

Expert Witness report for the Victorian Planning Authority

Prepared by Rob Dabal

April 2022

# 1 Witness Details

I, Rob Dabal of Alluvium Consulting Australia (Alluvium), 105 – 115 Dover Street, Cremorne, Victoria 3121, prepared this report. I hold the position of Senior Ecologist. I have a Master of Ecosystems Science from University of Melbourne, Victoria, 2016-2018 and Bachelor of Science (Biology) with majors in Botany and Zoology from La Trobe University, 1993-96

I am a member Ecological Society of Australia

My expertise and interest include

- Rehabilitation and ecology of riparian and wetland vegetation,
- Applied design and management programs to rehabilitate ecological function and flora diversity,
- Riparian vegetation assessment and monitoring,
- Ecological risk management,
- Revegetation assessment and planning,
- Development of conservation action plans and indigenous engagement.

## Related Experience

I am an ecologist with extensive botanical and ecological knowledge of Melbourne's waterways and vegetation having worked in riparian and terrestrial vegetation management for over 25 years. I began my ecological career at Merri Creek Management Committee in the 1996 and have extensive knowledge of the Merri Creek catchment from its headwaters in forested areas to downstream urban reaches.

I have held senior vegetation management roles at Melbourne Water, Trust for Nature, local government and in a subcontracting capacity with Melbourne's leading ecological consultancies. As Senior Vegetation Specialist at Melbourne Water I was responsible for the development of Melbourne Waters vegetation management approaches across the Port Phillip and Westernport region, developing catchment scale site assessment methods and numerous management plans for waterways and sites of high biodiversity significance. I have worked with traditional owners in Victoria and south-central Queensland combining cultural flows and ecological knowledge to improve the management of wetlands and waterways.

My Masters of Ecosystems Science at the University of Melbourne in 2018 investigated the relationship between invasive species encroachment and hydrology in threatened wetland forests. This research is being used to refine and improve the management of invasive species to protect habitat of the critically endangered Helmeted Honeyeater and lowland Leadbeater's Possum. I am the former president of the Merriang District Landcare Group which comprised of landowners in the upper Merri catchment (between Donnybrook and Wallan) with an interest in biodiversity and agricultural management.

My expertise and experience in ecology and vegetation assessments qualifies me to make this report.

## Support

I have been supported in my preparation of this evidence by Dan O'Halloran. Dan is an Environmental Engineer with 20 years experience who specialises in Integrated Water Management plans and strategies including within Melbourne's development corridors.

## 2 Instructions

Alluvium provided advice within the then titled “*Hanna Swamp Investigation*” of June 2021. This evidence refers to the investigations undertaken to complete that report and a previous assessment of the study area conducted by Alluvium for Melbourne Water. This report draws primarily on the conclusions contained within the *Hanna Swamp Investigation* of June 2021 report. I had the role of Senior Ecologist on that project and prepared a significant proportion of that report.

The report focussed on providing ecological advice to the Victorian Planning Authority (VPA) and providing responses to the following questions:

1. The current ecological condition of Burrung Buluk (previously referred to as Hanna Swamp) and its resident ecological values
2. The potential for the swamp to be restored or rehabilitated and what factors would influence the likely success of those efforts over the medium term and when the catchment is urbanised
3. The options for the future Burrung Buluk and how do these futures align with the PSPs as they are presented today
4. The implications for ongoing maintenance and management of the swamp should it be retained.

This work was completed in approximately June of 2021.

I have been instructed by Aaron Shrimpton from Harwood Andrews to provide expert advice on the ecological values of the swamp in the context of the Precinct Structure Plan (PSP) for the area. In particular, I have been briefed to specifically address the following issues and or questions:

1. Outline your previous involvement with the Beveridge North West PSP, including an overview of the findings of the *Hanna Swamp Investigation* of June 2021
2. Does the PSP reflect or depart from the ‘Future #2’ scenario set out in the *Hanna Swamp Investigation* June 2021?
3. Does the ‘Future #2’ scenario set out in the *Hanna Swamp Investigation* June 2021 presuppose any particular land use pattern in the future, north of the PSP boundary?
4. Would it be appropriate to place infrastructure (for example an arterial road) in the southern section of the swamp?
5. Please outline your views on the issues raised in submissions, as relevant to your expertise.

This evidence report responds directly to the above issues by providing a summary of the investigations, assumptions and assessments that have been undertaken.

### 3 Information / Documentation

In preparing this evidence Rob Dabal has had regard to:

#### Reports

*Hanna Swamp Investigation*. Alluvium June 2021

*Wallan-Beveridge Pre-planning Waterways Assessment 2020 (Stage 1 to 3 – Desktop, field and modelling assessments)* Alluvium November 2020

#### Other Information

- Site Inspections
- Aerial Photography
- Australian Rainfall & Runoff (1997) – Engineers Australia
- Background literature provided by Victorian Planning Authority

Rob Dabal adopts this evidence as a true and correct statement of his opinions and the facts he believes to be true in this matter.

## 4 Facts, Matters and Assumptions

This report is based upon an assessment and review of the information provided to me as referenced in Section 3 and site visits undertaken in October 2020.

In my role as Senior Ecologist in the Alluvium team I commissioned Doug Flood to provide specific advice regarding wetland ecology for the *Hanna Swamp Investigation* (Alluvium, June 2021). I have relied upon the recommendations and advice provided by Doug Flood to inform an appropriate response to the reports key questions. Further to the work undertaken by Doug Flood I also draw upon an earlier assessment conducted in October 2020 as part of a separate piece of work for Melbourne Water as part of the *Wallan-Beveridge Pre-planning Waterways Assessment* (Alluvium, 2020). This piece of work comprised of a vegetation assessment conducted by Dylan Osler and reviewed by Doug Flood. This assessment comprised of a species list of visible flora undertaken in October and a comparison of this species information with the EPBC descriptor of SHW.

Burrung Buluk is located south of the township of Wallan within the Northern Growth Corridor of Melbourne. The subject site covers approximately 70 ha and straddles the Wallan South and Beveridge North West Precinct Structure Plan (PSP) areas.

Burrung Buluk lies within the Merri Creek catchment which is a tributary to the Yarra River. The Yarra (Birrarung) catchment encompasses the traditional lands of the Kulin Nation, including the Wurundjeri Woi Wurrung people. Archaeological evidence shows that Aboriginal Wurundjeri Woi Wurrung people lived and prospered in the Yarra (Birrarung) catchment for at least 30,000 years (Foundary Associates, 2019). A catchment and context map is shown in Figure 2 including the location of Burrung Buluk in relation to existing development surrounding Wallan, local waterways including Strathaird Creek, PSP boundaries and other historical swamps and wetland within this section of the northern growth corridor, including Meade and Hernes Swamps.

Historical mapping shows Burrung Buluk, Meade and Hernes Swamps within the northern growth corridor south of Wallan (Figure 2). Site surveys have identified the southern portion of Burrung Buluk as a Seasonal Herbaceous Wetland (SHW) based on the composition of its remnant vegetation. SHWs are listed as critically endangered within the Environmental Protection and Biodiversity Act (1999). SHWs were listed in 2012.

They typically receive the majority of their water from local catchments as part of a swamp's wetting regime. The filling of SHWs is typically intermittent and driven by local catchment and hydrological function. It is unlikely that Burrung Buluk received predictable inflows of the same duration, depth and timing on a regular and annual cyclical basis.

Figure 3 suggests that Burrung Buluk was partially hydrologically connected to Strathaird Creek. The wetland may have received periodic/intermittent inflows from Strathaird Creek. In recent times the landscape has been extensively cleared of indigenous vegetation (Parsons Brinkerhoff, 2008) for grazing and agricultural purposes (Victorian places, 2015). This has had a substantial impact on areas of ecological value (Victorian places, 2015). The upper Merri Creek catchment where Burrung Buluk is located is now predominantly rural (Melbourne Water, 2016) with the township of Wallan and its surrounds urbanising rapidly.

#### 4.1 What is a Seasonal Herbaceous Wetland (SHW)?

*“Seasonal Herbaceous Wetlands (SHW) are isolated freshwater wetlands that are seasonally or intermittently filled by rainfall. They are usually inundated in the cooler months (winter – spring), and generally dry out by late summer, so surface water is not permanently present. Being dry for part of each year means they often disappear from the landscape (or at least seem to) and as a result most have been cropped or drained during dry periods, as SHW often occur on fertile soil in agricultural landscapes” (Glenelg Hopkins Catchment Management Authority, 2017).*

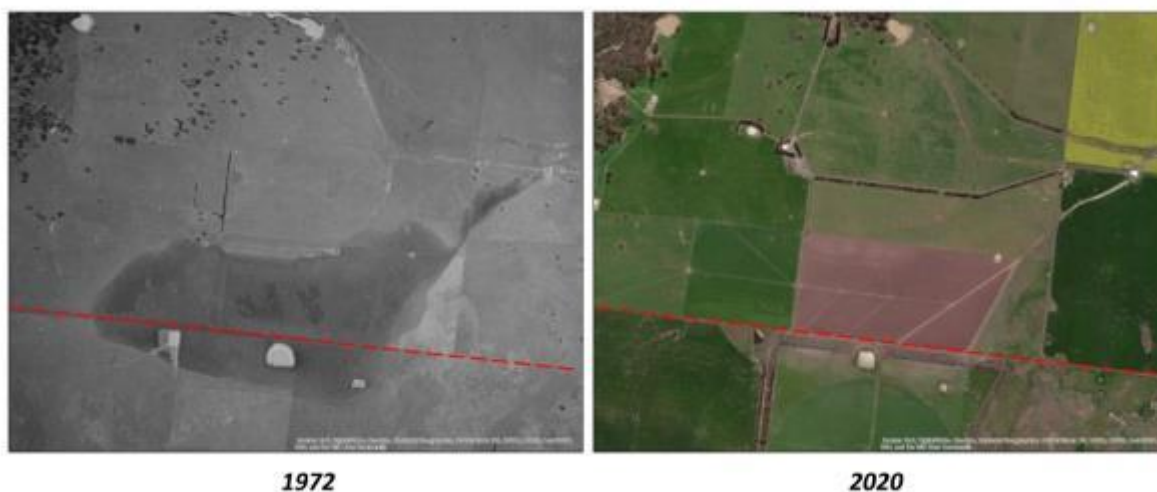
SHWs are dependent upon seasonal wetting and drying patterns (Threatened Species Scientific Community TSSC, 2012), where the depth, duration and frequency of inundation is highly variable, however typically they are inundated for up to a few months and the depth of water is usually shallow (<1m) and there may be little to no inundation for several years during drought periods. They are typically treeless, freshwater systems. Salinity is generally between 0 and 1000 mg/L (increasing to 3000 mg/L as water evaporates).

Wetlands that are saline or have either groundwater or overbank flooding as their dominant water source are excluded from the SHW threatened community.

Different types of wetlands (e.g. large and permanent freshwater lakes, saline marshes, and seasonal herbaceous wetlands) each provide habitat for a selection of fauna and flora species and the full diversity of wetland types need to be protected to conserve that range of biodiversity. Removing or replacing a SHW with another type of wetland will result in reduced species and functional diversity (TSSC 2012).

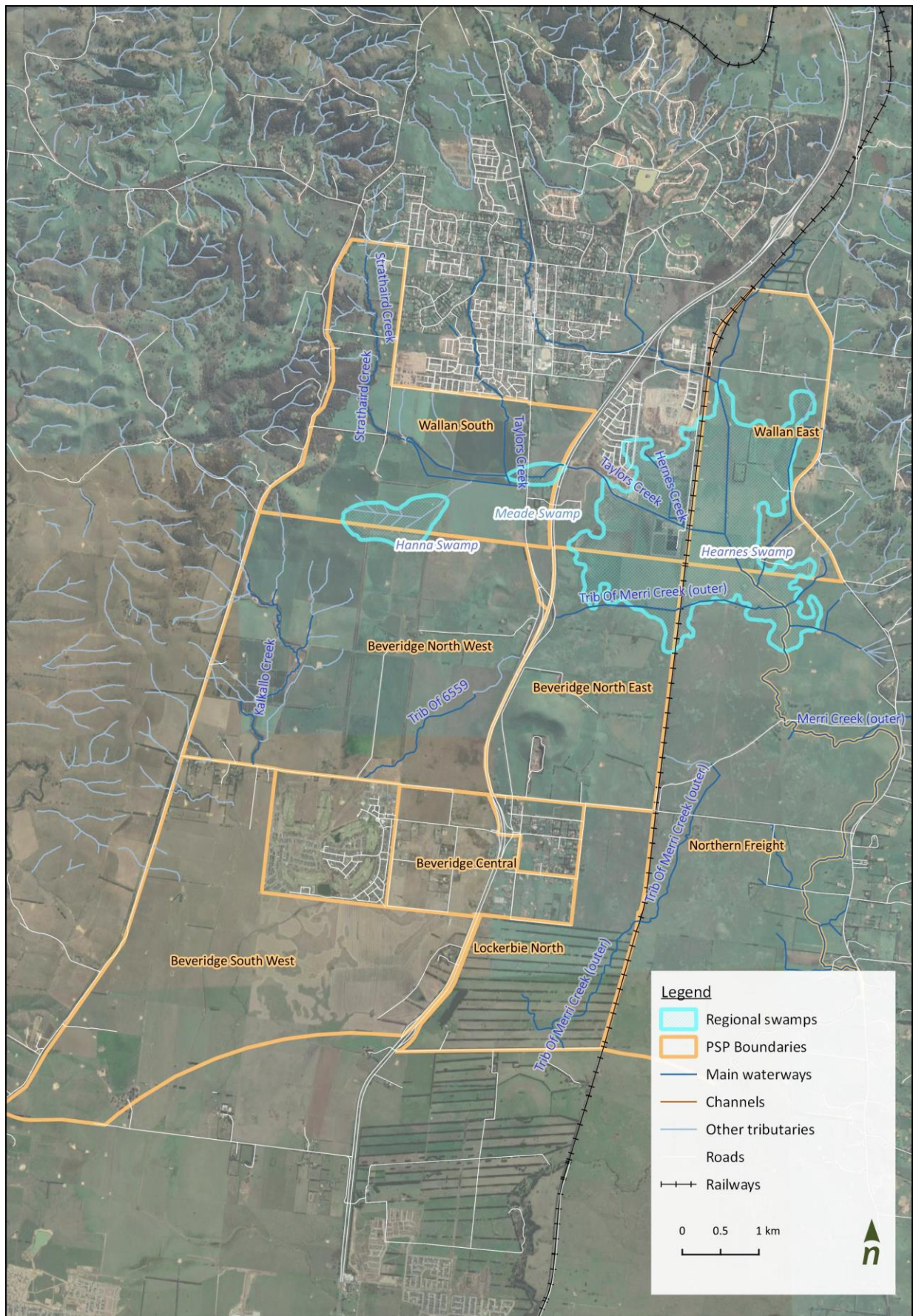
#### 4.2 Existing drainage condition

Burrung Buluk can become inundated or partially so during large rainfall events and currently receives water from its surrounding catchment. A series of formal drains have been cut through the swamp that drain the northern section of the swamp to the lower end of Strathaird Creek. These drains have been constructed in support of agricultural activities and have significantly altered the swamps hydrology ensuring that flows reaching the swamp are drained efficiently. The existing drainage lines across the northern sections of Burrung Buluk are visible in Figure 1.

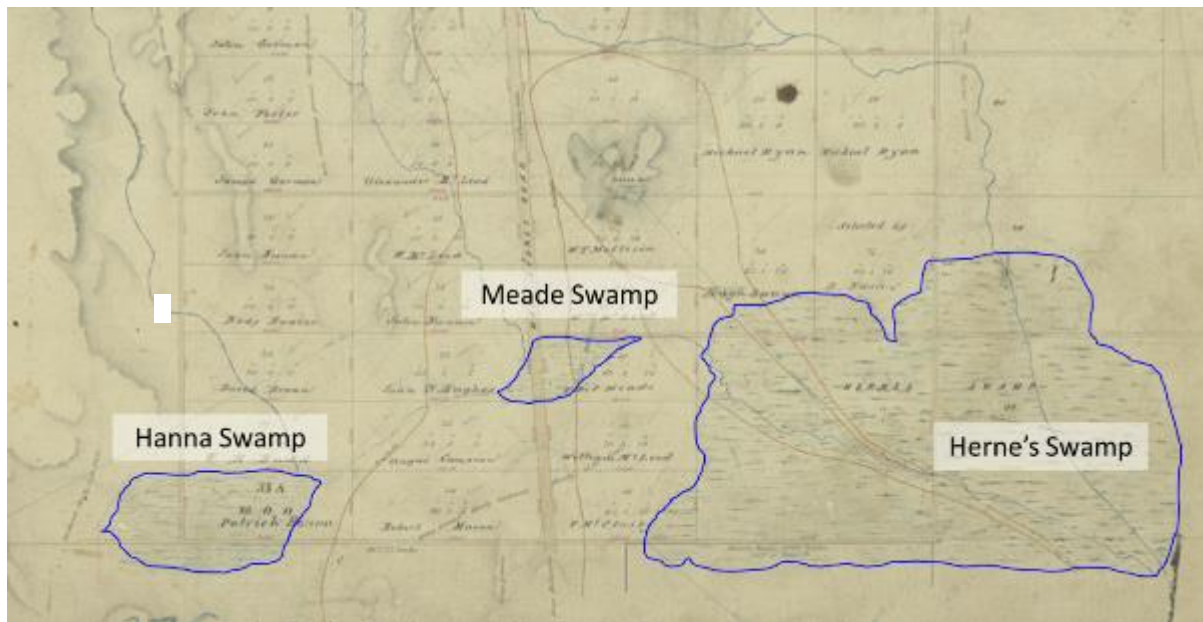


**Figure 1.** Burrung Buluk before and after comprehensive drainage. Red line is the boundary between PSP areas. (Friends of Merri Creek, 2020)





**Figure 2.** Burrung Buluk in the context of PSP boundaries and other regional swamps



**Figure 3.** 1850s parish map showing the extent of Hernes Swamp, Burrung Buluk and Meade Swamp at the time (Victorian Places, 2015)

### 4.3 Policy and planning context

#### The Melbourne Strategic Assessment

In 2009 the Victorian and Commonwealth Governments agreed to undertake a strategic assessment of the Victorian Government's urban development program (DELWP website, Accessed June 2021). This assessment was made with regard to the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC, 1999). The resulting Melbourne Strategic Assessment (MSA) sets out the State Government's approach to managing the impact of urban development on "matters of national environmental significance".

The Biodiversity Conservation Strategy for Melbourne's Growth Corridors (2013), or the BCS, was prepared to "evaluate(d) the impacts of the State Government's program Delivering Melbourne's newest sustainable communities on matters of national environmental significance" (BCS, 2013).

Field assessment of Burrung Buluk was not undertaken as part of this process. A desktop assessment was undertaken based on modelled data and interpretation of aerial photography. It was not identified as a conservation area under the BCS and has not been identified as an area requiring protection under the MSA.

In 2013, the Commonwealth Government approved urban development in the northern growth corridor in accordance with the outcomes of the BCS. Therefore, Burrung Buluk is no longer afforded protection under the EPBC Act (1999), including a note that this is "without regard for site surveys that may have been undertaken since 2013".

#### Beveridge North West PSP Panel Report

In evaluating the status of Burrung Buluk, the Beveridge North West PSP Panel Report recommended that "further consideration of the protection of Hanna Swamp is required". In discussing future options for integrating Burrung Buluk into the landscape, Mitchell Shire Council noted that "the portion of Hanna Swamp located between the SR-01 and Hadfield Road has the potential to be integrated with the open space area, albeit in modified form". The panel agreed that the expansion of SR-01 could be positive for reasons including the retention of a portion of Burrung Buluk.



The panel concluded that “not being identified in the Melbourne Strategic Assessment does not provide sufficient justification (for the removal of the swamp) given the broad range of state, regional and local planning policy that points to wetland protection and restoration”, recommending that “further investigation as to how Burrung Buluk might be protected”.

## **5 Understanding existing conditions & values**

### **5.1 Biodiversity values**

The resident biodiversity values for Burrung Buluk were assessed during a field investigation by Alluvium (October 2020). Shallow inundation had occurred in the weeks to months prior, triggering the growth of a range of seasonal wetland flora enabling detection of wetland flora elements key to the determination of a SHW. These flora elements cannot be readily identified during dry periods.

Despite vegetation throughout the area being highly modified by agriculture, there are significant biodiversity values associated with Burrung Buluk, primarily in the southern portion of the wetland with Plains Grassy Wetland EVC 125 (see below) and wetland plant species detected in the north also. These biodiversity values are summarised below, with brief comments on connected values downstream and with the broader Wallan Wetlands area.

#### **Desktop findings – vegetation**

Model-based vegetation mapping provides background information on what vegetation may occur at a site. The mapping referred to must be verified in the field. Results of previous field surveys are presented in the next section.

Burrung Buluk and the surrounding area fall within the Victorian Volcanic Plain (VVP) bioregion. Pre-1750 EVC mapping (DELWP, 2020) shows Burrung Buluk modelled as EVC 125 Plains Grassy Wetlands, which is classed as Endangered in the VVP bioregion. The pre-1750 EVC mapping is at a coarse scale and these modelled EVCs need to be coupled with interpretation and field investigation.

One federally listed threatened community that is recorded as likely to occur at Burrung Buluk is Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains, Critically Endangered (EPBC Act 1999) (EPBC Protected Matters Report). This community is considered equivalent to EVC 125: Plains Grassy Wetland (Endangered Conservation Status in the Victorian Volcanic Plains bioregion).

#### **Field survey findings (October 2020) – vegetation**

The redirection and channelisation of Strathaird Creek and drain construction through the floodplain, has modified the hydrology of the water-dependent vegetation zones throughout the Burrung Buluk and Strathaird Creek area. However, significant remnant vegetation still exists, and Burrung Buluk holds species and a vegetation community protected under state and federal legislation.

Starkly different values occur to the north and south of the property boundary which bisects the swamp. Field surveys conducted by Alluvium (October 2020) confirmed the presence of Plains Grassy Wetland EVC 125 / Seasonal Herbaceous Wetlands (SHW) at Burrung Buluk in the southern portion, and degraded vegetation in the northern portion. Plains Grassy Wetland species in the northern portion were restricted to robust common species tolerate of disturbance and often considered somewhat ubiquitous.

Note that further investigation as to the way in which vegetation condition might vary across the southern portion of the site have not been undertaken. Further assessment would provide valuable additional information as to the way in which quality varies across the southern portion of the wetland. Additional mapping would further reinforce the importance of the site and may identify additional species especially short lived and or cryptic species.

### **Burrung Buluk North**

The limited native vegetation values that remain in the north comprise robust, disturbance tolerant species derived from degraded Plains Grassy Wetland EVC 125 and does not meet the criteria for SHW (Alluvium 2021).

It is dominated by exotic plant species, with robust common indigenous plants currently restricted to drainage lines (i.e. *Amphibromus nervosus*, *Eleocharis acuta*, *Myriophyllum* spp. and *Juncus* spp.) and a patch dominated by the native grass *Poa labillardierei* occurring to the east of Burrung Buluk. At the time of assessment, 19 plant species were identified in total, comprising 11 exotic and 8 indigenous species.

This confirms findings of a prior vegetation survey conducted by Biosis on the eastern 2/3 of Burrung Buluk north in 2016 when the wetland had been wet but was drying (Biosis 2018). They found small areas of Plains Grassy Wetland (EVC 125) of poor quality (weed cover >50%) in the drainage lines and patches in the SE corner of Burrung Buluk North that did not meet the criteria for SHW (four patches, total 2.32 hectares).

### **Burrung Buluk South**

The south side maintains a portion of remnant Plains Grassy Wetland EVC 125 which qualifies as a very high quality SHW and provides habitat for a number of important wetland plant species. Indigenous wetland flora is evident throughout the south side co-occurring with exotic species.

This vegetation has much higher species diversity than the north, with 67 species found (33 indigenous species, 1 planted i.e. *Eucalyptus camaldulensis* Red Gum, and 33 exotic species). *Coronidium gunnianum* Pale swamp everlasting, a threatened species in Victoria (vulnerable under the FFG Act) was observed in the portion not subject to pasture renovation.

The very high quality SHW benchmark is met because the site contains more than three diagnostic species in the federal advice for this threatened ecological community (TSSC 2012). In this case six species were identified including *Calocephalus lacteus* Milky Beauty-heads, *Coronidium gunnianum* Pale Swamp Everlasting, *Eryngium vesiculosum* Prickfoot, *Lobelia pratioides* Poison Lobelia, *Montia australasica* White Purslane and *Ranunculus inundatus* River Buttercup.

The long term trajectory potential for Burrung Buluk south is positive, and is likely to maintain its values if hydrology is suitable and threats are managed appropriately.

### **Summary**

- From an ecological perspective, protecting the SHW values that are present within Burrung Buluk South is considered highly desirable. The southern portion of the site has the highest values and greatest long term capacity for rehabilitation.
- Incorporating an area in the northern section (i.e. within Wallan South PSP) to act as a stormwater treatment and flow moderation asset is also desirable, and likely to be fundamental to the protection of the SHW in the south.
- Development of a restoration plan is recommended to ensure that all stakeholders have a shared understanding of the objectives relating to the future direction of the area of Burrung Buluk that is retained (and for other significant natural assets in the region). This includes outlining expected ecological outcomes and how this may change over time, as well as the potential for community amenity and liveability outcomes. Additional data and/or modelling of Burrung Buluk's rehabilitation potential based on what is known about current ecological values and historical data would be needed to inform restoration planning.

## 6 Options for Burrung Buluk

### 6.1 Restoration versus Rehabilitation

In a strict sense, restoration implies return to a prior (pre-damage) condition. While aspects or components of ecosystems can be restored, their comprehensive restoration is generally unrealistic. A more useful approach is one of rehabilitation, which involves re-establishment of some ecological components and functions. While only a word, use of the term 'restoration' can create unrealistic expectations for the outcomes of ecological interventions, whereas 'rehabilitation' allows for a staged recovery of some of the ecological attributes and species composition, depending on the resources available.

If there are efforts to retain or rehabilitate the SHW of Burrung Buluk, some considerations will be critical in determining a successful outcome. These include:

1. Ensuring a sufficient buffer between the swamp and residential development.
2. A water supply of sufficiently high quality, presumably treated in a designed wetland area prior to it flowing into areas supporting SHW.
3. Regulated inflows to prevent urban runoff reaching the wetland at inappropriate times and in inappropriate volumes.
4. Resources for on-going maintenance including weed control.
5. A strategy for ecologically appropriate biomass management if this becomes necessary.
6. Monitoring to determine any required adaptive management responses.
7. Expertise in reintroducing SHW flora and if necessary relocating remnant flora to the new wetland shallows, to ensure its survival under the changed hydrological conditions.

### 6.2 Scenarios

The Burrung Buluk investigation (Alluvium, 2021) considered the following future scenarios:

- Future 1#: No future swamp i.e. the PSPs are delivered as planned
- Future 2#: Retain the SHW within Burrung Buluk South with minimal buffer
- Future 3#: Retain the SHW within Burrung Buluk South and retain an area within Burrung Buluk North to act as a buffer and stormwater regulation and treatment asset
- Future 4#: Retain the full boundary Burrung Buluk South and North, retaining the SHW values in the south and considering the restoration objective for the north (e.g. strive to restore to a SHW, or allow that area to act as an ecological buffer to the south).

Plans and descriptions for each scenario are provided below. The remainder of section 6 is a summary of that investigation.

Future 1# – No swamp

The ‘no swamp’ option reflects the outcome if the PSPs are implemented as planned, with the removal of the Seasonal Herbaceous Wetland, to be replaced by a combination of open space, residential development and roadways.

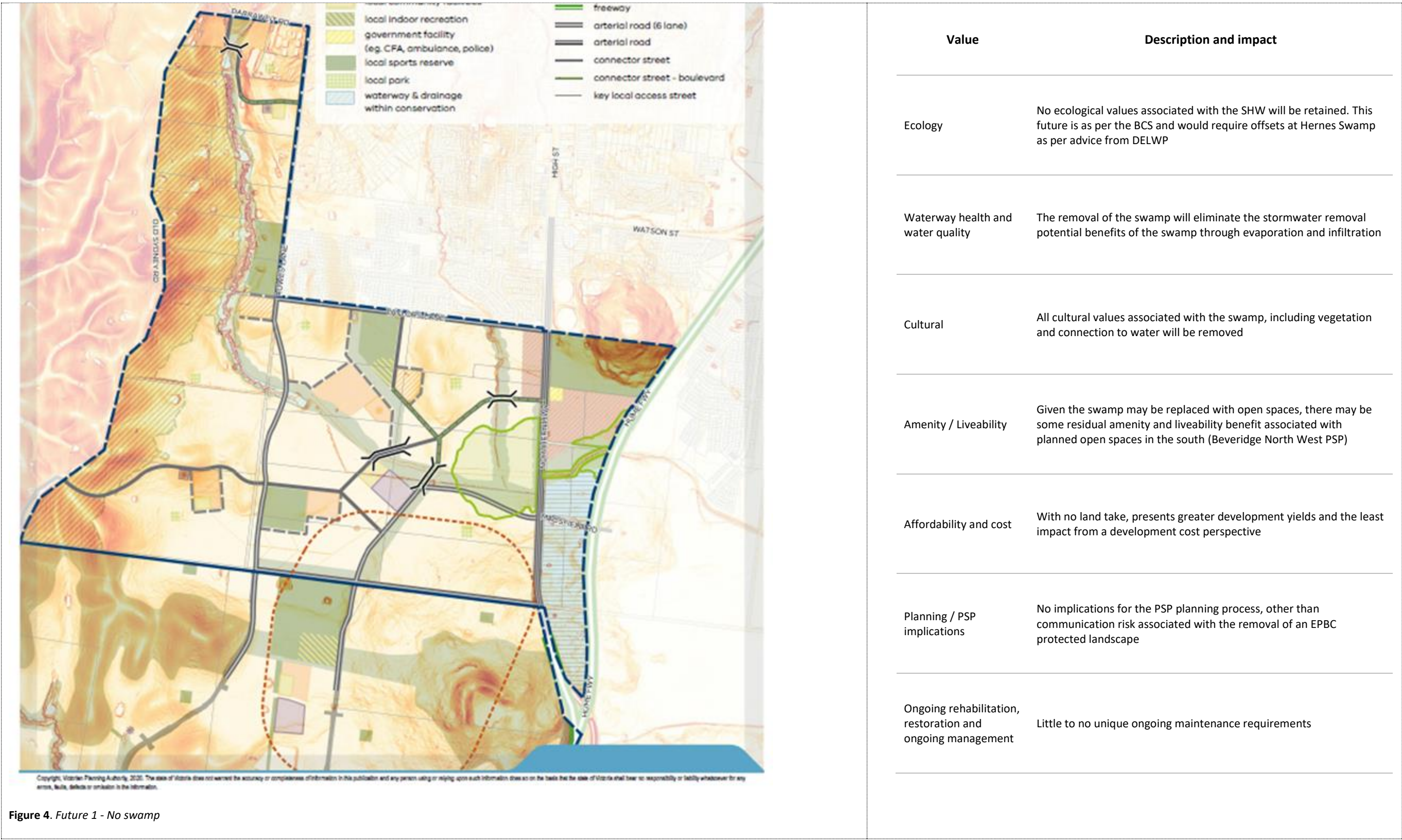
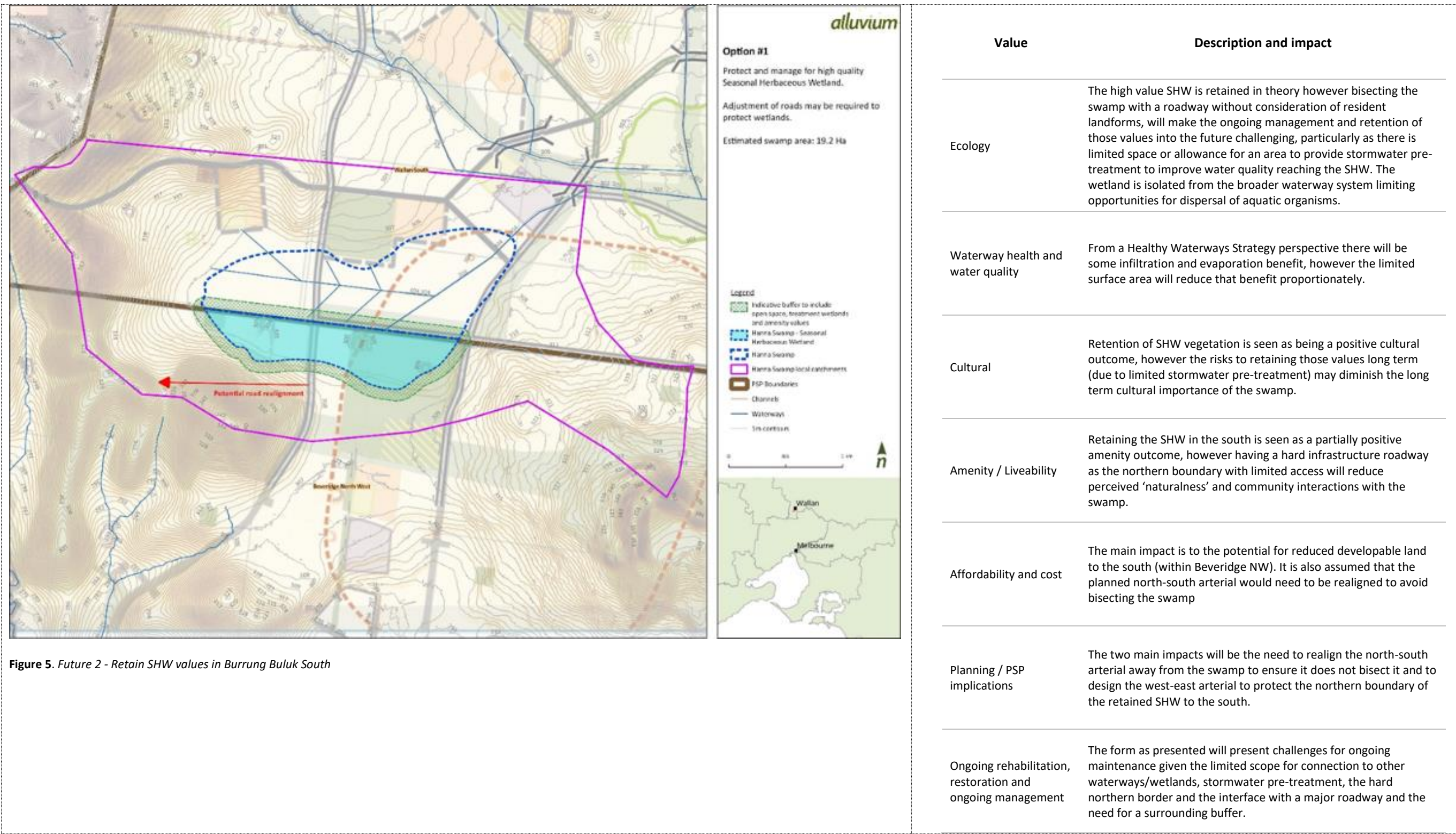


Figure 4. Future 1 - No swamp



Future 2# - Retain SHW values in Burrung Buluk

This option proposes retaining the high value SHW identified within the southern section of Burrung Buluk (in Beveridge North West PSP), while the northern section will be developed as per the PSP. A buffer area (in green) has been assumed and is presented below. A buffer would be required to protect the SHW values in the south and the width and area of the buffer would need to be determined if this option was progressed. In this plan, the swamp is bisected by a west – east arterial.





Future 3# - Retain SHW (HS South) and restore a portion of the northern wetland

In this future, high value SHW will be retained in the south as per Future 2#. A section of the northern wetland is retained to help support the southern portion, including by acting as an urban stormwater treatment and flow regulation asset. The perimeter buffer is retained around the swamp boundary.

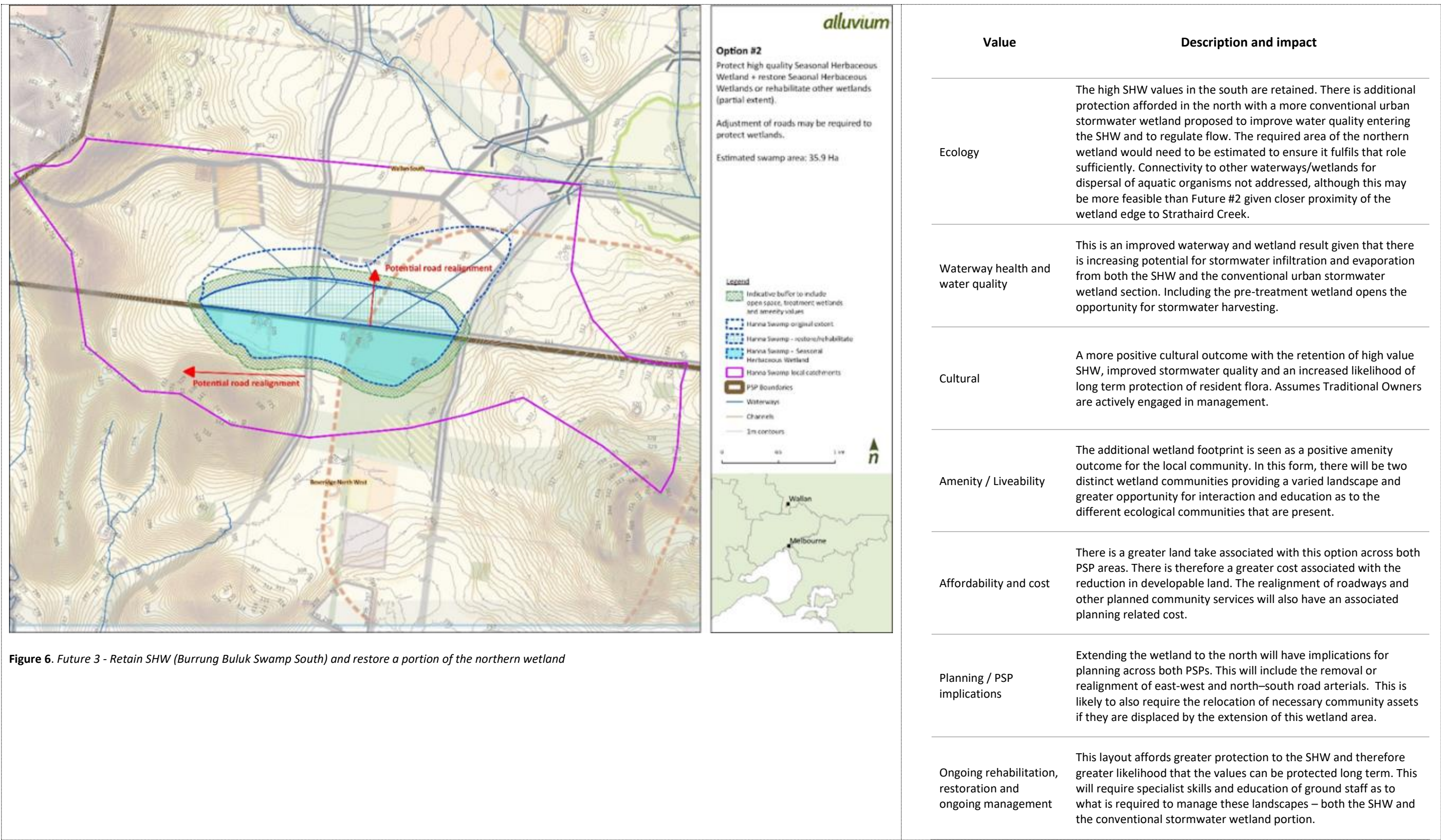


Figure 6. Future 3 - Retain SHW (Burrung Buluk Swamp South) and restore a portion of the northern wetland



Future 4# – Retain full extent of HS South and North

This option reinstates the Swamp footprint as best as possible within an urban landscape. The option includes the full known extent of Burrung Buluk and includes a buffer area. This has the maximum impact on land take and planned infrastructure while benefits include the potential retention of resident values with additional landscape values being introduced within Wallan South PSP. However, as the commentary and case studies above suggest, this is not a definite outcome and will require investment in specialist maintenance.

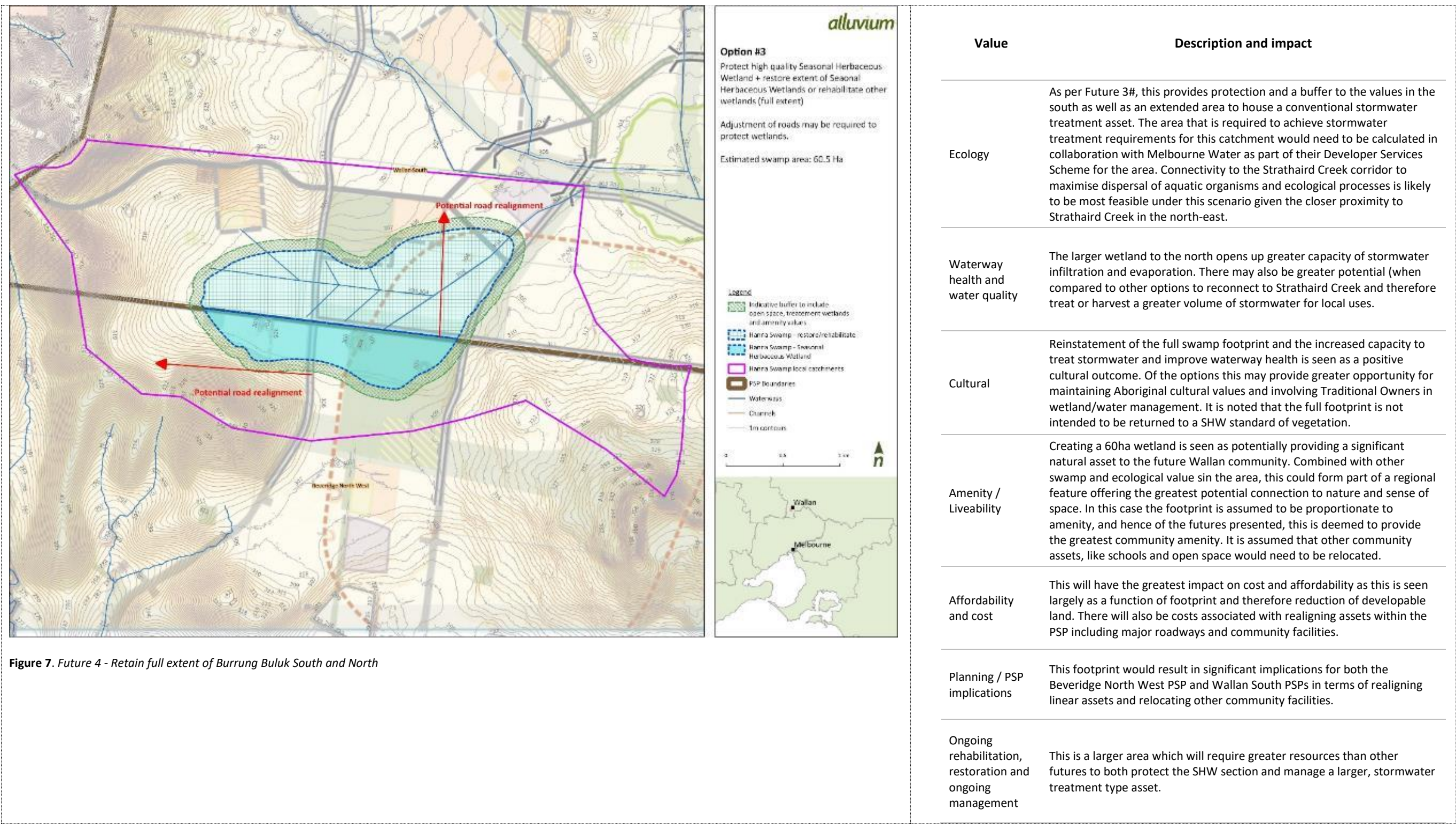


Figure 7. Future 4 - Retain full extent of Burrung Buluk South and North

### 6.3 Summary

- From an ecological perspective, and understanding the ruling under the BCS, it is the recommendation of this report that as much of the SHW in the southern section of the swamp (within Beveridge North West PSP) be protected and retained.
- A suitable buffer is critical to protecting the SHW ecological community on an ongoing basis. It is recommended that this include a buffer around the perimeter of the southern section and an allowance, potentially within Wallan South PSP, for a wetland asset to regulate flow and improve stormwater quality prior to flowing to the southern section.
- The area that is to be set aside in the north, should that advice be followed, would be defined based on the objectives of the asset as a whole e.g. to protect the SHW in the south or potentially fulfil a broader role that meets some of the HWS performance objectives for the sub-catchment such as stormwater harvesting.
- A suitable urban drainage network would need to be designed that meets defined stormwater quality, duration, timing and volume (inundation) requirements for a SHW. Ecological skills in SHW management and hydrological skills need to be applied early in the design phase.
- Maintenance of the SHW should be the responsibility of a suitably qualified organisation. This is not to say that Council or Melbourne Water could not meet this requirement, only that capacity building within the responsible organisation is likely to be required to ensure the SHW is managed appropriately. Other organisations such as Parks Victoria and community groups like the Friends of Merri Creek could also be invited to be involved.
- The integration of Burrung Buluk into the surrounding landscape should not occur in isolation of the rest of the Upper Merri Creek catchment. Landscape scale planning across multiple wetlands and waterways is recommended (including consideration of Hearne and Meade Swamps). In particular, connectivity to other waterways/wetlands is a high priority to support important ecological processes such as dispersal.
- Further investigation, analysis and stakeholder consultation will be required should a rehabilitation and management plan for Burrung Buluk be developed. Should some of Burrung Buluk be retained, a more detailed investigation into the feasibility of restoring Burrung Buluk and similar local wetlands could be conducted. This study could refer to the wetland recovery feasibility decision making tool produced by DELWP in 2017 (Roberts et al 2017).
- The issue of willingness to pay has not been addressed in this review. It is suggested that this is a broader issue for the water and development industries to address in consideration of this and other examples within Melbourne's Growth corridors.

## 7 Response to specific questions

### **Outline your previous involvement with the Beveridge North West PSP, including providing an overview of the findings of the Burrung Buluk Investigation June 2021.**

I have walked and observed the north side of Burrung Buluk in some detail. My understanding of the south side is based on a site visit conducted in late August 2020. In that visit, observations of the southern portion of the swamp were made from the north side. Assessment undertaken on this date was limited to the northern periphery of the southern portion of the swamp. The fence to the south was not crossed as permission had not been provided by the landowner.

My observations and assessment are limited to the vegetation assessment which comprised of a species list for the site and comparison against the definition of a SHW as per EPBC advice. We did not conduct a formal assessment of fauna values or any targeted assessment for significant fauna.

Observations made on this site visit in August 2020 confirmed that Seasonal Herbaceous Wetland was very likely to be present in the southern portion of the swamp as characteristics species of this vegetation type were identified from the periphery (i.e. from the northern boundary of the southern portion of the swamp) including Milky Beauty heads *Calocephalus lacteus* and *Eryngium vesiculosum* (Prickfoot). Possibly also *Coronidium gunnium* (Pale Swamp Everlasting).

Additional observations with focus on the visible species within the southern portion were made by an independent subcontractor engaged by Alluvium. This subcontractor conducted assessments in October 2020. These observations confirmed the presence of SHW with a specific focus on the 'herbaceous' component. Additional grasses and sedges and other flora were also observed. Herbaceous species of note include six species which are characteristic of SHW including *Calocephalus lacteus* (Milky Beauty-heads), *Coronidium gunnium* (Pale Swamp Everlasting), *Eryngium vesiculosum* (Prickfoot), *Lobelia pratioides* (Poison Lobelia), *Montia australasica* (White Purslane) and *Ranunculus inundatus* (River Buttercup).

Further to assessment conducted in 2020 Alluvium also conducted a desktop assessment as part of an options evaluation process. A second subcontractor was engaged to review the species list noted in the initial site assessment.

### **Overview of findings**

#### **Field survey findings (October 2020) – vegetation**

The redirection and channelisation of Strathaird Creek and drain construction through the floodplain has modified the hydrology of the water-dependent vegetation zones throughout the Burrung Buluk and Strathaird Creek area. However, significant remnant vegetation still exists, and Burrung Buluk holds species and a vegetation community protected under state and federal legislation.

Starkly different values occur to the north and south of the property boundary which bisects the swamp. Field surveys conducted by Alluvium (October 2020) confirmed the presence of Plains Grassy Wetland EVC 125 / Seasonal Herbaceous Wetlands (SHW) at Burrung Buluk in the southern portion, and degraded vegetation in the northern portion. Plains Grassy Wetland species in the northern portion were restricted to robust common species tolerate of disturbance and often considered somewhat ubiquitous.

Note that further investigation as to the way in which vegetation condition might vary across the southern portion of the site have not been undertaken. Further assessment would provide valuable additional information as to the way in which quality varies across the southern portion of the wetland. Additional mapping would further reinforce the importance of the site and may identify additional species especially short lived and or cryptic species.

An important consideration regarding the function of the southern portion is the management of the northern portion. While the northern and southern portions are in separate PSPs the function of the southern portion is influenced by management of the northern portion in the adjoining PSP. The northern portion cannot be planned for or managed without regard for the impact on the southern portion.



### **Burrung Buluk North**

The limited native vegetation values that remain in the north comprise robust, disturbance tolerant species derived from degraded Plains Grassy Wetland EVC 125 and does not meet the criteria for SHW (Alluvium 2021).

It is dominated by exotic plant species, with robust common indigenous plants currently restricted to drainage lines (i.e. *Amphibromus nervosus*, *Eleocharis acuta*, *Myriophyllum* spp. and *Juncus* spp.) and a patch dominated by the native grass *Poa labillardierei* occurring to the east of Burrung Buluk. At the time of assessment, 19 plant species were identified in total, comprising 11 exotic and 8 indigenous species.

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### **Burrung Buluk South**

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This vegetation has much higher species diversity than the north, with 67 species found (33 indigenous species, 1 planted i.e. *Eucalyptus camaldulensis* Red Gum, and 33 exotic species). *Coronidium gunnianum* Pale swamp everlasting, a threatened species in Victoria (vulnerable under the FFG Act) was observed in the portion not subject to pasture renovation.

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The long-term trajectory potential for Burrung Buluk south is positive. It is likely to maintain its SHW values if hydrology is suitable, and threats are managed appropriately.

### **Summary**

- From an ecological perspective, protecting the SHW values that are present within Burrung Buluk South is considered highly desirable. The southern portion of the site has the highest values and greatest long-term capacity for rehabilitation.
- Incorporating an area in the northern section (i.e. within Wallan South PSP) to act as a stormwater treatment and flow moderation asset is also desirable, and likely to be fundamental to the protection of the SHW in the south.
- Development of a restoration plan is recommended to ensure that all stakeholders have a shared understanding of the objectives relating to the future direction of the area of Burrung Buluk that is retained (and for other significant natural assets in the region). This includes outlining expected ecological outcomes and how this may change over time, as well as the potential for community amenity and liveability outcomes. Additional data and/or modelling of Burrung Buluk's rehabilitation potential based on what is known about current ecological values and historical data would be needed to inform restoration planning



## Does the PSP reflect or depart from the 'Future #2' scenario set out in the Burrung Buluk Investigation June 2021?

The PSP in its current form constrains the opportunity for retention and rehabilitation of the ecological values of Burrung Buluk. This is due primarily to the changes associated with hydrology and reduced buffer area for the values of the site as the PSP currently stands. The PSP needs to ensure that there is sufficient connection of ecological values within and between sites. The PSP also needs to ensure that sufficient space is provided to protect and maintain existing values with consideration for the changes that will result from development.

Ecological function and process operate differently in an urbanised setting compared to the current rural setting. On balance it is more likely that values will be lost in an urban setting and that ecological values are driven to a more simplified state with biodiversity adapted to a range of disturbances including both episodic and prolonged disturbances as well as acute disturbance being favoured. In addition to disturbance urban development would tend to fragment and isolate ecological values.

The scenario presented in Future 2 would result in the wetland being functionally isolated from the broader waterway system limiting its ecological capacity. The relatively limited scale and size presented in Future 2 would substantially constrict the scope for ecological processes and function to be maintained. Examples of how ecological function might be limited include reduced opportunities for dispersal of aquatic organisms, increased exposure to urban pressures such as invasive species and constraints to the exchange of genetic diversity. These functions would also be influenced by increased human activity in the landscape. The relatively small scale of the wetland would influence its function. Small scale reservations of land for biodiversity purposes have reduced capacity to sustain species diversity and richness. This is due in part to the reduced habitat and niche diversity present at smaller scales and the impact of threatening process at a species and system level.

High value SHW vegetation is retained in the current PSP however any proposal that might include the bisecting the swamp with a roadway and/or having a roadway to the north without consideration of resident landforms, will make the ongoing management and retention of those values resource intensive and challenging. There is limited space or allowance for an area to provide stormwater pre-treatment to improve water quality reaching the SHW. In effect the PSP as it stands may reduce the capacity for ancestral hydrology to be re-instated and compromise the long-term sustainability of ecological values at the site. Insufficient regard for the hydrological regime of a SHW will result in loss of ecological values.

Given the constraints of Future 2 it is useful to outline a number of principles/considerations that would offer improved ecological function.

- **Buffer habitat.** Sufficient buffer habitat to transition between land uses of differing intensity is required. In this case a gradual change from urbanised or other developed habitat would need to be staged across the landscape with adequate protection of habitat for species and systems of interest. The proximity of development to areas of important habitat needs to be considered. High intensity use areas should not be in close proximity to areas of significance.
- **Connectivity.** As far as practically possible there would need to be sufficient connectivity between existing wetland values at Burrung Buluk with surrounding wetlands to the east, particularly Meade Swamp and Hernes Swamp. The exact scale and size of this connectivity would need to take into account a range of land uses, it would therefore be presumptuous to apply a 'rule of thumb' at this stage.
- **Core habitat.** Ecological function operates more efficiently when sufficient core habitat can be established and maintained. In general the larger the core habitat area the better, in this case a minimum core habitat area of the current SHW should be sought. Further supporting this core area should be buffer habitat. Core habitat also needs to be connected to other areas of core habitat to increase ecological function.
- **Monitoring and adaptive management.** Any future scenario for the protection and maintenance of habitat within the PSP needs to be supported by sufficient management expertise which is informed by monitoring and an adaptive management framework. Ecological management and SHWs in particular

are complex systems. Their ecological expression fluctuates in ways that are difficult to predict. Given this complexity it is essential to develop an adaptive management framework.

**Does the 'Future #2' scenario set out in the Burrung Buluk Investigation June 2021 presuppose any particular land use pattern in the future, north of the PSP boundary?**

A number of ecological and hydrological conditions need to be met and assumptions made for Future 2 to be functional. These would need to be met within the current PSP boundary and beyond, i.e. to the north within the Wallan South PSP. We would need to assume that:

- sufficient buffer is provided,
- appropriately variable hydrological management can be established,
- future land managers have sufficient technical understanding of the ongoing maintenance needs of the site's ecology and management and
- there is a process in place to for sufficient monitoring for adaptive management.

As a minimum an adequate buffer for the protection of the wetland in the Beveridge North West PSP is required. This buffer needs to include sufficient space for the construction of stormwater treatment and buffer habitat. Buffer habitat is required for a number of reasons including:

- to provide physical distance between the values of the south and impacts that will result from development in the north,
- enable to construction of stormwater wetlands from development in the catchment, and
- the consideration of other potential future urban ecology impacts and the relationship between urbanisation and climate change.

If there are efforts to retain or rehabilitate the SHW of Burrung Buluk , additional hydrological and engineering considerations will be critical in determining a successful outcome. As a minimum these may include:

- Sufficient regard to integrated water management principles.
- A water supply of sufficiently high quality, presumably pre-treated within a constructed wetland area prior to it flowing into areas supporting SHW.
- Regulated inflows to prevent urban runoff reaching the wetland at inappropriate times and in inappropriate volumes.
- Resources for on-going maintenance including weed control.
- A strategy for ecologically appropriate biomass management if this becomes necessary.
- Expertise in reintroducing SHW flora and if necessary relocating remnant flora to the new wetland shallows, to ensure its survival under the changed hydrological conditions.

A number of design scenarios could be proposed to meet the minimal consideration identified above. These would also need to sufficiently take on board and expand on the ecological principles identified in the response to the previous question.

We can speculate about the potential outcomes of a range of different design responses that would facilitate the delivery of scenario 2 but without seeing these options it is not possible to determine their merit. Given this, it is necessary to return to broader principles of ecological management and function.

Providing sufficient buffer, connectivity and core habitat area must be central to any design that supports scenario 2 or any other future scenario that seeks to protect and retain ecological values. Transparency around objectives needs to be validated in the context of an adaptive management framework. Uncertainty and risk need to be factored into this framework. Consideration of the uncertainty resulting from future climate change impacts would be a key risk management consideration in the development of Future 2.

**Would it be appropriate to place infrastructure (for example an arterial road) in the southern section of the swamp?**

Locating infrastructure 'in the southern section' i.e. within the current SHW would be detrimental to the SHW. The appropriateness of other infrastructure would depend on its type, exact location and proximity to other values. Infrastructure which would dissect the wetland compared to infrastructure at the periphery of the wetland would have differing impacts. Infrastructure which dissects the wetland is likely to have a more substantial impact than infrastructure on the periphery.

In the case of a substantial arterial road there would be a significant impact taking into consideration the overall footprint of construction that would be required. Any infrastructure within the southern portion would obviously destroy the SHW where the infrastructure was located. Furthermore, an arterial road would also likely have an impact beyond its immediate construction footprint. Roads are well recognised for their impact beyond the simple footprint of the constructed roadway. Several factors influence the ecological impact that arterial roads can have including (but not limited to) the impact of vehicle movements and noise on fauna, light pollution, changed drainage, increased edge effect and increased disturbance associated with human activity.

Ecological function at the study area has to some extent already been compromised by the history of management and degradation with extensive areas of the former swamp being substantially degraded. Additional infrastructure in the southern section would contribute further to the decline of ecological function and process.

Other infrastructure for example to manage hydrology would have a different impact.

Infrastructure related to the management of hydrology such as the diversion of flows to reinstate (as much as possible) an ancestral hydrology and the installation of wetlands to improve water quality by mitigating the impact of urban development would assist in the rehabilitation of Burrung Buluk. However, critical to this potential improvement is the location of any such infrastructure particularly its proximity to current values. The establishment of stormwater management infrastructure should not be located on areas where very high SHW values have been identified. Location of stormwater wetlands at the periphery of existing SHW may provide a buffering effect to the proposed development to the north and south.

**Please outline your views on the issues raised in submissions, as relevant to your expertise**

Note that the comments made below are in addition to the preceding paragraphs which respond directly to specific aspects of submissions as requested. The information below is intended to highlight the need for an appropriately considered strategy to manage complex natural assets such as seasonal herbaceous wetlands.

Sufficient resourcing of pre-emptive ecological inventory is prerequisite to rigorous planning. Ecological inventory is critical to the planning process and can contribute substantially to the attainment of strategic goals at for a range of agencies. A fundamental aspect that needs to be acknowledged is the insufficient level of field verified determination at the commencement of various state and national review processes. Initial assessment was restricted to modelled data and interpretation of aerial photography. Failure to adequately assess the site in 2009 meant that the site was not afforded the level of scrutiny, evaluation or subsequent prioritisation for its long-term protection. It was not identified as a conservation area under the BCS requiring protection due to the lack of inventory prior to these processes gaining traction. Agencies need to invest appropriately in investigations and inventory.

Notwithstanding the inadequacy of initial review, very high ecological values remain in southern section of the wetland. These values conform to EPBC listed Seasonal Herbaceous Wetlands with the southern section of the wetland is of very high quality. An opportunity to secure the long-term protection of this site present itself. Sufficient consideration of key aspects of ecological planning/management including the provision of adequate buffers, connectivity within and between areas of ecological value and core area protection must be afforded. It would be a poor outcome for this SHW, biodiversity broadly and the instruments of planning if this site is not comprehensively protected and managed.

SHWs are complicated ecosystems that are not readily managed without sufficient experience and detailed ecological knowledge. They do not function like constructed wetlands or riparian vegetation that the natural

resource management industry has learned to manage over the past few decades. A level of sophistication is required that does not lend itself to a programmed management regime where asset management targets are scheduled well in advance of on-ground management.

An adaptive management approach is required with particular attention to hydrology and the responsiveness of biodiversity to hydrological regimes. Any future management needs a well thought out strategy to protect biodiversity at the site.

Strategies, like the recent IWM Forums Strategic Directions Statement for the Yarra Catchment, support a coordinated and integrated approach to planning, development and the protection of the environment while calling for collaboration across stakeholders and sectors to achieve these outcomes. The protection and management of wetlands is consistent with the broad policy intent expressed at a local and state level. The protection of a site like Burrung Buluk would be consistent with the outcomes sought in documents like Water for Victoria (State Government, 2016) and specifically Chapter 5 “Resilient and liveable cities and towns” that calls for Healthy and valued urban landscapes and Melbourne Waters Healthy Waterway Strategy.

Significant ecological assets such as Burrung Buluk will benefit from co-ordinated planning and management. Engagement with stakeholders including community groups with an interest in biodiversity management, informed by a detailed understanding of the sites ecological management requirements will help secure biodiversity values consistent with state planning policy.

## 8 Summary

In summary, my findings with respect to the proposed strategy and the exhibited PSP are provided below.

- The southern portion of Burrung Buluk retains important ecological values.
- Recent assessment in a favourable season has identified the presence of Nationally Significant vegetation. This vegetation requires sensitive informed management and is likely to degrade if adjoining development does not adequately consider these impacts and place management regimes to account for this.
- The construction of infrastructure in close proximity to or through the wetland will lead to further decline of values and compromise future potential.
- Land management to the north of the southern section will have significant impact on the recovery trajectory of the southern portion.
- Increased space for the provision of wetland and stormwater treatment as well as buffering of any development or infrastructure to the north of the wetland within the Beveridge North West PSP is essential.
- Adequate consideration of buffers, connectivity and core habitat are essential as is sufficient monitoring supported by an adaptive management framework informed by specialist wetland ecologists.

I have made all the enquiries that I believe are desirable and appropriate and that no matters of significance which I regard as relevant have to my knowledge been withheld from the Panel.