MAROONDAH AQUEDUCT REPLACEMENT

Flora and Fauna Report

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KBR derived the data in this report primarily from visual inspections and examination of records in the public. The passage of time, manifestation of latent conditions or impacts of future events may require further exploration at the site and subsequent data analysis, and re-evaluation of the findings, observations and conclusions expressed in this report.

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1 Introduction

Melbourne Water Corporation (MW) has engaged Kellogg Brown & Root Pty Ltd (KBR) to conduct an ecological assessment for the preferred alignment for the Maroondah Aqueduct Replacement Pipeline.

1.1 BACKGROUND

The Maroondah aqueduct was originally built in the early 1890s to transfer water from the Maroondah weir on the Watts River to Preston. It was enlarged in conjunction with the building of the Maroondah Dam in the late 1920s. The total length of the aqueduct that is currently in service is 27.2km. The aqueduct is integral to the water supply of the Yarra Glen township and enables transfers from Maroondah Reservoir Catchment to Sugarloaf Reservoir.

At present, sections of the Maroondah Aqueduct have reached the end of its service life due to its deteriorating condition and presently are at risk of failure due to its age and condition. One of the consequences of failure includes the possibility of restricting supply to the township of Yarra Glen.

Melbourne Water is progressively updating sections of the aqueduct, with several sections already replaced with new pipe. Melbourne Water are proposing to upgrade a 5.5 km section of the aqueduct considered at high risk of failure, north of Yarra Glen, between Gulf Road, west of the Melba Highway and Pauls Lane.

1.2 OBJECTIVES

Melbourne Water has engaged KBR to complete an options assessment and subsequent functional design of a preferred alignment, selected through a multi-criteria assessment of several options.

The objective of this report is to support a functional design of the preferred alignment through identifying ecological values present within the preferred alignment project area. The ecological values present will inform the environmental approvals required for the project and the interested stakeholders and regulators that need to be involved in approval for installation of the pipe.

Melbourne Water are also considering options for decommissioning of the aqueduct following the completion and commissioning of the replacement pipeline. This report includes the results of the ecological values associated with potential decommissioning of the aqueduct.

This report will also highlight significant values present within the alignment and recommend measures to avoid or minimise impacts to these values, plus best practice environmental controls that are recommended to be implemented during construction.

1.3 STUDY AREA

A locality map of the study area is included in Appendix A. The study area begins at the end of Tunnel 8 of the Maroondah Aqueduct, located immediately off Pauls Lane on the aqueduct reserve managed by Melbourne Water.

The alignment extends in a westerly direction from the tunnel to the Melba Highway, following contours through the landscape. The alignment then turns south along the Melba Highway, then turning west along Gulf Road to connect to the existing siphon (underground pipes) within the Gulf Road reserve.

The study area is 5.5 km in length and generally follows the aqueduct reserve between Pauls Lane and the Melba Highway. The proposed pipeline is to be installed south of the aqueduct reserve, generally in adjacent private property. Through hilly sections of the reserve, where there are several bends in the aqueduct, the alignment will maintain straight lines where possible, cutting off several large bends. Through these sections the alignment will occur in private property, however, the study area extends into and includes sections of the aqueduct reserve, which is public land.

The study area assessed for the current survey is generally a 40 m wide corridor. The corridor does expand in areas that are likely to require access for large machinery (eg. tunnel boring machine) and contract in other areas to minimise impacts on adjacent properties. The study area is included on the ecological features maps in Appendix B.

The study area occurs through a mix of the following, each with different land management:

- private property
- aqueduct reserve with open channel that has restricted access
- aqueduct reserve with siphons that are currently or have previously been used for grazing
- road reserve.
- Likely areas for construction and machinery access were also assessed for potential vegetation impact. This included vegetation within the road reserves of Bleases Lane and Pauls Lane. The entire road reserve was assessed from the intersection with the aqueduct reserve south to the Old Healesville Road, which is the likely access point for both roads.

1.4 PROJECT IMPACT AND STAGING

The project will be conducted in two stages; construction and pipe installation, and aqueduct decommissioning. The aqueduct is required to remain in operation during works to ensure water supply to Yarra Glen. Following the completion of the pipe installation and commissioning, the aqueduct will be decommissioned and made safe for future land use and maintenance.

As the project will be conducted over two stages, permits and approvals relative to ecological values will also be staged. Therefore, this report separates values, impacts and requirements between the two stages.

Pipe installation

The pipe to be installed will be a large diameter pipe of 1750 mm. The pipe will be installed predominately through trenching, with a bore to occur through a steep hill that will extend approximately 200 m. A second bore will also occur under the Melba Highway and the Sugarloaf Pipeline at the intersection of Gulf Road.

The construction corridor required to install the pipe through trenching is estimated at 25 m wide. This includes a minimum 3.5 m deep and 3 m wide trench, top soil, spoil and base material stockpiles, pipe laydown areas, haul road and room for machinery. The impact corridor is also likely to expand out where there is significant cross-fall through the corridor, which will result in additional trench widths for safety requirements.

There will also be additional impacts associated with construction, including stockpile locations of spoil and materials and construction site offices and parking.

In addition, through obtaining constructability advice, it has been identified that potential road widening and upgrade works along Bleases Lane and Pauls Lane may be required to facilitate machinery access.

Machinery access requirements and any other additional areas required for a particular construction method that lay outside of the current study area will need to be assessed for ecological impact once the method is determined.

Aqueduct Decommissioning

Following completion of the pipeline, Melbourne Water are proposing to decommission the section of the aqueduct replaced by the pipe. Options and methods for decommissioning are still be considered by Melbourne Water; however, it is likely to be abandoned through filling in the channel to recreate the natural drainage to alleviate safety issues in future use of the pipe track.

The decommissioning and abandonment of the aqueduct will require significant fill material to be filled into the existing channel to an extent that facilitates overland drainage. This will require large stockpiles of spoil and fill along the reserve and impacts from machinery in filling in the channel.

The decommissioning of the aqueduct will be included in the detailed design and construction phase of the pipe installation project, at which stage the ecological impact will need to be determined following the selection of a preferred decommissioning method.

2 Methods

2.1 DESKTOP ASSESSMENT

A desktop review of available databases was undertaken to establish the potential presence of species and communities of conservation significance occurring within the study area. This information was used to support and inform the field assessment.

Databases reviewed included the following:

- Department of the Environment (DoE) Protected Matters Search Tool Database (DoE 2015)
- Department of Environment, Land, Water and Planning (DELWP) Victorian Biodiversity Atlas (VBA) (DELWP 2015)—point locations for listed flora and fauna species
- Biodiversity Interactive Map 3.2 (DELWP 2015)—bioregion location, modelled Ecological Vegetation Class (EVC) distribution and bioregional conservation status
- DEPI Biological Significant Sites (Biosites) Maps and Reports (DSE 2005)

Searches of the on-line Commonwealth DoE database were completed to identify the presence of matters of national environmental significance within a 5 km search radius of the site. A search of VBA database was conducted for all recent records of threatened flora and fauna within a 5 km radius of the study area. All flora and fauna database records were plotted on field maps to assist field teams in identifying areas for potential habitat.

2.2 FIELD ASSESSMENT

2.2.1 Ecological Assessment

A site assessment was completed along the study area on 28 October 2015. An additional ecological survey was also conducted on 21 and 23 December 2015 to quantify the impacts associated with decommissioning and abandonment of the aqueduct. Both assessments employed the same field assessment method.

The assessments were completed by two ecologists and involved walking along the entire alignment.

Private property access was pre-arranged with each landholder or land manager and agreed prior to the ecologists entering. Where no agreement or permission granted to access private property, the ecologists did not enter. Instead, assessments were conducted from the closest accessible location, such as road reserve, aqueduct reserve or private land agreed for access.

Patches of remnant native vegetation, habitat areas for listed flora and fauna species, observations of threatened flora or fauna species and scattered trees were recorded using a hand-held GPS and have been plotted on attached maps (see Appendix B).

Biodiversity Assessment Guidelines

The study area is located in an agricultural and rural living area north of Yarra Glen, approximately 45 km north east of Melbourne. The majority of the study area is within low risk (Location A) modelled areas. Small sections of the study area also intersect through modelled areas of Locations B and C that appear to be associated with the vegetation and habitat that extends from Pauls Range State Forest. Pauls Range State Forest is an area of zoological significance within the Shire of Yarra Ranges.

As remnant vegetation is likely to be impacted within modelled Location Risk C areas, the project would be considered a High Risk pathway application under the Biodiversity Assessment Guidelines (DEPI 2013). Therefore, a habitat hectare assessment has been completed within the study area.

Native vegetation within the study area has been characterised into two categories as determined by the Biodiversity Assessment Guidelines (DEPI 2013), remnant patch and scattered trees, as described below. Vegetation that does not form part of the two remnant native vegetation definitions is considered to be modified vegetation and does not require an offset.

All scattered remnant trees within the study area were assessed and mapped. The diameter at breast height (DBH) was recorded for each scattered tree. This is used to determine the Tree Retention Zone (TRZ) (DSE 2010) for each tree and to guide construction works so that root zone impacts can be avoided. Construction activities, including vehicle movement, car parking and stockpiling anywhere within the TRZ will have root zone impacts and may require offsetting.

Remnant patch

A remnant patch of native vegetation is either:

- an area of vegetation where at least 25 per cent of the total perennial understorey plant cover is native
- any area with three or more native canopy trees where the canopy foliage cover is at least 20 per cent of the area.

Locations of remnant patches are mapped and included in Appendix B.

Where remnant patches were deemed present, a habitat hectare assessment was completed using the current vegetation quality assessment method (DSE 2004). Remnant patches were assigned a habitat quality score if deemed similar to other patches previously assessed. In assigning habitat quality, where acceptable degrees of variation were considered by the assessor to result in a similar score, i.e. less than 2 category difference in any one site condition component or less than one category difference in two site condition components, an applicable quality score was applied.

Where variation was considered present in the vegetation, i.e. significant differences in categories of one or several site condition components that did not correspond with an existing quality score, a new habitat hectare assessment was completed.

Scattered trees

A scattered tree is a native canopy tree that does not form part of a remnant patch. A canopy tree is a mature tree that is greater than 3 m in height and is normally found in the upper layer of a vegetation type.

Locations of scattered trees are mapped and included in Appendix B.

Modified vegetation

Vegetation that does not fall into the above two categories has not been categorised and is considered to be modified vegetation, that is dominated by exotic vegetation, that contain no trees and a native understorey cover of less than 25 per cent. This category of vegetation does not require offsets and has not been mapped.

Scattered native vegetation within modified vegetation will require planning permits for removal. In addition, should any species protected under the *Flora and Fauna Guarantee Act 1988* (FFG Act) occur within modified vegetation, a protected flora permit will be required should the species be removed.

2.2.2 Targeted growling grass frog assessment

A targeted assessment was completed for the growling grass frog (*Litoria raniformis*) on 30 November and 9 December 2015. Surveys were completed at suitable habitat locations identified during the ecological assessment, plus additional habitat locations within close proximity to the habitat within the study area, where access by the field team was agreed by the landholder. The locations of habitat surveyed during the targeted assessment are identified in Appendix C.

The survey method, timing and duration employed was as per the basic survey techniques in Heard *et al.* (2010) and designed to achieve a cumulative probability of detection for the growling grass frog of 95% probability. Targeted surveys are completed on warm nights (air temp above 16° C) during times of little or no wind.

Night surveys were preceded by day time active searches within 20 m of aquatic habitat. This included lifting and turning rocks, logs and other debris, such as corrugated sheet metal or old wooden fence posts lying on the ground. Daytime searches were also used by the field team for site familiarisation and identification of areas to target night-time searches.

Night surveys commenced at each dam with quiet observation from the water-line for a period of 10 minutes, listening for calling males. Call playback was applied during this period to stimulate calling by males.

Following listening and playback, a search of aquatic habitat areas was conducted for active frogs with the aid of spotlights. Binoculars were used to confirm the identity of frogs observed.

Table 2.1 Weather conditions during the targeted survey

Survey No.	Date	Air temp (start)	Air temp (finish)	Wind speed
1	30 November	18.5°C	16.4°C	7 km/h
2	9 December	17.0°C	14.5°C	13 km/h

2.3 LIMITATIONS

Ecological survey

The assessment represents a one-day survey by two ecologists, randomly walking within the study area to identify and map ecological features. No targeted flora or fauna surveys were completed during this time, although more thorough searches were completed for flora species, where the ecologists deemed greater quality habitat or vegetation was present.

One private landholder did not agree to allow site investigations to occur within their property. The property, located adjacent to the Melba Highway to the east, was assessed from the Melba Highway road reserve. A remnant patch was considered to be present on the property. As no access was allowed the extent of the patch was mapped using Geographic Information Systems (GIS) and aerial photography, with the condition and cover estimates completed from the adjacent road reserves.

During the follow-up survey of the aqueduct channel for the decommissioning stage of the project, access to the north side of the channel was difficult. The terrain in some isolated sections was steep and not able to be assessed safely by the ecologists. These areas also contained high cover of blackberry, which may prevent observation of small cryptic species. In addition, this survey was completed at the end of December, which was past the optimal period for survey and observation of annual species. Some species may not have been present or where unidentifiable at this time.

Targeted growling grass frog survey

Habitat for growling grass frog was identified predominately outside of the study area for the ecological assessment along Dixons Creek and Pauls Creek. It was determined that the species may utilise the waterways for movement thought the landscape, including through the Melbourne Water aqueduct reserve and the study area. For this reason adjacent private landholders were approached to allow targeted searches to occur at habitat that occurs within close proximity to the habitat within the study area. Access was agreed with landholders either side of the Melbourne Water reserve along Pauls Creek. However, access was denied for all three properties which contained potential habitat along Dixons Creek. Therefore, no targeted surveys were able to be conducted in potential habitat areas along Dixons Creek.

However, it is noted that the habitat along Pauls Creek is considered better quality in comparison to Dixons Creek; where there is a greater concentration of habitat areas, better connectivity to the habitat along the Yarra River, including a series of ox-bow lakes and billabongs, and higher cover of in-stream vegetation and habitat.

For the purposes of this report the results of the targeted survey along Pauls Creek has been extrapolated to include Dixons Creek. This is considered suitable considering the presence of more suitable habitat along Pauls Creek.

3 Results - Pipeline Alignment

3.1 GENERAL CONDITION

The majority of the study area was generally of a modified state. This has been through historic clearing for agriculture and for the construction of the aqueduct. The condition of the vegetation that exists between agricultural areas and the aqueduct reserve varies significantly.

Within agricultural areas, which include livestock grazing and horse paddocks, the vegetation is largely representative of open paddocks dominated by exotic pasture grasses. Areas of native vegetation remain within these areas, although generally restricted to waterways and drainage lines in the eastern section of the alignment. This also includes sections of the aqueduct reserve either side of Dixons Creek and Pauls Creek, where underground pipes carry water and no open channels are present. These areas are either currently being grazed or have had grazing in the past and are largely devoid of native vegetation.

In comparison, in the aqueduct reserve, there is an open channel contained extensive areas of high quality remnant understorey. Although the reserve has been largely cleared of canopy and shrubs, the remnant understorey that remains includes numerous patches of kangaroo grass (*Themeda triandra*) dominated open areas with a high diversity and abundance of indigenous herbs and other forbs.

Overall, the study area is generally degraded and modified. Areas of native vegetation, excluding the aqueduct reserve, have an appearance of regrowth, with indigenous trees over an exotic grassy understorey. For patches around Paul Range, this includes natural regrowth and regeneration from the 2009 Black Saturday fires.

3.2 FLORA

3.2.1 Vegetation Communities

Pipeline

A total of 2.615 ha of remnant vegetation recorded within the study area were concentrated within the aqueduct reserve, where the open channel is present, and at the eastern end of the alignment around Pauls Road. Forty-one trees were also recorded within the alignment, which were also concentrated in locations along the alignment.

Details of the remnant patches and scattered trees recorded within the study area are included below in Table 3.1 and Appendix D, respectively. The extent of remnant patches and location of scattered trees was mapped and included in Appendix B.

The vegetation was found to be of varying condition, though most was generally modified. Remnant vegetation was generally recorded either within the aqueduct reserve or along drainage lines east of Pauls Creek. Some remnant vegetation, including scattered trees, was also recorded within the road reserves of Pauls Road, Melba Highway and Gulf Road.

Remnant vegetation was found to be representative of three different Ecological Vegetation Classes (EVCs), valley grassy forest, grassy forest and swampy riparian woodland.

The dominant EVCs were valley grassy forest and grassy woodland. Although creekline herb-rich woodland was modelled to occur in many of these areas, forest EVCs was considered to the most appropriate communities, due to the tall and straight form of the overstorey. The recorded patches of EVCs are mapped and included in Appendix B.

Within private land and road reserves, remnant patches of valley grassy forest and grassy woodland were dominated by a mix of eucalypt species, mainly messmate (*Eucalyptus obliqua*), candlebark (*E. rubida*), long-leaf box (*E. goniocalyx*), narrow-leaf peppermint (*E. radiata*) and Yarra gum (*E. yarraensis*).

Large shrubs were prominent, including black wattle (*Acacia mearnsii*), blackwood (*A. melanoxylon*), tree everlasting (*Ozothamnus ferrugineus*) and cherry ballart (*Exocarpus cupressiformis*). Understorey was generally modified and was often dominated by exotic grasses, with only minimal cover and diversity of indigenous species, often bracken (*Pteridium esculentum*), tall sedge (*Carex appressa*) and rushes (*Juncus* sp.).

Two patches of swampy riparian woodland were recorded in grazed or agricultural areas, one within private land and the other in the siphon section of the aqueduct reserve. Both patches were heavily modified, containing only common understorey aquatic species and high cover of exotic species.

The remnant vegetation recorded within the aqueduct reserve with open channel was found to be significantly different from the remaining areas. The trees and shrubs have largely been removed from the reserve (except for some isolated groups of trees), through previous clearing and regular mowing, with the patches being dominated by indigenous understorey species.

The south side of the channel is currently used for maintenance vehicles and appears to be regularly mown and the structure of the vegetation is low, often less than 50 cm. To the north, no regular mowing occurs and the vegetation is thicker and taller, generally 0.5 - 1.5 m.

On the southern side of the channel, the vegetation is dominated by kangaroo grass with a high diversity of herbs and forbs. Common species recorded were common onion-orchid (*Microtis unifolia*), sun-orchids (*Thelymitra* sp.), chocolate lily (*Arthropodium strictum*), grass trigger-plant (*Stylidium graminifolium*), bulbine lily (*Bulbine bulbosa*), milkmaids (*Burchadia umbellata*), scaly buttons (*Leptorrhynchus squamatus*) and tall bluebell (*Whalenbergia stricta*).

The vegetation on the south side is considered to be high quality understorey. However, considering the area is cleared forested land, the vegetation is assessed

against a forest vegetation benchmark. As several components are missing from the vegetation in the aqueduct reserve, vegetation quality scores are relatively low considering the diversity and density of remnant understorey vegetation.

A patch was recorded on the north side of the channel at the eastern end of the alignment. The vegetation is dominated by thatch saw-sedge (*Gahnia radula*). The patches on the north of the channel are high in stature compared to the south side, as no mowing occurs as access is not available. The vegetation has increased weed cover, including blackberry (*Rubus fruticosus* spp. agg.) and Spanish heath (*Erica lusitanica*).

Vegetation was also assessed along Pauls Lane and Bleases Lane for potential impacts to vegetation present in the road reserves that may be impacted for construction access. Both road reserves were found to be largely modified and contained a generally weedy understorey. Trees are the dominated ecological feature for both road reserves, with some forming patch vegetation with some regrowth wattles (*Acacia* spp.) and the occasional area of indigenous understorey with indigenous grasses and occasional forbs and herbs.

Table 3.1 Details of remnant patches recorded in the pipeline alignment study area

Patch identification (see Appendix B)	Ecological vegetation class	Quality score	Area (ha)	Habitat hectares
HZ01	Valley grassy forest	0.30	0.08	0.02
HZ02	Valley grassy forest	0.50	0.11	0.06
HZ03	Valley grassy forest	0.50	0.05	0.03
HZ04	Grassy forest	0.39	0.15	0.06
HZ05	Grassy forest	0.38	0.03	0.01
HZ06	Valley grassy forest	0.48	0.76	0.36
HZ07	Grassy forest	0.49	0.11	0.05
HZ08	Grassy forest	0.38	0.02	0.01
HZ09	Grassy forest	0.38	0.06	0.02
HZ10	Valley grassy forest	0.40	0.12	0.05
HZ11	Grassy forest	0.54	0.06	0.03
HZ12	Grassy forest	0.38	0.09	0.03
HZ13	Valley grassy forest	0.32	0.13	0.04
HZ14	Valley grassy forest	0.32	0.06	0.02
HZ15	Swampy riparian woodland	0.16	0.13	0.02
HZ16	Valley grassy forest	0.36	0.20	0.07
HZ17	Valley grassy forest	0.36	0.10	0.04
HZ18	Valley grassy forest	0.38	0.19	0.07
HZ19	Swampy riparian woodland	0.18	0.48	0.09
HZ20	Valley grassy forest	0.44	0.05	0.02
HZ21	Valley grassy forest	0.18	0.02	0.004
HZ22	Valley grassy forest	0.18	0.03	0.01
HZ23	Valley grassy forest	0.36	0.03	0.01

Table 3.1 Continued

Patch identification (see Appendix B)	Ecological vegetation class	Quality score	Area (ha)	Habitat hectares
HZ24	Valley grassy forest	0.18	0.18	0.032
HZ25	Valley grassy forest	0.21	0.036	0.008
HZ26	Valley grassy forest	0.18	0.102	0.018
HZ27	Valley grassy forest	0.18	0.014	0.003
HZ28	Grassy forest	0.30	0.107	0.032

3.2.2 Threatened flora

One national and state listed flora species; matted flax-lily (*Dianella amoena*) was recorded within the study area. No other listed flora species has been recorded within 2 km of the study area.

Three separate mats of matted flax-lily were recorded within a patch present along Gulf Road. The patch appears to be a retained area of vegetation that was protected from the Sugarloaf pipeline project, as the vegetation is restricted along the top of the cutting above Gulf Road, with clear previous ground disturbance occurring between the northern edge of the patch and the adjacent fence line. This patch is also known by local council, as a sign, restricting mowing/slashing of the vegetation, is present.

In addition, two other flora species considered a Victorian rare or threatened (VROT) species, were recorded. Green scentbark (*Eucalyptus fulgens*) and Yarra gum, are both considered rare in Victoria, and were recorded in isolated sections of the alignment. Green scentbark was recorded along a drainage line at the eastern end of the alignment and Yarra gum was recorded along Gulf Road. Neither species is listed under state or Commonwealth legislation.

3.3 FAUNA

3.3.1 Fauna habitat

Fauna habitat within the study area is largely limited and generally confined to the eastern most section of the alignment, where remnants of forest vegetation and habitat is connected to Pauls Range biosite. In addition, two waterways intersect the alignment, provide aquatic habitat and habitat corridors through the landscape; however, each waterway has been heavily modified, in particular Dixons Creek. Each habitat type is discussed further below.

The limited amount of habitat is a reflection of a predominately agricultural area, which has been historically been used for grazing and vineyards.

Forest

Remnants of forest habitat are in greater concentrations in the eastern end of the alignment. The connectivity with the forest habitat in Pauls Range, suggests that several fauna species may potentially use the habitat available within the study area. However, considering the lack of ground level habitat in the study area (fewer logs, debris and understorey cover) and that the habitat is often adjacent to open paddocks,

vegetation within the study area is more likely to be utilised by species such as hollow-dependent birds and mammals, as within the study area,.

Several large old trees were present within the study area that also contained hollows. Hollows are often a limiting factor in populations of numerous arboreal mammals and bird species, particularly in disturbed environments (Gibbons and Lindenmayer 2002). Hollow-bearing trees are highly likely to be utilised by native fauna, including several threatened and listed species, including powerful owl (*Ninox strenua*) and brush-tailed phascogale (*Phascogale tapoatafa*), both of which have been recorded within 2 km of the study area.

Waterways and wetlands

Both waterways that intersect the study area are degraded and modified. In particular, Dixons Creek within the study area is dominated by willows (*Salix* spp.) and contains little native vegetation or in-stream vegetation. Pauls Creek has also been modified and at the intersection of the study area, contains minimal riparian vegetation (no native trees or shrubs), although does contain some in-stream vegetation including tall spike-rush (*Eleocharis sphacelata*) and water ribbons (*Triglochin procera*).

Both waterways drain into the Yarra River approximately 2 km south of the study area. Dixons Creek drains into the Yarra River via Steeles Creek, passing immediately east of the Yarra Glen township. Pauls Creek generally flows in a north–south direction, flowing into the Yarra River, south of the Healesville - Yarra Glen Road.

Both waterways appear to have some level of revegetation plantings occurring within various properties. Overall, each waterways contains a mix of open grazing, native revegetation of trees and shrubs and areas dominated by exotic trees and shrubs. Therefore, although both waterways provide a habitat link between the Yarra River and forest habitats associated with Kinglake National Park and Toolangi State Forest, there are apparent breaks in the riparian vegetation.

From aerial photography and through the completed surveys, several large dams were identified in close proximity to each waterway, particularly along Pauls Creek. These dams provide some aquatic habitat for fauna, mainly frog species, although most appeared to have minimal habitat features, such as aquatic and fringing vegetation and logs and debris.

3.3.2 Threatened Fauna

No listed and threatened fauna species were recorded during the current assessment. At two locations, white-wash, most likely from a favoured powerful owl roosting site, was identified; however, the species was not able to be confirmed. Powerful owl is a listed species under the *Flora and Fauna Guarantee Act 1988* (FFG Act) and it is likely that the species is present and will utilise the habitat in the study area for roosting and potentially nesting in hollows.

There is potential for the listed brush-tailed phascogale to also utilise similar habitat features to the powerful owl, particularly along the drainage lines and waterways that immediately connect into Paul Range. However, the species is less likely to inhabit areas, directly adjacent to agricultural areas, where foraging areas are reduced.

3.3.3 Growling grass frog

Previous records

Growling grass frog was last known to be recorded in 2003 within 2 km of the study area. These records were associated with the wetlands along the Yarra Glen bypass alignment, south of the site. Previous records on the VBA indicate that the species has been recorded in 1988 several kilometres further upstream of the study area along both Dixons and Pauls Creeks.

Habitat quality

Habitat for growling grass frog was considered to be present at Dixons Creek and Pauls Creek. The configuration of large dams in close proximity to the creeks, particularly along Pauls Creek, is considered suitable for growling grass frog to provide sufficient aquatic habitat and connectivity between habitats. This configuration of dams adjacent to Pauls Creek continues south to the Yarra River, linking to the habitat associated with the river, including numerous billabongs and ox-bow lakes.

Following agreement from landholders, targeted surveys were completed at six dams and along Pauls Creek, identified as potential habitat for growling grass frog (See Appendix C).

The dams assessed were generally in a similar condition, located in paddocks with low stock levels, aside from Dam 6, which was fenced preventing stock access. Dams were generally considered to provide low to moderate habitat value for the growling grass frog.

Dams 1-5 generally contained some low levels of aquatic macrophytes (15 per cent cover) and some emerging vegetation, predominately tall spike-sedge, at scattered locations on the fringes of the dams, generally only to 5 to 10 per cent overall cover. Minimal habitat features were present on the fringes of the wetlands, such as the occasional log or stump, and only scattered rocks present at overflow points to prevent erosion. Surrounding vegetation consisted of grazed paddocks, with only minimal vegetation cover of mainly exotic pasture, although some rushes (*Juncus* spp.) were present.

Dam 6 contained the highest levels of aquatic macrophytes and emerging vegetation, with approximately 15 per cent cover overall. The water level at Dam 6 also appeared to have been low for several years due to the high cover of vegetation growing on the edges of the dam. This included several thistles and native species, including several fireweeds and groundsels (*Senecio* spp.). Some logs were present amongst the vegetation regenerating in the bank of the dam.

Pauls Creek provided the highest quality habitat of the sites assessed during the targeted survey, although at the time of the assessment, was not flowing and water was present in pools. Both stretches of the creek consisted of several pools that generally contained high cover of aquatic vegetation, dominated by either tall spike-sedge, water plantain (*Alisma plantago-aquatica*), water ribbons or swamp lily (*Ottelia ovalifolia*).

Stock has access to the waterway along Stretch 1 and there is a farm track across an old ford. Some riparian vegetation is present in clumps to the north of the stretch,

although the surrounding area is mainly exotic pasture grasses and scattered large eucalypts above the creek channel. Several branches and trees have fallen adjacent to the creek and therefore, the stretch had good terrestrial habitat cover close to aquatic habitat.

Stretch 2 has been revegetated with indigenous shrubs and trees and fenced from stock for several years. Revegetation is well established and is present over a weedy embankment. The creek was reduced to scattered small pools, which were highly turbid, although did generally contain emerging and floating vegetation, including tall spike-sedge and swamp lily.

Survey results

No growling grass frogs were recorded during the survey. The most common species recorded during the survey was Peron's tree frog (*Litoria peroni*), which was recorded at all habitat locations, except for Stretch 2 of Pauls Creek, where no frogs were recorded. Other species recorded included the southern tree frog (*Litoria ewingi*), common froglet (*Crinia signifera*) and spotted marsh frog (*Limnodynastes tasmaniensis*).

Table 3.2 Targeted survey results

Site	Habitat quality	Species recorded
Dam 1	Low-moderate. Low cover of emergent tall spike sedge on southern bank. Minimal fringing or surrounding habitat features.	Peron's tree frog
Dam 2	Low. Low cover of aquatic vegetation. No floating or emergent vegetation. No fringing vegetation or habitat features close to dam edge.	Peron's tree frog; long-necked turtle
Dam 3	Low. Low cover of aquatic vegetation. No floating or emergent vegetation. No fringing vegetation or habitat features close to dam edge.	Peron's tree frog; long-necked turtle
Dam 4	Low. Low cover of aquatic vegetation. No floating or emergent vegetation. Minimal fringing vegetation and habitat features, mainly rocks near dam edge.	Peron's tree frog; southern tree frog
Dam 5	Low-moderate. Localised patches of emergent vegetation within dam. Minimal fringing vegetation and surrounding habitat features.	Peron's tree frog
Dam 6	Moderate. Moderate cover of emergent vegetation and high cover of surrounding vegetation. Some logs present in and around dam. Lower turbidity with no stock access.	Peron's tree frog; spotted marsh frog; long-necked turtle
Pauls Creek (stretch 1)	Moderate-High. Creek not flowing at time of assessment. Numerous pools which contained generally high cover of emergent or floating vegetation. Moderate riparian and overhanging tree and shrub cover. Several logs present adjacent to the channel of the creek.	Peron's tree frog; southern brown tree frog; common froglet
Pauls Creek (stretch 2)	Moderate. Creek not flowing at time of assessment. Limited to scattered pools which were turbid, though contained generally moderate cover of emergent or floating vegetation. Fenced from stock and high cover of riparian vegetation from waterway planting.	None.

3.4 ECOLOGICAL IMPACT

The upgrade of the Maroondah Aqueduct through the installation of a large pipeline will generally require a 25–30 m wide impact corridor. The impact corridor will account for the large pipe, trench, construction haul road, machinery and stockpiles of materials and spoil.

These impacts will be concentrated on private land, which has largely been cleared of remnant vegetation. However, construction is likely to impact on the aqueduct reserve and the remnant patches present within the reserve and impact remnant vegetation along vegetated drainage lines within private land (some of which have been revegetated). In addition, the project will require a construction haul road through the waterways to facilitate the installation of the pipe. Some minor upgrades of Bleases Lane and Pauls Lane are also likely required to facilitate construction machinery and materials access.

Overall, there are 3.202 ha of remnant vegetation and 146 scattered trees present in the study area that will potentially be impacted by the project. It is likely that extensive patch areas and numerous trees will be protected by the project and the actual impact will be significantly less than the total amount recorded. These impacts will need to be determined during the detailed design and construction planning phase and considered in a revised ecological impact.

To avoid impacts to significant ecological features recorded during the current survey, Melbourne Water has committed to avoiding the patch of vegetation along Gulf Road that contains the three matted flax-lily plants. The construction corridor will be reduced to avoid impact to the plants and the patch. This patch appears to have been protected from impacts during the Sugarloaf pipeline project, and essentially the patch and matted flax-lily, will again be protected.

Through avoiding impacts to the above patch; Melbourne Water will also avoid impacts to the rare Yarra gums that are present. In addition, the Yarra gums that are present at the intersection of Gulf Road and Melba Highway will also be avoided by works, as the pipe will be installed via boring under the highway, which will be extended to avoid impacts to the trees.

4 Results - Aqueduct Decommissioning

4.1 GENERAL CONDITION

The majority of the study area was generally of a modified state. This has been modified through historic clearing for the construction of the aqueduct and regular maintenance, predominately slashing, which is limited to the south side of the aqueduct channel.

The aqueduct reserve with open channel consists of three narrow bands of vegetation across the study area divided by the open channel and the maintenance track.

North of the channel the vegetation is not slashed and doesn't appear to be maintained, such as weed spraying. The vegetation is considered to be remnant patch vegetation that is dominated by grasses, herbs and forbs, with the occasional shrub. This band of vegetation also contains the highest levels of weed cover, predominately blackberry and phalaris (*Phalaris aquatica*).

Between the channel and the maintenance track, a band of remnant vegetation persists, other than in small and discrete locations where there is a structure present or bridge. This vegetation was dominated by kangaroo grass and contained few weeds at low or negligible cover. Although, only some scattered forbs at the end of their fruiting period were present at the time of survey, these patches are likely to contain a high diversity of annual forbs, which were present in similar patches within pipeline alignment that were assessed at a more optimal time.

To the south of the maintenance track, the vegetation varies depending on the location. It is likely that, as with the remainder of the aqueduct reserve, that the vegetation was cleared of trees and shrubs. Within these patches remnant trees and shrubs have been allowed to regenerate, or have been planted into the reserve, such as the section between the Melba Highway and Gulf Road. These patches appear to be the most modified, containing a mix of planted indigenous vegetation, regrowth trees and shrubs and a generally weedy understorey.

4.2 FLORA

4.2.1 Vegetation Communities

The results of the vegetation quality assessment are included in Table 4.1. A total of 4.307 ha of remnant vegetation was recorded within the aqueduct reserve where decommissioning is proposed. No scattered trees were recorded within the study area for the decommissioning.

The vegetation is significantly modified and determining the appropriate EVC benchmark to assess vegetation quality was difficult. Therefore, pre-1750 EVC

mapping (DELWP 2015) was generally used to determine the appropriate EVC benchmark, unless adjacent site factors could be used to determine the EVC.

The dominant EVC was considered to be valley grassy forest, with some patches of grassy forest, mainly at the eastern end of the aqueduct.

On the north side of the channel, the vegetation contains significantly more weeds, particularly west of the Melba Highway. Vegetation is dominated by indigenous species, thatch saw-sedge at the eastern end of the alignment and kangaroo grass, thatch saw-sedge and native raspberry (*Rubus parvifolius*) west of Tunnel 7. The patches on the north of the channel are high in stature compared to the south side, as no mowing occurs as access is not available. The vegetation has varying weed cover, but is generally moderate (at least 25 per cent); and is predominately phalaris and blackberry.

The north side of the channel also contained a variety of herbs and forbs, including the nationally listed matted flax-lily. A total of 81 plants were recorded in three locations north of the concrete channel; all were located west of Tunnel 7. These plants were predominately recorded immediately above the concrete channel, often were less weeds and biomass were present.

The south side of the channel is currently used for maintenance vehicles and appears to be regularly mown and the structure of the vegetation is low. Between the channel and the access track, the vegetation consisted of high cover of kangaroo grass, generally above 60 per cent cover. Some lilies and orchids were present, although the majority had completed flowering and fruiting and were beginning to die back. Some species that were identifiable included sun-orchids, a small tongue orchid (*Cryptostylis leptochila*), chocolate lily and milkmaids.

One matted flax-lily was recorded on the south side of the channel. The individual is also the only record east of Tunnel 7. The plant was located at a bend in the channel on what appeared to be fill. There was only minimal vegetation present as the location had little to no top soil. The individual may have been transported in fill from a nearby location; however, this is difficult to confirm.

The vegetation on the north of the aqueduct channel and between the channel and the access track are considered to be high quality understorey. However, considering the area is cleared forested land, the vegetation is assessed against a forest vegetation benchmark. As several components are missing from the vegetation in the aqueduct reserve, vegetation quality scores are relatively low considering the diversity and density of remnant understorey vegetation.

South of the access track the vegetation varies more compared to the other bands of vegetation bordering the channel. In some locations, the vegetation is very similar to the middle band between the channel and the access track, but can vary to be dominated by regrowth wattles over a weedy understorey, or a mix of planted and regrowth indigenous shrubs and trees over a sparse understorey. These patches are generally considered to be modified and of moderate to low quality.

Table 4.1 Details of remnant patches recorded in the study area

Patch identification (see Appendix B)	Ecological vegetation class	Quality score	Area (ha)	Habitat hectares
HZB01	Grassy forest	0.39	0.157	0.061
HZB02	Grassy forest	0.38	0.026	0.010
HZB03	Grassy forest	0.49	0.017	0.008
HZB04	Grassy forest	0.38	0.030	0.011
HZB05	Grassy forest	0.23	0.027	0.006
HZB06	Grassy forest	0.36	0.063	0.023
HZB07	Grassy forest	0.23	0.024	0.006
HZB08	Grassy forest	0.31	0.123	0.038
HZB09	Grassy forest	0.57	0.161	0.092
HZB10	Grassy forest	0.23	0.069	0.016
HZB11	Valley grassy forest	0.39	0.052	0.020
HZB12	Grassy forest	0.23	0.061	0.014
HZB13	Grassy forest	0.23	0.020	0.005
HZB14	Grassy forest	0.57	0.108	0.062
HZB15	Grassy forest	0.23	0.048	0.011
HZB16	Grassy forest	0.45	0.077	0.035
HZB17	Grassy forest	0.23	0.046	0.011
HZB18	Valley grassy forest	0.33	0.064	0.021
HZB19	Valley grassy forest	0.21	0.114	0.024
HZB20	Valley grassy forest	0.21	0.009	0.002
HZB21	Valley grassy forest	0.21	0.005	0.001
HZB22	Valley grassy forest	0.33	0.278	0.092
HZB23	Valley grassy forest	0.37	0.041	0.015
HZB24	Valley grassy forest	0.37	0.135	0.050
HZB25	Valley grassy forest	0.31	0.328	0.102
HZB26	Valley grassy forest	0.34	0.080	0.027
HZB27	Valley grassy forest	0.31	0.083	0.026
HZB28	Valley grassy forest	0.34	0.088	0.030
HZB29	Valley grassy forest	0.21	0.164	0.034
HZB30	Valley grassy forest	0.31	0.866	0.268
HZB31	Valley grassy forest	0.21	0.047	0.010
HZB32	Valley grassy forest	0.34	0.325	0.111
HZB33	Valley grassy forest	0.21	0.012	0.003
HZB34	Valley grassy forest	0.21	0.005	0.001
HZB35	Valley grassy forest	0.21	0.022	0.005
HZB36	Valley grassy forest	0.23	0.506	0.116
HZB37	Valley grassy forest	0.21	0.040	0.008
HZB38	Valley grassy forest	0.35	0.062	0.022
HZB39	Valley grassy forest	0.31	0.116	0.036
HZB40	Valley grassy forest	0.21	0.028	0.006

4.4 FAUNA AND HABITAT

Fauna habitat is limited within the decommissioning study area. The overstorey vegetation has been largely removed of trees and shrubs and as a result there are minimal habitat features associated with trees, including hollows, nests, logs and other debris.

Fauna use of the site was predominately by rabbits (*Oryctolagus cuniculus*), with scats present along the majority of the study area. There was also evidence of common wombat (*Vombatus ursinus*), including burrows in the access track embankment.

There are some locations that do contain some trees and overstorey habitat, including between Melba Highway and Gulf Road, and between Tunnel 8 exit and Tunnel 7 entrance. Trees are present on the south side of the aqueduct reserve between Melba Highway and Gulf Road on the south side of the reserve; apparent as a mix of regrowth and supplementary planting. There appears to be minimal top soil within these patches and the understorey, including weedy species is sparse, generally dominated by burgan (*Kunzea ericoides*), a known indigenous colonising species. This strip of habitat is generally isolated in the landscape, with the trees relative young in appearance, there are minimal hollows present; plus there is also minimal habitat cover available in the understorey. Although this section may provide some habitat value as a stepping stone within the landscape, it is likely to be utilised by common bird species.

The section of the study area between the Tunnel 8 exit and Tunnel 7 entrance on the north side of the channel abuts a large patch of vegetation that is continuous with Pauls Range and Toolangi State Forest. This area north of the channel is generally lacking trees, which is due to management of the aqueduct, plus the 2009 Black Saturday bushfires, which impacted the area. Numerous eucalypts are regenerating following the fires, mainly on the outer edge of the reserve, away from the aqueduct. There are also numerous logs from burnt trees that have fallen. This area provides some habitat value for fauna that utilise the adjacent habitat connected to Pauls Range and Toolangi State Forest, but as there are minimal trees, the fauna likely to use the habitat are ground-dwelling fauna, such as wombats, black wallaby (*Wallabia bicolor*), antechinus (*Antechinus* spp.) and native and exotic rat species (*Rattus* spp.).

4.5 ECOLOGICAL IMPACT OF DECOMMISSIONING

The current proposal to make safe the aqueduct and maintain drainage over the site will involve the use of fill, both excavated from the pipe installation and importing fill to backfill the channel. It is also likely that the maintenance track will be cut down for utilisation as fill into the channel and also reduce the height required to achieve natural drainage.

The result of the proposed decommissioning will result in extensive area of patch vegetation being impacted by the project. Vegetation either side of the channel will be buried under the fill into the channel. This will likely include a large proportion of the recorded matted flax-lily, which occurs predominately within 1 m from the top of the concrete channel.

There is potential for vegetation south of the access track to be impacted by the works. This includes several indigenous trees located close to the access track.

Extensive patches of good quality understorey vegetation will also be impacted by the decommissioning. Overall there are 4.527 ha of vegetation present within the decommissioning area, which equates to 1.437 habitat hectares.

The decommissioning works are currently proposed to be included in the design and construction contract for the pipe installation. Melbourne Water is proposing to use this process of design and construction contractors to identify additional options and methods to achieve the requirements of decommissioning and also reduce impact to ecological values.

Following the selection of a decommissioning method, Melbourne Water will then recalculate offset requirements with the aim to reduce the impact to remnant vegetation, including matted flax-lily. However, it is likely that any decommissioning works will impact on native vegetation present either side of the aqueduct channel.

5 Legislative requirements - Pipeline

The following assessment of legislative requirements for the project is based solely on and relative only to the ecological values recorded within the study area.

5.1 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

The Commonwealth EPBC Act protects matters of national environmental significance (MNES) including world heritage properties, national heritage places, Ramsar wetlands, commonwealth marine areas, threatened species, ecological communities and migratory species.

One protected MNES, the matted flax-lily, was recorded on site, while habitat is considered present for another, the growling grass frog.

Through the protection of the matted flax-lily along Gulf Road, the project is not considered to have a significant impact (DoE 2013) on the species. Strict protection measures and enforcement will need to be implemented to ensure that this species and the patch in which it is contained are protected from works.

Targeted surveys for the growling grass frog did not identify the presence of the species. In addition, the majority of works within the waterways will occur outside of the species active period from October to March. It is therefore unlikely that the works will have a significant impact to the species. Minimising impacts to potential habitat areas at Pauls Creek and Dixons Creek is recommended to further reduce potential impacts. These include:

- minimising impacts to aquatic and riparian vegetation
- engaging a wildlife handler to check for any fauna in the creek during vegetation removal
- protecting the waterways from sedimentation
- covering any trenches or excavations overnight.

In consideration of the likely minimal impacts to matted flax-lily and growling grass frog, a referral for the pipeline installation stage of the project is not recommended. However, there is potential for the stage to be included in a referral to the Commonwealth Environment Minister under the Act, due to potential significant impact to matted flax-lily for the decommissioning stage of the project. See Section 6.1.

5.2 FLORA AND FAUNA GUARANTEE ACT 1998

The FFG Act provides protection for a wide range of threatened Victorian plants, animals and communities. One listed species, matted flax-lily, was recorded during the current survey, with potential habitat identified for three listed fauna species, brush-tailed phascogale, powerful owl and growling grass frog.

For the pipeline installation, the project will need to gain a protected flora permit under the FFG Act for impacts to protected flora species on public land. This permit is issued by DELWP and will include the following species:

- Black wattle
- Golden wattle (*Acacia pycnantha*)
- Tree everlasting
- Musk daisy bush (*Olearia lirata*)
- Common onion-orchid
- Sun-orchids
- Grass trigger-plant
- Scaly buttons
- Cottony fireweed (*Senecio quadridentatus*)

This stage will not include matted flax-lily, as the individuals will be protected by the project.

The project will likely require a Wildlife Permit under the *Wildlife Act 1975* for impacts to native fauna during construction. This permit will need to consider potential impacts to powerful owl and brush-tailed phascogale during construction, particularly when removing hollow-bearing trees. The permit should also consider frog species during works within or near Pauls Creek and Dixons Creek, although growling grass frog is not likely to be present. Consultation should occur with DELWP to determine appropriate management measures to be considered for these species. Management measures will need to be included in a project Construction Environmental Management Plan.

A wildlife handler will need to be engaged during the vegetation clearing phase of the project. Suitable release points may need to be agreed with DELWP prior to clearance.

5.3 CATCHMENT AND LAND PROTECTION ACT 1994

Under the *Catchment and Land Protection Act 1994* (CaLP Act), land owners have legal obligations regarding the management of declared noxious weeds and must take all reasonable steps to prevent the growth and spread of regionally controlled weeds on their land.

Blackberry, Spanish heath and watsonia (*Watsonia meriana* var. *bulbillifera*) are listed noxious weeds that are considered to be regionally controlled in the catchment. During construction, measures will need to be taken to prevent the spread of weeds in the construction zone both during works and as part of reinstatement.

5.4 PLANNING AND ENVIRONMENT ACT 1987

The *Planning and Environment Act 1987* (P&E Act) is the primary legislation that governs land use and development in Victoria. The P&E Act is administered by each local council through controls established in their respective planning schemes. The project is subject to the Yarra Ranges Shire Council planning scheme and any planning authorisation may occur in the form of planning permits.

A planning permit will be required from Yarra Ranges Council under Clause 52.17 for removal of native vegetation and Clause 53.01 for impacts to vegetation. A planning permit application will need to submitted to Yarra Ranges; however, as the project is considered a high risk pathway application the application will be referred to DELWP and should meet the minimum requirements under the Biodiversity Assessment Guidelines (DEPI 2013).

Several environmental planning overlays exist in proximity to the study area, although two, a Bushfire Management Overlay and Environmental Significance Overlay only intersect the study area within the Pauls Lane road reserve. These overlays may require additional planning application requirements. An additional Environmental Significance Overlay is present north of the alignment along Dixons Creek. This overlay does not extend over the study area.

5.4.1 Biodiversity Assessment Guidelines

The Biodiversity Assessment Guidelines (DEPI 2013) applies to the removal of native vegetation under Clause 52.17 of planning schemes in Victoria. Under the guidelines, where removal of remnant vegetation or scattered trees triggers a moderate or high risk pathway, the application requires a habitat hectare assessment, an assessment of the vegetation and habitat's contribution to Victoria's overall biodiversity and an offset proposal. Habitat hectare details are described in Section 3 and detailed in the attached BIOR report (Appendix C).

The following provides the other required information to accompany moderate and high risk applications to remove native vegetation.

Contribution to Victoria's biodiversity

The project area traverses through an agricultural area north east of Yarra Glen. The area has been grazed and used for viticulture since the late 1800's, which has modified the landscape. The understorey in the study area and surrounding region is largely dominated by exotic species. The most intact understorey remaining in the study area is contained within the aqueduct reserve, which has been removed of trees and shrubs and is regularly mown and used for maintenance.

As such this vegetation does not provide significant contributions to Victoria's biodiversity. The vegetation that is present is generally on the extremities of more significant vegetation and habitat amongst agricultural land. This is highlighted by the average strategic biodiversity score of the vegetation being 0.215.

In addition, the majority of the vegetation within the study area is modelled as Location Risk A, with some areas of Location B and C located between Pauls Creek and Pauls Range.

Several threatened flora and fauna species have modelled habitat within the study area. These species are dominated by wetland and forest bird species, for which there is little habitat present on site. Other species, mainly small terrestrial herbs and forbs, which have habitat models within the study area, are more likely to be present due to the intact understorey. However, their presence may be impacted by the regular mowing regime occurring on site.

Two species, the green leek-orchid (*Prasophyllum lindleyanum*) and forest bitter-cress (*Cardamine papillata*) have specific offset requirements, based on the maximum impact. There is potential for minimisation measures to reduce the proportional impact to either species to below the level that triggers a specific offset. This is particularly relevant to the forest bitter-cress, which is slightly above the proportional impact threshold.

The vegetation represents generally isolated remnants in an agricultural landscape. The contribution the vegetation is likely to provide is likely to be important at a regional level.

Minimising impacts on native vegetation

The project is proposing to minimise impacts on the highest value ecological features recorded within the study area. Notably, this includes the three matted flax-lily plants and all Yarra gums recorded along Gulf Road.

In addition, the project can also minimise the impact to remnant vegetation, through minimising the construction impact corridor, or through realigning the impact corridor into cleared private land. It should be noted that no construction method is currently available, and minimisation of impacts should be further developed during detailed design and construction planning. Construction of the project should aim to minimise impacts to the following as a priority:

- high quality understorey vegetation in the aqueduct reserve, where there is open channel
- locations where green scentbark is present
- large trees and trees with hollows
- areas of modelled habitat for green leek-orchid and forest bitter-cress. In particular, remnant patches and scattered trees along Bleases Lane and Pauls Lane
- revegetation and remnant patches along drainage lines
- Pauls Creek and Dixons Creek, where possible.

Proposed impacts

Currently the proposed construction methodology is unknown. Following selection of a preferred contractor, detailed design and construction method will need to be determined. It is likely that the project will be able to minimise impacts to vegetation, in addition to avoiding impacts along Gulf Road, although this cannot be predicted here. Therefore, a maximum impact and offset requirement is presented here to determine maximum offset requirement.

An initial Biodiversity Impact and Offset Requirements (BIOR) report was received from the Department on 28 January 2016. This report considers the impacts associated with the decommissioning stage of the project, which currently includes a maximum impact, in determining the overall ecological impact. The report confirms the high risk pathway, considering the location and extent of the impact.

In total, there is a predicted maximum impact of:

- 3.202 ha of remnant vegetation
- 146 scattered trees.

Impacts to this vegetation would require both a general and specific offset. The project will require a general offset of 0.072 general biodiversity units. These offsets are to be located within the same catchment, the Port Phillip and Westernport Catchment Management Area. The minimum strategic biodiversity score for the offset is 0.147.

In addition, there are also specific offset requirements for the green leek-orchid, of 0.373 specific units, and the forest bitter-cress, of 3.653 specific units. These offsets are required to be sourced from within the modelled habitat area for both species.

It should be noted that the above impact and offset calculation is based on the vegetation contained within the study area. It is likely that this figure will need to be revised following the implementation of minimisation measures and inclusion of potential additional impacts related to construction access and the decommissioning of the aqueduct.

Updated project impact

Following the issue of this report to Melbourne Water, several avoidance and minimisation recommendations have been adopted by the project to reduce the overall offset requirements. This included identifying areas within the aqueduct reserve and road reserves that could reasonably be protected.

As such the above offset amount has been reduced. An updated BIOR report was received from DELWP on 11 April 2016 and indicates that revised maximum offset impact. This BIOR report is included in Appendix E. As above the BIOR indicates the maximum project offsets for both the pipeline installation and decommissioning.

The project will require a maximum general offset of 0.053 general biodiversity units, located within the Port Phillip and Westernport Catchment Management Area. The minimum strategic biodiversity score for the offset is 0.121.

In addition, there are also specific offset requirements for the green leek-orchid, of 0.081 specific units, and the forest bitter-cress, of 2.062 specific units. These offsets are required to be sourced from within the modelled habitat area for both species.

Offset strategy

Melbourne Water has extensive credits available from existing offsets from past projects and their vegetation asset base. These credits will be used to satisfy offset requirements for the pipeline installation.

The offset requirement included in this report is considered to be a maximum impact. It is likely that following detailed design and a detailed construction plan, further

minimisation of impacts will be identified. Melbourne Water will provide incentives and set key performance indicators to include minimisation of vegetation removal during the tender phase and the detailed design phase.

The project will use detailed design and the detailed construction method to determine the impacts on the project. This impact will not exceed 0.053 general biodiversity units, 0.081 specific units for green leek-orchid and 2.062 specific units for forest bitter-cress.

Once detailed design and construction planning has defined the actual impact of the project, the impacted remnant vegetation will be submitted to DELWP to obtain an updated BIOR report. This report will be submitted to DELWP and Yarra Ranges Council to notify of the final offset requirements for the pipe installation.

6 Legislative requirements-Aqueduct decommissioning

The following assessment of legislative requirements for the project is based solely on and relative only to the ecological values recorded within the study area.

6.1 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

One protected MNES, the matted flax-lily, was recorded on site. The species was recorded over three populations on the north side of the aqueduct channel, aside from one individual which was recorded on the south side of the channel, east of Tunnel 7. A total of 81 plants were recorded within the study area for the decommissioning.

It is likely that the proposed decommissioning will result in a significant impact to the matted flax-lily. The number of plants affected through filling the aqueduct to a level to allow surface water drainage is not determined, although it is likely to impact a large proportion of the 81 plants.

This proposal will require a referral to the Commonwealth Environment Minister. Based on the above impact the project will likely be considered a controlled action and require assessment under the EPBC Act. The assessment approach will be determined by DoE following notification of a controlled action. It is likely that this impact will require the species to be offset and development of species specific management plans.

Actions referred under the EPBC Act are generally considered and assessed on the whole impact. This is likely to include consideration by the Department of the Environment of the pipeline installation stage of the project. It is recommended that the Department be consulted on splitting the referral to suit the two stages of the project. This will allow the pipe installation stage of the project to proceed, while potentially finalising approval under the EPBC Act for the decommissioning stage.

It should also be noted that the figure of 81 plants is considered to be a minimum count. This is due to the difficult terrain in completing a targeted survey and the high cover of weeds and biomass that may be limiting growth of some individuals. There is potential for more individuals to be identified, although the key areas and the majority of individuals are assumed to be recorded.

6.2 FLORA AND FAUNA GUARANTEE ACT 1998

The FFG Act provides protection for a wide range of threatened Victorian plants, animals and communities. One listed species, matted flax-lily, was recorded during the current survey and will require permit to take protected flora. This permit is issued by DELWP.

In addition to listed threatened species, the protected flora permit will be required for impacts to listed protected flora species on public land. This will include the following species:

- Black wattle
- Golden wattle
- Common onion-orchid
- Sun-orchids
- Small tongue orchid
- Grass trigger-plant
- Button everlasting (*Coronidium scorpioides*)
- Common everlasting (*Chrysocephalum apiculatum*)
- Cottony fireweed
- Shrubby fireweed (*Senecio minimus*)
- Annual fireweed (*Senecio glomeratus* ssp. *glomeratus*)

6.3 CATCHMENT AND LAND PROTECTION ACT 1994

Under the *Catchment and Land Protection Act 1994* (CaLP Act), land owners have legal obligations regarding the management of declared noxious weeds and must take all reasonable steps to prevent the growth and spread of regionally controlled weeds on their land.

Blackberry, Spanish heath and watsonia (*Watsonia meriana* var. *bulbillifera*) are listed noxious weeds that are considered to be regionally controlled in the catchment. During construction, measures will need to be taken to prevent the spread of weeds in the construction zone both during works and as part of decommissioning.

6.4 PLANNING AND ENVIRONMENT ACT 1987

The decommissioning stage of the project is will require a planning permit from Yarra Ranges Council under Clause 52.17 for removal of native vegetation and Clause 53.01 for the removal of vegetation. The project is considered to be a moderate risk application and will be assessed by DELWP and should meet the minimum requirements under the Biodiversity Assessment Guidelines (DEPI 2013).

It was agreed with Yarra Ranges Council that a separate planning permit applications will be submitted for the pipe installation and aqueduct decommissioning stages. This will allow the pipeline construction to gain planning approval, while Melbourne Water is defining the method and impact for decommissioning.

Several environmental planning overlays exist in proximity to the study area, although two, a Bushfire Management Overlay and Environmental Significance Overlay only intersect the study area either side of Tunnel 7. These overlays may require additional planning application requirements.

6.4.1 Biodiversity Assessment Guidelines

The Biodiversity Assessment Guidelines (DEPI 2013) applies to the removal of native vegetation under Clause 52.17 of planning schemes in Victoria. Under the guidelines, where removal of remnant vegetation or scattered trees triggers a moderate or high risk pathway, the application requires a habitat hectare assessment, an assessment of the vegetation and habitat's contribution to Victoria's overall biodiversity and an offset proposal. Habitat hectare details are described in Section 3 and detailed in the attached BIOR report (Appendix C).

Based on the proposed level of impact, the decommissioning is considered to be a high risk pathway application. The following provides the other required information to accompany high risk applications to remove native vegetation.

Contribution to Victoria's biodiversity

The project area traverses through an agricultural area north east of Yarra Glen. The area has been grazed and used for viticulture since the late 1800's, which has modified the landscape. The understorey in the surrounding region is largely dominated by exotic species.

The structure and high diversity in the understorey remaining within the aqueduct reserve is a consequence of aqueduct construction and ongoing management. The state of the vegetation present is quite different to other surrounding areas and is likely to represent regional value considering the high diversity of lilies, orchids and other forbs and herbs.

The habitat may also be considered of national value due to the presence of populations of the matted flax-lily. The populations recorded within the aqueduct reserve are likely to be a significant population for the species, as they comprise a high number of individuals at the north eastern edge of its range.

Several threatened flora and fauna species have modelled habitat within the study area. These species are dominated by wetland and forest bird species, for which there is little habitat present on site. Other species, mainly small terrestrial herbs and forbs, which have habitat models within the study area, are more likely to be present due to the intact understorey. However, their presence may be impacted by the regular mowing regime occurring on site.

Two species, the green leek-orchid and forest bitter-cress have specific offset requirements, based on the maximum impact. There is potential for minimisation measures to reduce the proportional impact to either species to below the threshold that triggers a specific offset.

Minimising impacts on native vegetation

Currently the proposed construction methodology is unknown. Following selection of a preferred contractor, a decommissioning method and impacts will need to be determined.

During the selection process, Melbourne Water will include incentives to develop an option that meets safety requirement but will also minimise impacts to native vegetation.

Minimising impacts will be required to demonstrate compliance with the guidelines (DEPI 2013). This will also be an incorporated into the offset strategy, whereby, offsets will be minimised with the aim of reducing the offset requirement, including reducing the impact to the vegetation within the modelled habitat area for the green lee-orchid and the forest bitter-cress.

Proposed impacts

A Biodiversity Impact and Offset Requirements (BIOR) report was received from the Department on 28 January 2016. The report confirms the high risk pathway, considering the location and extent of the impact.

In total, there is a predicted maximum impact of 4.527 ha of remnant vegetation. Impacts to this vegetation would require both a general and specific offset.

The project will require a general offset of 0.142 general biodiversity units. These offsets are to be located within the same catchment, the Port Phillip and Westernport Catchment Management Area. The minimum strategic biodiversity score for the offset is 0.221.

In addition, there are also specific offset requirements for the green leek-orchid, of 0.645 specific units, and the forest bitter-cress, of 1.091 specific units. These offsets are required to be sourced from within the modelled habitat area for both species.

It should be noted that the above impact and offset calculation is based on the vegetation contained within the study area. It is likely that this figure will need to be revised following the implementation of minimisation measures and inclusion of potential additional impacts related to construction access and the decommissioning of the aqueduct.

Following the issue of this report to Melbourne Water, several avoidance and minimisation recommendations have been adopted in relation to impacts associated with the pipeline construction. As such the overall offset amount has been reduced; however, this has not impacted the proposed maximum offset amount for the decommissioning. An updated project BIOR report was received from DELWP is included in Appendix E. As above, the BIOR indicates the maximum project offsets for both the pipeline installation and decommissioning.

Offset strategy

Melbourne Water has extensive credits available from existing offsets from past projects. This includes such sites as nearby Christmas Hills, where existing credits include specific units for both green leek-orchid and forest bitter-cress. An offset strategy will be further developed following more detailed information of the impacts to native vegetation for both stages of the project.

During the contractor selection process, Melbourne Water will set key performance indicators to include minimisation of vegetation removal during the tender phase and the detailed design phase.

The project will use the detailed construction method to determine the impacts on the project. The impact of decommissioning will not exceed 0.124 general biodiversity units, 0.645 specific units for green leek-orchid and 1.091 specific units for forest

bitter-cress. The detailed impact area to remnant vegetation will be submitted to DELWP to obtain an updated BIOR report. This report will be submitted to DELWP and Yarra Ranges Council to notify of the final offset requirements for the pipe installation.

7 Conclusions and Recommendations

7.1 PIPELINE INSTALLATION

Installation of the proposed pipe to replace the Maroondah Aqueduct has been sited in a location that reduces impacts to the surrounding biodiversity and that has minimal impact to the local residents. The pipe is to be installed generally within the private land on the south side of the Maroondah Aqueduct, particularly where there is higher quality native vegetation in the aqueduct reserve.

The proposed impact will be influenced through the construction method, and there is opportunity for Melbourne Water, designers and construction planners to further reduce the impact to native vegetation and habitat. Generally, this is considered to be either through reducing the impact corridor or through shifting the impact corridor further south into private land.

Areas that should be targeted for avoidance should be aimed at minimising impacts to significant ecological features. These include high quality understorey in the aqueduct reserve, matted flax-lily, waterways and large and hollow-bearing trees, including green scentbark and Yarra gums. Additionally, vegetation that intersects with modelled habitat areas for the green leek-orchid and forest bitter-cress should be targeted for avoidance to assist in demonstrating compliance with the guidelines (DEPI 2013) and in attempting to minimise specific offset requirements where possible.

Through the implementation of measures to avoid impacts to matted flax-lily, including reducing the construction corridor width and protective fencing, it is unlikely that the project will significantly impact the species. Protection and minimising impacts to waterways and riparian habitat should also occur to further reduce potential impact to growling grass frog. Through implementing these measures, a referral under the EPBC Act is not recommended.

7.1.1 Recommendations

The following is a summary of the recommendations made in this report:

- Commit to implementing construction measures to avoid impacts to the matted flax-lily along Gulf Road. This direction should be given to any prospective tenderers.
- Construction of the project should aim to minimise impacts to the following as a priority:
  - vegetation that intersects with the habitat models for green leek-orchid and forest bitter-cress

  - high quality understorey vegetation in the aqueduct reserve, where there is open channel
  - large trees and trees with hollows
  - locations where green scentbark is present
  - revegetation and remnant patches along drainage lines
  - Pauls Creek and Dixons Creek, where possible.

- All vegetation and habitat not indicated for removal should be protected through temporary protective fencing during construction.
- Implement best practice construction methods vehicle hygiene methods to minimise weed and pathogen spread
- Employ construction best practice sediment and erosion controls, particularly when construction is adjacent to mapped habitat for aquatic fauna and other waterways and drainage lines
- Where there is likely to be any handling of wildlife required for construction, obtain a management authorisation under the *Wildlife Act 1975*. Note, as good practice no trenches should be left open overnight.

7.2 DECOMMISSIONING OF THE AQUEDUCT

The decommissioning of the Maroondah aqueduct has potential for extensive ecological impacts. The current proposal to decommission the aqueduct through filling-in with spoil to a level that allows natural drainage over the site is likely to result in the vegetation on either side of the channel being buried.

This method is likely to impact areas of high quality understorey that are present either side of the channel. This habitat also contains populations of the nationally endangered matted flax-lily, where a large proportion of the 81 plants observed were located close to the channel.

In consideration of the impact from this method to decommission the aqueduct, the project is required to be referred to the Commonwealth Environment Minister. It is recommended that the Department of the Environment be approached to discuss a staged referral process for the project, due to the project staging and the likely delays in gaining approval for the decommissioning stage under the EPBC Act, which may impact construction of the pipeline.

Following determination of the preferred option to decommission the aqueduct, detailed impacts of the works will need to be determined. This will inform the project referral and assessment requirements under the EPBC Act, potential permits under the FFG Act and offset requirements under the Guidelines (DEPI 2013).

It is recommended that a method to decommission the aqueduct be chosen that considers the potential ecological impacts and that areas of vegetation, particularly habitat for matted flax-lily, are avoided or at least minimised, where possible. Avoidance and minimisation measures should inform the proposed construction method for the decommissioning, to ensure that key ecological values are retained where possible.

7.2.1 Recommendations

The following is a summary of the recommendations made for the decommissioning:

- Provide prospective tenderers with ecological information to inform a proposed decommissioning method that includes avoidance and minimisation of ecological values as much as practical.
- Include performance requirements to tenderers to minimise impacts to ecological features.
- Consult with the Department of the Environment on staging the project during the referral and assessment under the EPBC Act.
- Refer the project to the Department of the Environment under the EPBC Act.
- Following determination of a decommissioning method, recalculate the impacts to native vegetation and matted flax-lily to determine the approval requirements.

8 References

DEPI 2013, *Biodiversity Assessment Guidelines*. Department of Environment and Primary Industries, East Melbourne.

DEPI 2014, *Flora and Fauna Guarantee – Characteristics of Threatened Communities*, website, http://www.depi.vic.gov.au/environment-and-wildlife/threatened-species-and-communities/flora-and-fauna-guarantee-act-1988/scientific-advisory-committee/victorian-threatened-community-descriptions, accessed 19 January 2015. Department of Environment and Primary Industries, East Melbourne.

DEPI 2015, DEPI Victorian Biodiversity Atlas. Department of Environment and Primary Industries, East Melbourne.

DEPI 2014, *Advisory list of rare or threatened plants in Victoria - 2014*. Department of Environment and Primary Industries, East Melbourne.

DELWP 2015, Biodiversity Interactive Map - Version 3.2. Department of Environment Land Water and Planning, Melbourne.

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DEWHA 2010, *Significant impact guidelines for the vulnerable growling grass frog* (Litoria raniformis). Department of the Environment, Water, Heritage and the Arts, Canberra.

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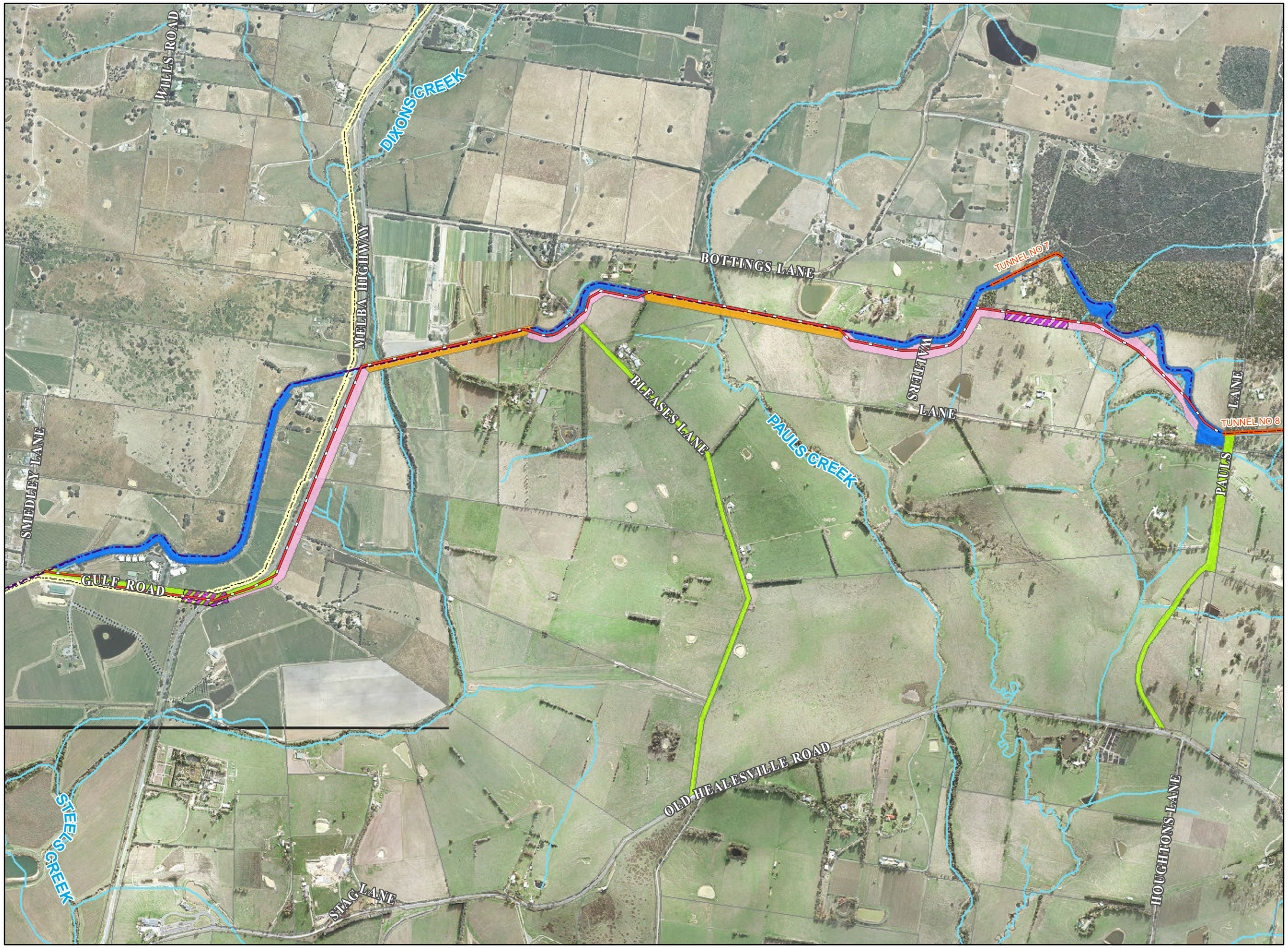
SPP 2008, *Sugarloaf Pipeline Project: Summary of Preliminary Flora and Fauna Assessment*. Sugarloaf Pipepline Project Team, Melbourne.

Appendix A

STUDY AREA MAP



KBR

Legend

- Proposed Pipeline Alignment
- Maroondah Aqueduct Existing
- Tunnel Section
- Sugarloaf Pipeline
- Boring Locations
- Cadastre
- Watercourses

Alignment Sections

- Aqueduct (Open Channel)
- Aqueduct (Siphon)
- Private Land
- Road Reserve

Notes

Melbourne Water

Projection	MGA55
Datum	GDA94
Scale	1:14,000

N

0 100 200 400
Metres

Maroondah Aqueduct

Proposed Alignment Locality Map

Date	05 Feb 2016	Paper Size	A3
Map 1 of 1		**MEG500-007**	
Map ID	MEG500-007-G-MAP-010-C	Rev	C