



ECOLOGY
AUSTRALIA

Greater Geelong Planning Scheme
Amendment C375 Barwon Heads Structure Plan
Expert Witness Statement

Prepared for: Save Barwon Heads Alliance

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1 Name and address

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2 Qualifications and experience

Bachelor of Economics (Monash) 1972; Bachelor of Biological Science (Honours) La Trobe University 1978, PhD studies (1979-1984) postponed; Director of Ecology Australia 1985 to present; 32 years' experience as a consultant ecologist.

Over the past three decades, I've gained extensive experience with flora and fauna across most environments in south-eastern Australia. I've authored or co-authored hundreds of commissioned studies on a very broad range of topics and have made frequent appearances as an expert witness at planning panels, VCAT, the Federal Court and a Commonwealth Commission of Inquiry.

In respect to the present subject matter I was senior author of Ecology Australia's 2009 report on Murtnagurt Lagoon and the Tidal Channel and presented at the panel on Amendment C159. More broadly I've worked extensively in coastal environments and was a contributing author to the Victorian Saltmarsh Study (2011).

3 Instructions

My instructions were to prepare a further report to supplement the one prepared by Ecology Australia in 2009 and presented as evidence to the Planning Panel on Amendment C159. More specifically, the report was to address any key changes to biodiversity policy, legislation or other strategic documents that have relevance to the Barwon Heads Structure Plan, and to Murtnurgurt Lagoon and the Tidal Channel in particular.

4 Information used and relied upon

In preparation of this statement I have relied upon the following documents and/or data sets:

Boon PI, Allen T, Carr G, Frood D, Harty C, McMahon A, Mathews S, Rosengren N, Sinclair S, White M and Yugovic J (2015). Coastal wetlands of Victoria, south-eastern Australia: providing the inventory and condition information needed for their effective management and conservation. *Aquatic Conservation: Marine and Freshwater Ecosystems* **25**, 454-479.

City of Greater Geelong (2017). Barwon Heads Structure Plan. (City of Greater Geelong, Geelong)

DELWP (2016a) Climate Changes Vulnerability Assessment and Adaptive Capacity of Coastal Wetlands. Decision Support Framework – Volume 1. (Department of Environment, Land, Water and Planning, East Melbourne)

DELWP (2016b) Climate Changes Vulnerability Assessment and Adaptive Capacity of Coastal Wetlands. Decision Support Framework – Volume 2. (Department of Environment, Land, Water and Planning, East Melbourne)

DELWP (2017). Protecting Victoria's Environment – Biodiversity 2037. (Department of Environment, Land, Water and Planning, East Melbourne)

DELWP (2018a). Port Phillip (Western Shoreline) and Bellarine Peninsula Ramsar Site Management Plan. (Department of Environment, Land, Water and Planning, East Melbourne).

DELWP (2018b). Victorian Coastal Inundation Dataset. (Department of Environment, Land, Water and Planning, East Melbourne).

DoE (2016). National Recovery Plan for the Orange-bellied Parrot, *Neophema chrysogaster*. (Department of Environment, Canberra).

DSE (2003). Bellarine Landscape Zone Biodiversity Action Planning – Landscape Plan for the Bellarine Zone – Otway Plains Bioregion (draft for discussion). (Department of Sustainability and Environment, East Melbourne).

DSEWPaC (2013) Conservation advice for Subtropical and Temperate Coastal Saltmarsh. (Department of Sustainability, Environment, Water, Population and Communities, Canberra)

Ecology Australia (2009). Murtnagurt Lagoon, Barwon Heads – flora and fauna assessment and expert witness statement. (Ecology Australia, Fairfield).

Garnett, ST and Franklin, DC (2014). Climate change adaptation plan for Australian birds. CSIRO publishing, Collingwood.

Lloyd LN, Cooling MP, Kerr GK, Dahlhaus P and Gippel, CJ(2012) Flow/ecology relationships and scenarios for the Lower Barwon Wetlands environmental entitlement. (Lloyd Environmental Pty Ltd).

Marine and Coastal Act 2018

Robinson RA, Crick HQ, Learmonth JA, Maclean I, Thomas CD, Bairlein F, Forchhammer MC, Francis CM, Gill JA, Godley BJ and others (2009). Travelling through a warming world: climate change and migratory species. *Endangered Species Research* **7**, 87 – 99.

Rosengren, N (2009). Murtnagurt Lagoon, Bellarine Peninsula and related landforms – nature, origin and geoscience significance (La Trobe University and Environmental GeoSurveys, Bundoora).

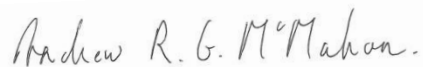
Victorian Coastal Council (2014). Victorian Coastal Strategy 2014. (Victorian Coastal Council, East Melbourne).

Victorian Saltmarsh Study (2011). Mangroves and coastal saltmarsh of Victoria – distribution, condition, threats and management (authors: Boon PI, Allen T, Brook J, Carr G, Froud D, Harty C, McMahon A, Hoye J, Mathews S, Rosengren N, Sinclair S, White M and Yugovic J). Institute for Sustainability and Innovation, Victoria University, Melbourne.

5 Declaration

This Expert Witness Statement has been prepared in accordance with the Guide to the Expert Witness prepared by Planning Panels Victoria.

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



Andrew R. G. McMahon

6 Background

6.1 This Expert Witness Statement examines key changes in environmental policy, legislation and evidence-based issues following the 2009 Greater Geelong Planning Scheme Amendment C159.

Ecology Australia was then commissioned by Save Barwon Heads Alliance (SBHA) to undertake an overview of the flora and fauna values of Murtnagurt Lagoon and Tidal Channel (sensu Rosengren 2009) and to outline the potential impacts of adjoining development proposals, namely 1920 Barwon Heads Road (the Macafee land), and Thirteenth Beach Residential Estate and Golf Course.

6.2 Key findings of that report – Murtnagurt Lagoon, Barwon Heads Flora and Fauna Assessment, Ecology Australia (2009) – included:

- Murtnagurt Lagoon and the Tidal Channel have values consistent with their Ramsar site listing;
- these values include migratory shorebirds, other threatened avifauna (e.g. Hooded Plover, Great Egret, Little Egret, Fairy Tern and Royal Spoonbill), endangered Ecological Vegetation Classes (EVCs) and suitable habitat for other threatened vertebrates, e.g. Swamp Skink;
- identification of threats, including hydrological barriers, invasive species, stormwater inputs, adjoining land use and climate change; and
- concluded that existing stressors had the potential to threaten the Ecological Character of the Ramsar site, and that existing and proposed developments could seriously challenge the Wise Use concept, with the potential for the Lagoon and Tidal Channel to become an enclave within a developed landscape.

6.3 In the intervening decade there have been several key advances in policy, legislation and strategic frameworks that are relevant to Murtnagurt and the Tidal Channel specifically, and to the Barwon Heads Structure Plan more generally. These include:

- Environment Protection and Biodiversity Conservation (EPBC) Act 1999 listing of Coastal Saltmarsh as a vulnerable ecological community. This is the dominant vegetation of the Lagoon and Tidal Channel;
- Far greater understanding of the distribution, extent and composition of saltmarsh and mangroves across Victoria, including identification and description of seven Ecological Vegetation Classes (EVCs) within the former Coastal Saltmarsh aggregate (Victorian Saltmarsh Study (VSS) 2011, Boon et al. 2015);
- Detailed understanding of historic and current threats and the likely consequences of climate change (Department of Environment, Land, Water and Planning (DELWP) 2016, Boon et al. 2015, VSS 2011);

- The climate change focused report on coastal wetlands: Climate Change Vulnerability Assessment and Adaptive Capacity of Coastal Wetlands, Decision Support Framework – Volumes 1 and 2, DELWP (2016);
- The recently revised Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site Management Plan, DELWP (2018a);
- The Victorian Coastal Strategy 2014; and
- The recently assented Marine and Coastal Act 2018.

6.4 While there are undoubtedly other documents of relevance and an increasing volume of literature on climate change, I consider the information provided in the above documents adequate to circumscribe the present position. This information updates biodiversity values and has a particular focus on environmental risks and uncertainties.

7 Environment Protection and Biodiversity Conservation (EPBC) Act 1999

7.1 Coastal Saltmarsh was listed as a vulnerable ecological community in May 2016, referred to as Subtropical and Temperate Coastal Saltmarsh. The listing applies to the coastal saltmarsh communities of Murtnagurt Lagoon and the Tidal Channel. This is additional to the existing Ramsar site listing under the EPBC Act which applies to the western (public land) section of the Lagoon and the Tidal Channel.

A fundamental change from 2009 is that in a regulatory sense, the entire Lagoon now falls under the provisions of the Commonwealth Act.

7.2 The approved Conservation Advice– the key legislative instruments for this community – highlights several issues germane to the listed community and the Structure Plan in general (DSEWPaC 2013, p. 16):

- a recommendation for buffer zones to allow for climate change expansion, including inland retreat;
- noting that if space is unavailable then saltmarsh will disappear with sea level rise; and
- that buffers should be taken into account when considering likely 'significant impacts' during EPBC Act decision-making.

7.3 Further, Key Priority Conservation Actions (p. 23) include:

- 'Avoid native vegetation clearance and destruction of the ecological community and its buffer zones including protecting potential areas of natural retreat';
- 'Liaise with planning authorities to promote the inclusion of Coastal Saltmarsh protections and projected tidal inundation zones in their plans/responses to climate change and sea level rise and in coastal zone management generally'; and
- 'Undertake surveys to identify areas where natural retreat of Coastal Saltmarsh may be possible and actively manage them to enable natural retreat in the future'.

7.4 The Lake Connewarre complex sector of the Ramsar site has long been recognised as habitat for the critically endangered Orange-bellied Parrot (OBP) (DoE 2016). While the wild population has dramatically declined, the Recovery Team has an established program around captive breeding and release of captive-bred individuals. Together with assisted migration between the breeding grounds in south-west Tasmania and the mainland, it is hoped to restore the wild population of the species (DoE 2016). While OBPs are known to forage on a range of exotic plants, Coastal Saltmarsh remains as key habitat in non-breeding areas for the species.

7.5 Overall, these EPBC Act listed items attest to the tenuous nature of these values, but also highlight the functional linkages that invariably connect threats to habitat to threats to species.

8 Mangroves and Coastal Saltmarsh of Victoria: Distribution, Condition, Threats and Management.

Victorian Saltmarsh Study (2011) – see also Boon et al. (2015)

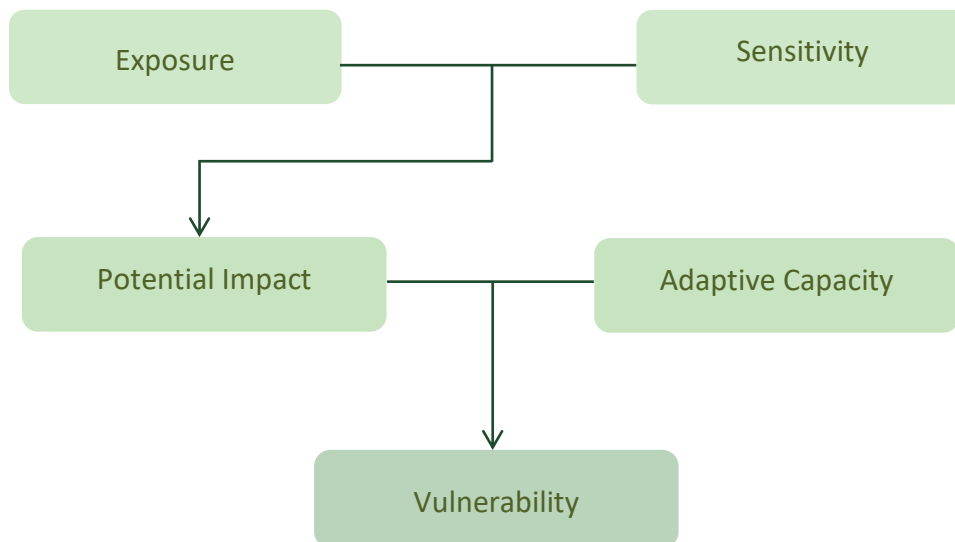
- 8.1 This study provided the first holistic view of coastal saltmarsh and mangrove communities across the Victorian coastline. It resulted in the identification and description of seven EVCs within the former Coastal Saltmarsh (aggregate) EVC and, importantly, provided a state-wide context for threats and management. Further, the study evaluated the existing information on the impacts of climate change, particularly sea level rise, and concluded that the adaptability of saltmarsh would rely on its capacity to migrate inland.
- 8.2 The relevance of this study to Murtnagurt and the Tidal Channel is that we have a better understanding of the saltmarsh diversity present, the likely replacement of saltmarsh by mangroves as sea levels rise, and the importance of the surrounding landscape to allow for adaptation.

9 Climate Change Vulnerability Assessment and Adaptive Capacity of Coastal Wetlands

Volumes 1 and 2 (DELWP 2016)

9.1 This document, commissioned by the Department of Environment, Land, Water and Planning, assesses the vulnerability and adaptive capacity of the range of coastal wetlands systems in Victoria to the impacts of climate change. Climate components include sea level rise, decreased freshwater inflows and increased frequency and severity of extreme events.

The document employs a vulnerability approach that is now widely used in the assessment of climate change impacts (e.g. Climate Change Adaptation Plan for Australian Birds (Garnet and Franklin 2014), and represented by the following flow chart:



Where:

- Exposure assesses the likelihood of a given group or type of wetland being subject to a given climate change component, e.g. sea level rise, reduced catchment flows;
- Sensitivity is how a given wetland will respond to exposure to climate change components, those tolerant of only small change being assessed as high sensitivity. For example, saltmarsh plants are considered highly sensitive to subtle changes in inundation, and expected to be highly sensitive to changes in sea level and storm-surge impacts (DELWP 2016);
- Potential Impact is the product of exposure and sensitivity;
- Adaptive Capacity describes the ability of a wetland to adapt to change as a result of the exposure to climate change components. It is closely allied to exposure and sensitivity but is also influenced by site-specific physical constraints. For example, seawalls, urban

development and/or unfavourable topography that prevent or hinder landward migration of saltmarsh and mangrove communities.

- The overall vulnerability of a wetland is the product of the potential impact of climate change and its ability to adapt and cope with the impact (DELWP 2016).

9.2 Importantly, the document provides a Decision Support Framework (DSF) to guide interested parties through the vulnerability assessment. Applying the DSF to the Murtnagurt Lagoon and the Tidal Channel – predominantly a saltmarsh wetland with Saline Aquatic Meadow EVC dominating the main lagoon (Ecology Australia 2009) - the following is evident:

- the most impacting exposures will likely derive from sea level rise and storm surges, the Victorian Coastal Inundation Dataset provides a guide to 2009, 2040, 2070 and 2100 outcomes (Figure 1);
- saltmarsh is considered highly sensitive to sea level rise, particularly including increased inundation and coastal erosion;
- the adaptability of saltmarsh will be determined by the capacity to migrate inland / upslope;
- there is a very high level of uncertainty around how climate change impacts will unfold in the area, considering connections to the balance of the Ramsar site (Lower Barwon Wetlands and Estuary) and its complex hydrology (Lloyd et al. 2012), uncertain sea level-groundwater interactions, and existing and possible future infrastructure to protect urban and/or agricultural assets.
- DELWP (2016) also canvases a comprehensive set of management options. Importantly, it addresses barriers to migration and the interplay with private land, this being a significant issue across substantial areas of coastal Victoria (Victorian Saltmarsh Study 2011, Boon et al. 2015), and relevant to Murtnagurt Lagoon and the Tidal Channel. While not wanting to simplify a complex issue, it is significant that the document articulates management actions that include influencing private land management and land acquisition.
- This is not a new strategy per se, as mechanisms for conserving biodiversity on private land have been around for decades. For example Trust for Nature covenants, Land Care, Land for Wildlife and more recently Offset sites associated with vegetation clearance policy, but its specific application to climate change impacts appears to be far more recent. In very broad terms a key difference to the status quo may be that private land with low intrinsic biodiversity value, e.g. pasture, may now be considered valuable, as it is potentially critical to the adaptive capacity of proximate coastal wetlands. Such an approach would also appear consistent with Victoria's Biodiversity Plan - Protecting Victoria's Environment - Biodiversity 2037 (DELWP 2017) Priority 11: 'Increase incentives and explore market opportunities for private landholders to conserve biodiversity'.

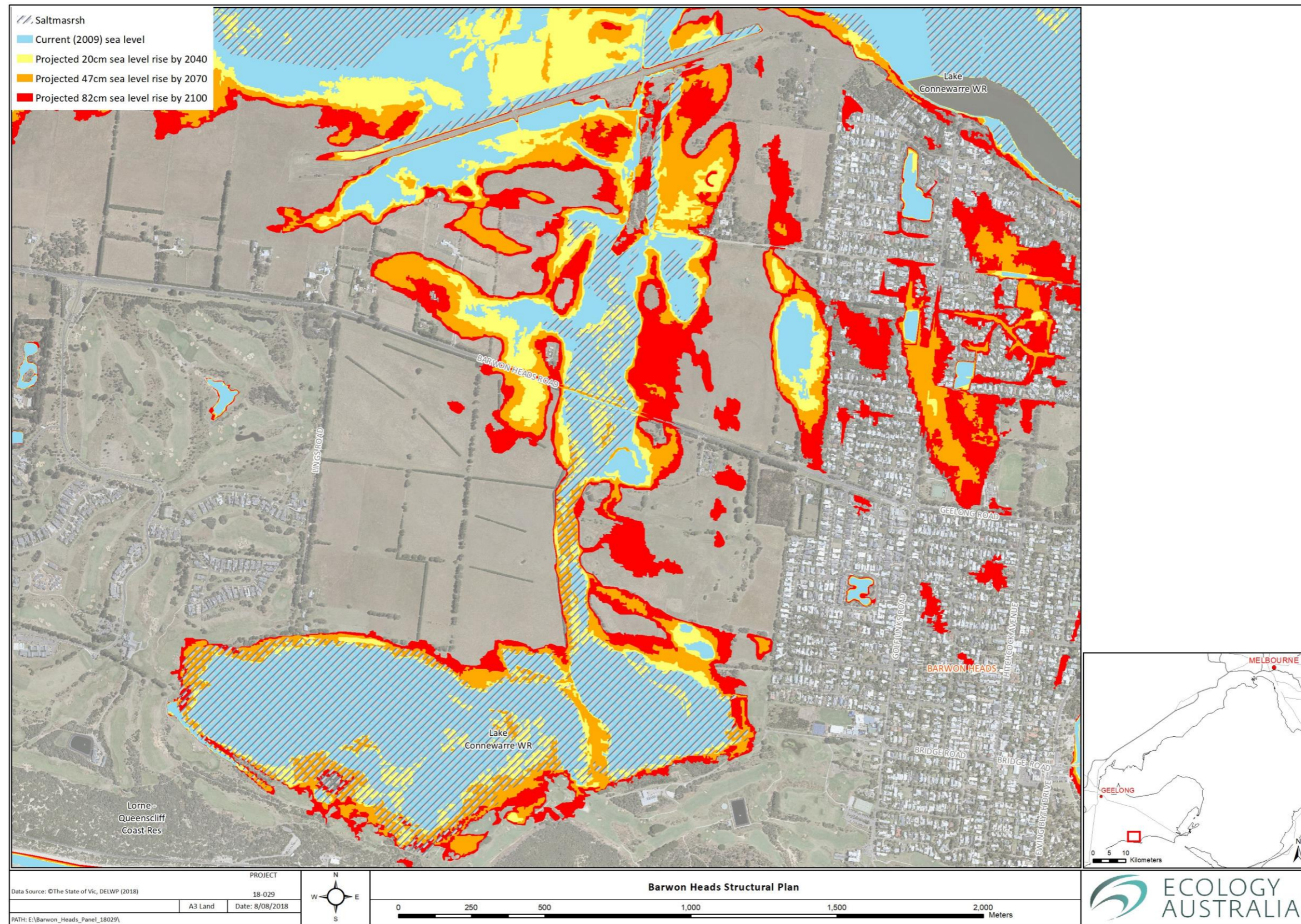


Figure 1 Murtagurt Lagoon and Tidal Channel: Current extent of saltmarsh and predicted sea level rise (Victorian Coastal Inundation Data Set, DELWP 2018b)

10 Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site Management Plan (2018).

- 10.1 This plan provides a comprehensive update of 2003 Ramsar Management Plan (DSE 2003). The plan addresses the Lake Connewarre complex which includes Murtnagurt Lagoon and the Tidal Channel. It updates information on the key Ramsar principals of maintenance of Ecological Character, Wise and Sustainable Use, and Limits of Acceptable Change.
- 10.2 The plan assesses the following stressors (syn. threats) to the Connewarre Complex as High Risk (DELWP 2018a Appendix B):
- Catchment inflows (including stormwater) leading to decreased salinity and adversely affecting saltmarsh, and favouring an expansion of Common Reed and Cumbungi;
 - Invasive species;
 - Recreational activities, notably vehicles in intertidal areas; and
 - Climate change, particularly sea level rise impacting saltmarsh and shorebird habitat. Roy (2015), cited in DELWP (2018a), indicated a potential loss of bird habitat in this sector of 64% by 2040, and more generally Robinson et al. (2009) states that shorebirds are highly vulnerable to sea level rise with loss of habitat predicted to be extensive.

11 Victorian Coastal Strategy 2014

- 11.1 Adaptation to a changing climate is one of the five key issues of the 2014 strategy. It states (Adaptation p. 24) 'Adapting to changes in climate means acting to reduce risks, increase resilience and take advantage of any new opportunities ...'
- 11.2 The strategy presents a Hierarchy of Principles; and sub-categories of Principle 1 – 'Ensure the protection of significant environmental and cultural values' – are particularly relevant to the study area. Principal 1.3 Wetlands and Estuaries (p. 38) and Principal 1.4 (p. 41) Onshore Environments share similar 'Desired Outcomes' including:
- promoting rich and diverse ecosystems;
 - maintaining or improving the condition of coastal wetlands including Ramsar sites;
 - supporting connectivity; and
 - promoting resilience and adaption to climate change.
- 11.3 The strategy pairs 'Desired Outcomes' with 'Policy for decision-making' and Point 3. (p. 40) for Wetlands and Estuaries is particularly relevant:
- Planning decisions to consider the impacts of development and a changing climate on wetlands and estuaries, in particular:
- a) promoting linkages across land tenure
 - b) reducing the potential to fragment habitats or alter natural processes;
 - c) creating opportunities to increase habitat, re-connect fragmented habitats, and facilitate adaptation to a changing climate.

12 Marine and Coastal Act (June 2018)

This recently assented act replaces the *Coastal Management Act 1995*. Part 2 of the Act sets the objectives and guiding principles for the planning and management of the marine and coastal environment. Several are most relevant to the study area:

Objectives (Clause 7):

- a) 'to protect and enhance the marine and coastal environment; and
- b) to promote the resilience of marine and coastal ecosystems, communities and assets to climate change; and
- c) to respect natural processes in planning for and managing current and future risks to people and assets from coastal hazards and climate change; and
- f) to promote the ecologically sustainable use and development of the marine and coastal environment and its resources in appropriate areas'

The following Guiding Principles (Clauses 9 -14) are also noteworthy:

- Ecosystem-based management
- Ecologically sustainable development
- Evidence-based decision making
- Precautionary principle
- Proportionate and risk-based principle
- Adaptive management

13 Barwon Heads Structure Plan

- 13.1 It is evident from this brief review that there have been significant advances in legislation, policy and processes that support decision-making, relevant to Murtnagurt Lagoon and the Tidal Channel, and the Structure Plan more generally. It is also evident that they are thematically linked, with a strong emphasis on biodiversity values, increasing threats, the prevalence of climate change impacts, and the need to promote resilience and adaptive capacity. While not routinely emphasised, it is self-evident that profound uncertainty surrounds how climate change will ultimately affect the Lake Connewarre complex, and Murtnagurt Lagoon and Tidal Channel components of the Ramsar site.
- 13.2 The broader literature expresses that key values of the Ramsar site – e.g. saltmarsh and shorebird habitat have a dire future unless allowance is made for such functionally linked components to potentially adapt to the changed conditions. The literature is also emphatic that current threats need to be controlled to optimise the chances for adaptation.
- 13.3 The concepts discussed here align well with those articulated in the Structure Plan. These include:
- Protection of significant and sensitive environmental features, including Ramsar wetlands (Section 2.2);
 - No policy support for expansion to the western end of the township (Section 2.6);
 - Specific reference to impacts to Murtnagurt Lagoon and the Tidal Channel from further urban growth (Section 3.3.1);
 - Reference to indirect impacts from development including stormwater and domestic animals (Section 3.3.1);
 - The need for wetland buffers (Section 3.3.1);
 - Need to adopt the 'precautionary principle' (Section 3.3.1) particularly in relation to stormwater inputs into saline wetlands. The structure plan also states that the Commonwealth Department of Environment and Energy are concerned over stormwater discharging into the Ramsar site (Section 6.3);
 - Ensure any future development of Stage C of the Thirteenth Beach Golf Resort provides a demonstrable net environmental benefit for Murtnagurt Lagoon and channel; and
 - Discussion of climate change impacts particularly in relation to coastal inundation and with specific reference to Murtnagurt and the Tidal Channel (Section 3.3.2 and 6.3.2).
- 13.4 While my brief is not to comment on specific proposals – e.g. the concept plan for 1900-1920 Barwon Heads Road (Structure Plan Fig 9) it is evident that current legislation and policy is directing a far more complex appraisal than may have been adequate 10 or so years ago. In the context of coastal wetlands – and particularly Ramsar sites, the need to accommodate adaptation and the ultimate establishment of new and perhaps novel habitats would now appear paramount. Reiterating a key priority action of the EPBC Act Conservation Advice for Coastal Saltmarsh, which specifically refers to undertaking surveys to

identify areas where natural retreat can occur in the future, also suggests that assessments need to be well supported.

- 13.5 In summary, the evidence suggests that the bar has been raised. With respect to development proposals in general, it is not necessarily the case that limited development can have a net environment benefit, and while this may be theoretically possible, any proposal would need to be assessed on its merits.

14 Glossary

Biodiversity	The variety of all life-forms, plants, animals, fungi, protists (including algae) and bacteria, their encoded genes, and the ecosystems of which they form a part
Bioregion	Defined geographical regions of Australia with similar climatic and geophysical characteristics, and which generally contain a suite of distinct ecosystems and species
CaLP Act	<i>Victorian Catchment and Land Protection Act 1994</i>
Conservation status	Categorisation of the threat risk to biological assets (plant and animal species, EVCs or plant communities) at a defined scale (e.g. national, state), as determined by specific criteria
Ecological Vegetation Class (EVC)	A vegetation classification described through a combination of its floristic composition, life form and ecological characteristics, and its association with particular environmental attributes. EVCs may include one or more floristic communities that occur across a biogeographic range, and have similar habitat and ecological processes operating
Endemic	Naturally found only in a defined geographic area
EPBC Act	<i>Commonwealth Environment Protection and Biodiversity Conservation Act 1999</i>
Exotic	Plants, animals, fungi and other organisms that have been introduced (deliberately or accidentally) to Australia or a given area after European settlement
Exotic vegetation	Vegetation comprised wholly or substantially of exotic species
FFG Act	<i>Victorian Flora and Fauna Guarantee Act 1988</i>
Floristic	Of or pertaining to plant species, i.e. flora
GIS	Geographic Information System. A digital platform for creating, analysing and viewing maps and other spatially referenced data
Habitat Hectares	A measure of the quality and extent of native vegetation, incorporating attributes including presence of large trees, tree canopy health, understorey structure and diversity, weed cover and landscape context
High threat weeds	Introduced species (including non-indigenous 'natives') which, as invading species have highly deleterious impacts on indigenous vegetation and faunal habitats
Indigenous	Plant and animal species found naturally in pre-European Australia
Indigenous vegetation	Vegetation native to Australia or native to a specific geographic region
Introduced	Deliberately or accidentally brought to Australia or part of Australia, usually by human agency

Life form	An abbreviated description of the habit, growth form and longevity of a plant species (e.g. tree, shrub, vine, annual, submerged aquatic)
Native vegetation	Species occurring naturally in Australia as part of the pre-European flora or fauna
Vegetation community	Term for interacting plant populations forming vegetation. A vegetation community in formal classifications may have characteristic plant species, composition and structure
VROTS	Victorian Rare or Threatened Species
WONS	Weeds of National Significance
