
LH	*Persicaria decipiens*	Slender Knotweed
LH	*Urtica incisa*	Scrub Nettle
LH	*Senecio odoratus var. odoratus*	Scented Groundsel
MH	*Hydrocotyle pterocarpa*	Wing Pennywort
SH	*Dichondra repens*	Kidney-weed
LTG	*Gahnia trifida*	Coast Saw-sedge
LTG	*Gahnia sieberiana*	Red-fruit Saw-sedge
LTG	*Gahnia clarkei*	Tall Saw-sedge
LTG	*Carex appressa*	Tall Sedge
LNG	*Phragmites australis*	Common Reed
MNG	*Schoenus lepidosperma*	Slender Bog-sedge
GF	*Blechnum minus*	Soft Water-fern
SC	*Muehlenbeckia adpressa*	Climbing Lignum

Recruitment:

Continuous

Organic Litter:

40 % cover

Weediness:

There are no consistent weeds in this EVC.

EVC 53: Swamp Scrub - Warrnambool Plain bioregion

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EVC/Bioregion Benchmark for Vegetation Quality Assessment

Warrnambool Plain bioregion

EVC 165: Damp Heath Scrub

Description:
Shrubland to 3 m tall with occasional emergent eucalypts. Occurs on flat to gently sloping terrain, on or near coastal sites. Generally high rainfall and lack of drainage combine to retain high levels of moisture throughout the year.

Life forms:

Life form	#Spp	%Cover	LF code
Medium Shrub	6	50%	MS
Small Shrub	3	5%	SS
Prostrate Shrub	2	5%	PS
Medium Herb	4	5%	MH
Small or Prostrate Herb	2	1%	SH
Large Tufted Graminoid	2	10%	LTG
Medium to Small Tufted Graminoid	4	15%	MTG
Medium to Tiny Non-tufted Graminoid	2	10%	MNG
Bryophytes/Lichens	na	10%	BL
Soil Crust	na	10%	S/C

LF Code	Species typical of at least part of EVC range	Common Name
MS	*Leptospermum continentale*	Prickly Tea-tree
MS	*Banksia marginata*	Silver Banksia
MS	*Allocasuarina paludosa*	Scrub Sheoak
MS	*Acacia verticillata*	Prickly Moses
SS	*Isopogon ceratophyllus*	Horny Cone-bush
SS	*Pultenaea stricta*	Rigid Bush-pea
SS	*Hibbertia stricta s.l.*	Upright Guinea-flower
SS	*Tetratheca ciliata*	Pink-bells
PS	*Bossiaea prostrata*	Creeping Bossiaea
PS	*Acrotriche serrulata*	Honey-pots
PS	*Xanthosia dissecta s.l.*	Cut-leaf Xanthosia
MH	*Gonocarpus tetragynus*	Common Raspwort
MH	*Viola hederacea sensu Willis (1972)*	Ivy-leaf Violet
MH	*Drosera peltata ssp. auriculata*	Tall Sundew
MH	*Selaginella uliginosa*	Swamp Selaginella
LTG	*Xanthorrhoea australis*	Austral Grass-tree
LTG	*Gahnia trifida*	Coast Saw-sedge
MTG	*Lepidosperma laterale*	Variable Sword-sedge
MTG	*Patersonia fragilis*	Short Purple-flag
MTG	*Lepidosperma filiforme*	Common Rapier-sedge
MTG	*Schoenus apogon*	Common Bog-sedge
MNG	*Schoenus lepidosperma*	Slender Bog-sedge
MNG	*Empodisma minus*	Spreading Rope-rush
GF	*Lindsaea linearis*	Screw Fern

Recruitment:
Episodic/Fire. Desirable period between disturbances is 30 years.

Organic Litter:
40% cover

Weediness:
There are no consistent weeds in this EVC.

Victoria The Place To Be

EVC 165: Damp Heath Scrub - Warrnambool Plain bioregion

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EVC/Bioregion Benchmark for Vegetation Quality Assessment

Warrnambool Plain bioregion

EVC 198: Sedgy Riparian Woodland

Description:
Eucalypt forest or woodland to 15 m tall with sedge-dominated understorey. Occurs on flats along low gradient creeks and drainage lines subject to seasonal inundation and waterlogging in moderately fertile habitats.

Large trees:

Species	DBH(cm)	#/ha
Eucalyptus spp.	70 cm	15 / ha

Tree Canopy Cover:

%cover	Character Species	Common Name
20%	*Eucalyptus ovata*	Swamp Gum
	Eucalyptus obliqua	Messmate Stringybark

Understorey:

Life form	#Spp	%Cover	LF code
Immature Canopy Tree		5%	IT
Medium Shrub	5	30%	MS
Large Herb	1	1%	LH
Medium Herb	7	10%	MH
Small or Prostrate Herb	2	5%	SH
Large Tufted Graminoid	3	30%	LTG
Large Non-tufted Graminoid	1	5%	LNG
Medium to Small Tufted Graminoid	1	1%	MTG
Medium to Tiny Non-tufted Graminoid	3	10%	MNG
Ground Fern	2	10%	GF
Scrambler or Climber	1	1%	SC
Bryophytes/Lichens	na	20%	BL

LF Code	Species typical of at least part of EVC range	Common Name
MS	*Melaleuca squarrosa*	Scented Paperbark
MS	*Bursaria spinosa ssp. spinosa*	Sweet Bursaria
MS	*Coprosma quadrifida*	Prickly Currant-bush
MS	*Ozothamnus ferrugineus*	Tree Everlasting
SS	*Pultenaea stricta*	Rigid Bush-pea
LH	*Villarsia reniformis*	Running Marsh-flower
LH	*Senecio minimus*	Shrubby Fireweed
MH	*Hypericum gramineum*	Small St John's Wort
MH	*Hydrocotyle hirta*	Hairy Pennywort
MH	*Gonocarpus tetragynus*	Common Raspwort
MH	*Lagenophora stipitata*	Common Bottle-daisy
SH	*Leptostigma reptans*	Dwarf Nertera
SH	*Lobelia pedunculata s.l.*	Matted Pratia
SH	*Oxalis exilis*	Shady Wood-sorrel
SH	*Dichondra repens*	Kidney-weed
LTG	*Lepidosperma laterale var. majus*	Variable Sword-sedge
LTG	*Gahnia sieberiana*	Red-fruit Saw-sedge
LTG	*Lomandra longifolia ssp. longifolia*	Spiny-headed Mat-rush
LNG	*Tetrarrhena juncea*	Forest Wire-grass
MTG	*Tetraria capillaris*	Hair Sedge
MTG	*Poa clelandii*	Noah's Ark
MNG	*Tetrarrhena distichophylla*	Hairy Rice-grass
MNG	*Poa tenera*	Slender Tussock-grass
MNG	*Microlaena stipoides var. stipoides*	Weeping Grass
MNG	*Empodisma minus*	Spreading Rope-rush
GF	*Lindsaea linearis*	Screw Fern
GF	*Pteridium esculentum*	Austral Bracken
GF	*Adiantum aethiopicum*	Common Maidenhair
SC	*Clematis aristata*	Mountain Clematis

Recruitment:
Continuous

Organic Litter:
30 % cover

Logs:
20 m/0.1 ha.

Weediness:

LF Code	Typical Weed Species	Common Name	Invasive	Impact
MS	*Rubus fruticosus spp. agg.*	Blackberry	high	high
MH	*Hypochoeris radicata*	Cat's Ear	high	low

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APPENDIX 7

Tree Data

A7.1 Tree Data

Table A7.1 Tree data, Heytesbury Site

Tree Species#	DBH (cm)	Size Class	EVC/ Pre-1750	Bioregion	EVC bioregional conservation status	Within Patch or Scattered	Cons. Significance of tree	Recommendations
Eucalyptus obliqua	25	ST	LF	Warrnambool Plain	Vulnerable	Scattered	Low	Avoid
Eucalyptus ovata	30	ST	LF	Warrnambool Plain	Vulnerable	Scattered	Low	Avoid
Eucalyptus ovata	35	ST	LF	Warrnambool Plain	Vulnerable	Scattered	Low	Avoid
Eucalyptus ovata	40	ST	LF	Warrnambool Plain	Vulnerable	Scattered	Low	Avoid
Eucalyptus aff. *willisii*	35	ST	LF	Warrnambool Plain	Vulnerable	Scattered	Low	Avoid
Eucalyptus obliqua	30	ST	LF	Warrnambool Plain	Vulnerable	Scattered	Low	Avoid
Eucalyptus ovata	25	ST	LF	Warrnambool Plain	Vulnerable	Scattered	Low	Avoid
Eucalyptus obliqua	45	ST	LF	Warrnambool Plain	Vulnerable	Scattered	Low	Avoid
Eucalyptus obliqua	35	ST	LF	Warrnambool Plain	Vulnerable	Scattered	Low	Avoid
Eucalyptus obliqua	25	ST	LF	Warrnambool Plain	Vulnerable	Scattered	Low	Avoid
Eucalyptus obliqua	30	ST	LF	Warrnambool Plain	Vulnerable	Scattered	Low	Avoid
Eucalyptus obliqua	40	ST	LF	Warrnambool Plain	Vulnerable	Scattered	Low	Avoid
Eucalyptus ovata	35	ST	LF	Warrnambool Plain	Vulnerable	Scattered	Low	Avoid
Eucalyptus ovata	25	ST	DHS	Warrnambool Plain	Vulnerable	Scattered	Low	Avoid
Eucalyptus ovata	20	ST	DHS	Warrnambool Plain	Vulnerable	Scattered	Low	Avoid
Eucalyptus ovata	25	ST	DHS	Warrnambool Plain	Vulnerable	Scattered	Low	Avoid
Eucalyptus ovata	18	ST	DHS	Warrnambool Plain	Vulnerable	Scattered	Low	Avoid
Eucalyptus ovata	18	ST	DHS	Warrnambool Plain	Vulnerable	Scattered	Low	Avoid
Eucalyptus ovata	19	ST	DHS	Warrnambool Plain	Vulnerable	Scattered	Low	Avoid
Eucalyptus ovata	100	LOT	SRW	Warrnambool Plain	Endangered	Within patch	High	Avoid

Size classes: ST = Small tree; LOT = Large old tree
LF = Lowland Forest
DHS = Damp Heath Scrub
SRW = Sedgy Riparian Woodland

GLOSSARY & ABBREVIATIONS

Items marked with an asterisk (*) are cited from DSE (2007b).

AVW (Atlas of Victorian Wildlife)

State government database containing fauna records.

BA (Birds Australia)

Birds Australia is a non-government organisation that maintains an independent database of bird records throughout Australia.

Benchmark*

A standard vegetation –quality reference point, dependent on vegetation type, which is applied in habitat hectare assessments. Represents the average characteristics of a mature and apparently long undisturbed state of the same vegetation type.

Biodiversity*

The variety of all life-forms, the different plants, animals and micro-organisms, the genes they contain, and the ecosystems of which they form a part. The Framework applies this definition to those native species indigenous to or expected to visit the site.

Bioregion*

Biogeographic areas that capture the patterns of ecological characteristics in the landscape or seascape, providing a natural framework for recognising and responding to biodiversity values. A landscape based approach to classifying the land surface using a range of environmental attributes such as climate, geomorphology, lithology and vegetation.

Bioregional conservation status (of an EVC)*

A state-wide classification of the degree of depletion in the extent and/or quality of an Ecological Conservation Class (EVC) within a bioregion in comparison to the State's estimation of its pre-1750 extent and condition. The assessment takes account of how commonly it originally occurred, the current level of depletion due to clearing, and the level of degradation of condition typical of remaining stands. There are 6 classes: Presumed Extinct, Endangered, Vulnerable, Depleted, Rare and Least Concern as described on page 51 of the Framework (NRE 2002).

CAMBA (China – Australia Migratory Bird Agreement)

An international agreement relating to protection of migratory birds that range between China and Australia.

Conservation status (see Bioregional conservation status)

Degraded treeless vegetation*

Vegetation that is neither a wetland, a remnant patch nor scattered tree(s).

DEWHA (Department of the Environment, Water, Heritage and the Arts). Now DSEWPC.

Diameter at Breast Height (DBH) *

The diameter of the main trunk of a tree measured 1.3 m above ground level.

DSE (Department of Sustainability & Environment)

DSEWPC (Department of Sustainability, Environment, Water, Population and Communities). Formerly DEWHA.

Ecological Vegetation Class (EVC) *

A type of native vegetation classification that is described through a combination of its floristic, life form and ecological characteristics, and though an inferred fidelity to particular environmental attributes. Each EVC includes a collection of floristic communities (i.e. lower level in the classification that is based solely on

groups of the same species) that occur across a biogeographic range, and although differing in species, have similar habitat and ecological processes operating.

EPBC (Environment Protection and Biodiversity Conservation Act 1999)

EVC (see Ecological vegetation class) *

Forb

A herbaceous flowering plant that is not a graminoid (grass, sedge or rush).

FFG (Flora and Fauna Guarantee Act 1988 (Vic.))

FIS (Flora Information System)

Database produced by Viridans Biological Databases (2009), containing flora data and information from throughout Victoria. Includes DSE data up to 2007.

Gain*

An increase in the extent and/or quality of a site either by management or maintenance commitments and actions.

Gain Target*

The amount of gain that needs to be achieved to offset a loss measured in habitat hectares.

Habitat hectare*

A site based measure of quality and quantity of native vegetation that is assessed in the context of the relevant native vegetation.

Habitat score*

The score assigned to a habitat zone that indicates the quality of the vegetation relative to the ecological vegetation class benchmark – sum of the site condition score and landscape context score, usually expressed as a percentage or on a scale of 0 to 1.

Habitat zone*

A discrete area of native vegetation consisting of a single vegetation type (EVC) within an assumed similar quality. This is the base spatial unit for conducting a habitat hectare assessment. Separate *Vegetation Quality Assessments* (or habitat hectare assessments) are conducted for each habitat zone within the designated assessment area.

HDD (Horizontal Directional Drilling)

Improvement gain*

This is gain resulting from management commitments beyond existing obligations under legislation to improve the current vegetation quality. Achieving improvement gain is predicated on maintenance commitments being already in place. For example, control of any threats such as grazing that could otherwise damage the native vegetation must already be agreed. Typical actions leading to an improvement gain include reducing or eliminating environmental weeds, enhancement planting or revegetation over a 10-year management period. If the vegetation is to be used as an offset, a commitment to maintain the improvement gain (i.e. no subsequent decline in quality) will be required in perpetuity.

Indigenous vegetation*

The type of native vegetation that would have normally been expected to occur on the site prior to European settlement.

IUCN (International Union for Conservation of Nature)

JAMBA (Japan – Australia Migratory Bird Agreement)

An international agreement relating to protection of migratory birds that range between Japan and Australia.

Large Old Tree (LOT)*

A tree with a DBH equal to or greater than the large tree diameter as specified in the relevant EVC benchmark.

Like-for-like*

These are part of the criteria for determination of an offset and provide a direct link between the loss and the offset gain, in terms of vegetation type or landscape function. There are more specific requirements for higher conservation significance vegetation and more flexible requirements for lower significance.

Maintenance Gain*

This is gain from commitments that contribute to the maintenance of the current vegetation quality over time (i.e. avoiding any decline). Includes foregoing certain entitled activities that could otherwise damage or remove native

vegetation, such as grazing or firewood collection. Also typically requires a commitment to ensure no further spread of environmental weeds that may otherwise result in the loss of vegetation quality over time. If the vegetation is to be used as an offset, a commitment to maintain the vegetation quality will be required in perpetuity.

Medium Old Tree (MOT)*

A tree with a DBH equal to or greater than 0.75 of the large tree diameter in the relevant EVC benchmark but less than the DBH for a large old tree.

MWF (Melbourne Water Fish database)

Database provided by Melbourne Water containing fish data within Melbourne Water's management area to 2009.

Native (indigenous) vegetation*

Native vegetation is plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses (as defined in Clause 72 of the planning scheme).

Net Gain*

Where, over a specified area and period of time, losses of native vegetation and habitat, as measured by a combined quality-quantity measure (habitat-hectare), are reduced, minimised and more than balanced by commensurate gains.

Net outcome*

The result of applying conservation significance criteria to protection, investment and offset decisions. This results in a range of outcomes from short term losses for Low conservation significance to substantial net gain for Very High conservation significance. For offsets, the Framework (Table 6) specifies a multiplier on the calculated loss (in habitat hectares) to achieve the net outcome. This is graded according to conservation significance.

Offset Management Plan (OMP)

A document which sets out the requirements for establishment, protection and management of a Net Gain offset site.

Old tree*

A tree with a DBH equal to or greater than 0.75 of the large tree diameter as specified in the relevant EVC benchmark. Includes medium old trees and large old trees (see separate definitions). Some Regional Native Vegetation Plans additionally define very large old trees (1.5 times large tree diameter).

Offset*

A native vegetation offset is any works, or other actions to make reparation for the loss of native vegetation arising from the removal or destruction of native vegetation. The gains achieved must be permanent and ongoing, and linked to a specific clearing site. See also on-site offset and third-party offset.

On-site offset*

An offset located on the same property as the clearing.

Third-party offset*

An offset located on a property owned by a person other than the landowner who incurs the native vegetation loss being offset.

Patch (see Remnant Patch)

Prior management gain

This gain acknowledges actions to manage vegetation since State-wide planning permit controls for native vegetation removal were introduced in 1989.

Property Vegetation Plan*

A plan which relates to the management of native vegetation within a property, and which is contained within an agreement made pursuant to section 69 of the Conservation, Forests and Lands Act 1987.

Protection (of a tree) *

An area with twice the canopy diameter of the tree(s) fenced and protected from adverse impacts: grazing, burning and soil disturbance not permitted, fallen timber retained, weeds controlled, and other intervention and/or management if necessary to ensure adequate natural regeneration or planting can occur.

Recruitment*

The production of new generations of plants, either by allowing natural ecological processes to occur (regeneration etc), by facilitating such

processes such as regeneration to occur, or by actively revegetating (replanting, reseeding). See Revegetation.

Remnant patch or patch*

An area of vegetation, with or without trees, where native plants constitute more than 25% of the total understorey plant cover (bare ground is not included); or an area of treed vegetation where the density of the trees is such that canopy tree cover is at least at benchmark canopy cover.

Remnant vegetation*

Native vegetation that is established or has regenerated on a largely natural landform. The species present are those normally expected in that vegetation community. Largely natural landforms may have been subject to some past surface disturbance such as some clearing or cultivation (or even the activities of the nineteenth century gold rushes) but do not include man-made structures such as dam walls and quarry floors.

Revegetation*

Establishment of native vegetation to a minimum standard in formerly cleared areas, outside of a remnant patch.

ROKAMBA (Republic of Korea – Australia Migratory Bird Agreement)

An international agreement relating to protection of migratory birds that range between the Republic of Korea and Australia.

Scattered trees*

Canopy trees within an area where total understorey plant cover comprises at least 75% of weeds or non-native plants and the overall canopy cover for a group (i.e. Three or more trees) is less than 20%.

Section 173 agreements*

A management agreement primarily between a landowner and the responsible authority according to section 173 of the Planning and Environment Act 1987.

Security Gain

This is gain from actions to enhance security of the on-going management and protection of native vegetation at the offset site, either by entering into an on-title agreement (for example under Section 173 of the *Planning and Environment Act 1987*), or by locating the offset on land that has greater security than the clearing site, or by transferring private land to a secure public conservation reserve.

Small tree*

A tree with a DBH equal to or greater than 0.25 of the large tree diameter in the relevant EVC benchmark but less than the DBH for a medium old tree.

sp.

Species (one species).

spp.

Species (more than one species).

Supplementary planting

Establishment of overstorey and/or understorey plants within a remnant patch. Typically includes the planting or direct-seeding of understorey life forms.

Taxon (plural taxa)

A term used to describe any taxonomic unit. This term is typically used when referring broadly to any scientifically recognised species, subspecies or variety.

Understorey*

Understorey is all vegetation other than mature trees – includes immature trees, shrubs, grasses, herbs, mosses, lichens and soil crust. It does not include dead plant material that is not attached to a living plant. More information on understorey life forms is set out in the Vegetation Quality Assessment Manual (DSE 2004).

VAF (Victorian Aquatic Fauna database)

Database provided by DSE containing aquatic fauna data throughout Victoria to 2003.

VBA (Victorian Biodiversity Atlas)

Database provided by DSE containing flora and fauna data throughout Victoria. This database replaces the VFD and FIS.

Vegetation Quality Assessment

The standard DSE method for assessing remnant patches of vegetation. Details of the method are outlined in the Vegetation Quality

Assessment Method (DSE 2004). The results of the assessment are expressed in habitat hectares. Also referred to as a 'habitat hectare assessment'.

Very Large Old Tree (VLOT)

A tree with a DBH of at least 1.5 times that of the large tree DBH as specified in the relevant EVC benchmark.

VFD (Victorian Fauna Database)

Database produced by Viridans Biological Databases (2009), containing fauna data and information from throughout Victoria. Includes DSE data up to 2007.