Aitken Creek Waterways Expert Witness

Expert Witness Statement

Final

20 April 2021

Melbourne Water

Aitken Creek Waterways Expert Witness

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Final	20/4/21	Expert witness statement	ST	BG	GH	GH

Contents

Important note about your report

The sole purpose of this Statement is to provide expert advice on behalf of Melbourne Water to the Standing Advisory Committee for the Craigieburn Precinct Structure Plan area. The scope of this advice includes the role and importance of headwater streams in the landscape, Aitken Creek's value as a headwater stream, appropriate waterway corridor width for protection of these values in this area and a response to relevant submissions to the Victorian Planning Authority on this matter in this PSP.

The Statement must be read in full with no excerpts to be representative of the findings; no liability is accepted for any use or reliance on the Statement by third parties. This Statement relies on information contained in the Aitken Creek Waterway Values Assessment, the Headwater Streams Technical Note and Factsheet, included as appendices to this Statement.

1. Matters required by Planning Panels Victoria Guide to Expert evidence

Name: Dr Simon Treadwell

Address: 70 Arthur Street, Eltham, Victoria, 3095

I am the Global Technical Lead for Ecosystem Restoration and Principal Aquatic Ecologist in Jacobs People and Places Solutions business. I have an under-graduate degree in Agricultural Science (Latrobe University, 1990), a Master of Science (Monash University 1994) and a PhD in aquatic ecology (Monash University 2000).

I have over twenty years' research and consulting experience in river, floodplain and wetland ecology, management and habitat rehabilitation, environmental flow assessments and restoration, environmental risk assessment and water quality monitoring and assessment. I have recently completed projects identifying the environmental benefits associated with protecting headwater streams in urban and peri-urban areas around Melbourne, methods for assessing and managing the impacts of stormwater runoff on environmental flows, the identification of waterways at risk from urban development and the impacts of altered hydrology from catchment development on waterway health. I was a member of Melbourne Water's 2018 Healthy Waterways Strategy (HWS) Science Advisory Panel providing advice on the science underpinning the 2018 HWS development and helped inform the decision for the HWS to acknowledge the importance of headwater streams in the Melbourne Water region and provide specific objectives toward their protection.

My Curriculum Vitae is attached to this statement (Appendix A).

I have prepared this Expert Witness Statement with the assistance of Bronwyn Gwyther, Senior Environmental Scientist at Jacobs, who helped collate materials to support the preparation of this statement and who was the Project Manager and co-author of the Aitken Creek Project referred to in this statement. I was also assisted by Greg Hoxley, Senior Principal Hydrogeologist at Jacobs, who provided a review of this statement in accordance with Jacobs technical and quality assurance processes for all project deliverables.

Melbourne Water has instructed me that the key technical points to be covered in this Statement are in relation to the role and importance of headwater streams in retaining water and nutrients in the landscape and the benefits of this retention to protecting downstream reaches. This advice is to be of a conceptual nature and to integrate my earlier headwater streams and Aitken Creek work to discuss importance of retention of Aitken Creek as a headwater stream. This task includes the review of issues raised in regard to proposed waterway corridor width in relevant submissions to the VPA for this matter. Appendix B provides a record of instruction from Melbourne Water and our response in terms of a task description and limit of technical advice.

In preparing this Witness Statement I have relied on the 'Aitken Creek Waterway Values Assessment' (Final Project Report 8th December 2020) **(Aitken Creek Report)**; 'Headwater Streams Technical Note – The importance of protecting headwater streams' (Final Project Report 20th April 2016) **(Headwater Streams Technical Note)**; and 'The Importance of Headwater Streams Factsheet' (2016) **(Factsheet)**. Copies of these reports are attached to this statement (Appendices C, D and E respectively). I have not undertaken field or site studies specific to this opinion.

For the **Aitken Creek Report**, Jacobs was engaged by Melbourne Water to undertake desktop and field investigations into the flora, fauna and geomorphic values of Aitken Creek and tributaries as it flows through the Aitken Creek Development Services Scheme (DSS). The project was undertaken to inform the revision of the Aitken Creek DSS as well as consultation with the VPA regarding appropriate waterway buffers and asset locations in the Craigieburn West Precinct Structure Plan (PSP). The major output of this project was the technical report 'Aitken Creek Waterway Values Assessment' dated 8th December 2020 that outlines the ecological and geomorphic values present, and provides an assessment of the sensitivity of these values to hydrological change, a high level review and recommendations regarding the suitability of proposed buffers, and potential management interventions to protect these values. Relevant sections of this report are referred to in this statement.

My role in preparing the Aitken Creek Report was as follows:

- I was a co-author, Technical Lead and Project Director. My role included attendance at all project workshops and meetings, input regarding technical direction and content and initial technical review of project outputs.

The following people were also involved in the in preparation of the Aitken Creek Report:

- Peter Sandercock – a Senior Geomorphologist with over 15 years' research and consulting experience, specialising in fluvial geomorphology investigations and studies that assess the impact of land use change and flow regulation on waterway management and rehabilitation. Peter has completed numerous urban growth area investigations and environmental flow studies for Melbourne Water in which he has developed and applied methodologies to assess the impact that urban induced hydrological changes have on the physical form of waterways, their geomorphological and ecological processes and values. Peter was the lead author of the Headwater Streams Technical Note and Factsheet and recently completed a review of the design response to geomorphological issues associated with sodic soils and a future constructed waterway in the Merrifield area.
- John Kershaw – Senior Associate Ecologist with over 15 years' experience in the ecological consulting sector. He has undertaken a wide variety of projects, predominantly within Victoria, working closely with a diverse range of clients. John is highly experienced in the collection and interpretation of botanical field data, and has high-level reporting, plant identification and project management skills, as well as a sound working knowledge of environmental legislation and policy. John's consulting work is informed by years of on-ground ecological restoration works prior to consulting.
- Bron Gwyther – Senior Environmental Scientist with 12 years' waterway and catchment management experience across policy and strategic planning, land management planning and on-ground waterway restoration roles. Bron has recently led several investigations into the potential impact of development in Precinct Structure Plan areas on waterway values and was the Project Manager for the Aitken Creek Report. She also led the development of the state-wide Riparian Works Review Standards for DELWP and has also been involved in the development and review of several other state-wide guidelines for waterway management.

For the **Headwater Streams Report**, Jacobs was engaged by Melbourne Water to undertake a review of the scientific literature regarding headwater streams, including their form in the landscape, their ecological and social benefits, major threats to this waterway type and best practice management and protection. The major outputs of this project were the 'Headwater

Streams Technical Note – The importance of protecting headwater streams' dated 20th April 2016 and 'The Importance of Headwater Streams Factsheet' 2016. Relevant sections of these reports are referred to in this statement.

My role in preparing the Headwater Streams Technical Note and Factsheet was as follows:

- I was the Technical Lead, Technical Reviewer and Project Director. My role included technical advice on the role of headwater streams in retaining water and nutrients in the catchment, the impacts of urbanisation and increased stormwater runoff on stream flows, and the development of conceptual models of the functioning of headwater streams under urban and non-urban conditions. My knowledge of the functioning and importance of headwater streams has been informed by my own observations of the impacts of urban development and increased volume of stormwater runoff on stream form and waterway health, and from reviews of the scientific and technical literature on the subject of the impacts of urban development on waterway health.

The following people were also involved in the preparation of the Headwater Streams Technical Note and Factsheet:

- Peter Sandercock – In addition to experience noted above in lines 72-82, Peter was the primary author of the Headwater Streams Technical Note and Factsheet. The content of these documents was informed by Peter's own observations of the impacts of urban development on the geomorphology of waterways, and from reviews of relevant literature on the subject of the impacts of urban development on waterway health.
- Jodi Braszell – Jodi provide project management, preliminary review of available literature and general review of the Headwater Streams Technical Note and Factsheet.

I confirm that I adopt the assessment and any assumptions as outlined in the Aitken Creek Report and Headwater Streams Technical Note and Factsheet.

I note that the Aitken Creek Project Report did not include hydrological or water quality modelling to confirm 1) the current flow or water quality contributions the upper (undeveloped) reaches of Aitken Creek make to downstream reaches or 2) the impacts (both positive or negative) that alternative drainage designs would have on downstream reaches of Aitken Creek. As stated in the Aitken Creek Project Report, it is recommended to confirm the scale of impacts of different development scenarios to enable an evaluation of possible actions to mitigate any impacts of development on water quality and quantity to downstream reaches.

My expert witness advice is based on my own observations of the impacts of urban development on waterways and from my review of relevant literature on the topic. It does not extend to detailed technical advice around the specific measures or drainage designs that would be required to successfully mitigate stormwater impacts in Aitken Creek or the specific management of sodic soils, wetland vegetation communities or native fauna.

I have reviewed submissions to the VPA that raise issues with the waterway corridor proposed by Melbourne Water (in particular submissions 16, 28, 31, 38). I understand that the submissions have raised concerns regarding the proposed waterway classification and corridor width.

2. Discussion

The following discussion, based on the previously referred reports, provides:

- A definition of headwater streams.
- An overview of their role in the landscape, especially in mediating flow and water quality to downstream waterways, and risks from development.
- Acknowledgement of the role of headwater streams through the establishment of objectives for their management in the HWS.
- A discussion of headwater streams in the context of Aitken Creek.
- A general response to submissions associated with waterway designation and buffer proposed widths for Aitken Creek and the North Eastern tributary.

2.1 Headwater streams

Headwater streams are the small flow lines (swales), creeks and streams that are the origin of most rivers. These streams are closely linked to their adjacent hillslopes, they are generally very small, and under normal flow conditions they lack the power to scour their bed and banks and hence often do not exhibit an obvious stream channel (bed and banks). They are commonly referred to as first order streams, which means that they have no inflowing tributaries. Once two first order streams join together the combined stream is classified as a second order stream and so on.

Headwater streams join together to form larger streams and rivers or run directly into larger streams and lakes. They may only flow or have ponds of water occasionally, and sometimes for only a few days each year (ephemeral). This is a distinction from the larger downstream reaches that are often characterised by more permanent flow.

The catchment area for a headwater stream varies with different landscape settings, from as small as 5 hectares or less to greater than 200 hectares in area. Despite their small size, they typically make up more than 75% of the stream length in a catchment and account for a large proportion of the water that flows in downstream reaches of a waterway by virtue of their extent.

2.1.1 The importance of headwater streams

Headwater streams are critical in mediating the flow of water and nutrients to downstream waterways and have a large role in the retention and breakdown of carbon, nutrient cycling and sediment transport. The ecosystem services provided by headwater streams in terms of mediating flow, retaining nutrients and sediments, and contributing to the maintenance of biodiversity rely on maintaining the functional integrity of these waterways.

Specific ecological services provided by headwater streams include:

- Reducing flood peaks - Headwater streams (and their associated catchments) are naturally very good at retaining and temporarily storing water. The retention of water in the upper catchments helps to moderate potential downstream flooding.
- Infiltration to groundwater and maintenance of base flows - The infiltration of surface water in headwater streams into the local groundwater system plays an important role contributing to groundwater levels and maintaining base flows in downstream waterways.

- Sediment and nutrient retention and cycling - Headwater streams make up a significant proportion of the stream network and collect the majority of the runoff, sediment and dissolved nutrients from a catchment. Nutrient cycling and retention in headwater streams can significantly reduce nutrient exports to downstream reaches, estuaries and bays (by more than 50%). This is because headwater streams provide the ideal mix of shallow depths, high surface area-to-volume ratios, water-sediment exchange and biotic communities required for nutrient cycling. Downstream reaches naturally have a lower capacity to process nutrients, and if the amount of nutrients exported from headwater reaches exceeds the processing capacity of these downstream reaches this results in a net increase in nutrient export to receiving waters such as estuaries and bays.
- Biodiversity and habitat - Although the number of species occurring in any one headwater stream is often relatively low, the collective contribution to regional biodiversity is high because of the large number of these types of streams in the catchment. Headwater streams can provide important habitat for rare and threatened species, such as the Growling Grass Frog, as well as more common frogs, lizards, birds and mammals. They also support a range of vegetation types and threatened plants adapted to seasonal wet and dry conditions.

2.1.2 Risks to headwater streams from development

When urbanisation occurs, catchment imperviousness is increased so that more water is directed to adjacent waterways and these waterways now need to be able to cope with the larger volumes of runoff. The standard approaches to stormwater and drainage management practices may not adequately control the volume of additional water entering waterways and can result in degradation of these waterways, and thus the loss of the values and services provided by healthy waterways.

Specific impacts to waterways from development of headwater streams include:

- *Increased flood peaks and erosion* - If headwater streams are destroyed or piped there is a corresponding increase in the number and duration of high flows that are passed directly to downstream reaches. These high flow events can cause bed and bank erosion that significantly degrades community and environmental values. Notably, standard flood control measures may be suitable for managing the impacts of larger flood events on built assets but don't necessarily retain some smaller flow events that nonetheless can still cause disturbance to downstream waterways.
- *Increased nutrient export* - If the nutrient processing capacity of headwater streams is diminished (e.g. through changed flows or the clearing of vegetation) or lost altogether (e.g. through drainage and piping), then more nutrients are delivered to downstream reaches. As an example, we know that the nitrogen export from a pipe for a 100 ha suburban catchment is likely to be at least an order of magnitude greater than would have been the export from the pre-urban stream. Typically constructed wetlands are designed to reduce nitrogen loads by ~45% (from the urban state), so that the resulting nitrogen exports even with a stormwater treatment wetland are likely to be greater than the pre-urban state. Hence, wetlands designed to current Best Practice Environmental Management Guidelines do not necessarily maintain the same level of protection to downstream waters compared to the undeveloped condition. Increased loads of nutrients from the surrounding catchments are recognised as one of the major threats to environmental health, and community and recreational values, and also to the economic productivity of Port Phillip Bay.

Supporting citations from the scientific literature for the above text are provided in the Headwater Streams Technical Note.

2.1.3 Headwater streams in the Healthy Waterways Strategy

Melbourne Water's HWS is the regional co-designed strategy for waterway management in the Port Phillip and Western Port region. It contains a series of regional targets relevant to headwater streams, which includes the upper reaches of Aitken Creek:

- Regional Performance Objective 16 - Protection mechanisms are in place for headwaters to ensure that they are retained as features in the landscape for environmental, social, cultural and economic benefits.
- Regional Performance Objective 14 - Standards, tools and guidelines are in place and implemented to enable re-use and infiltration of excess stormwater and protect and/or restore urban waterways.

The HWS also recognises the importance of headwater streams:

> *"As well as altering stream flows and water quality, ongoing greenfield and infill development has historically impacted waterways where small natural streams have been converted into underground pipes or enlarged, rock-lined channels. These small, headwater streams play an important role in the protection of waterway health, for example: reducing flooding, filtering excess nutrients and sediment, processing organic matter, supporting unique species, and decreasing downstream erosion"*.

Our review of the value of Aitken Creek as a headwater stream and support for its protection in waterway buffers is consistent with the objectives of the HWS.

2.2 Aitken Creek

Aitken Creek is an ephemeral (experiences surface flow only some of the time) headwater stream that rises in an agricultural landscape and flows in a south easterly direction, joining small tributaries before flowing through the suburban areas of Craigieburn and the Craigieburn Golf Course to meet Merri Creek approximately 5 km downstream of the PSP boundary, at the Craigieburn Grassland Nature Reserve.

The Aitken Creek main channel and its North Eastern tributary, as they pass through the Craigieburn West PSP, are classified as first order streams, in this case drainage lines including small streams and broad depressions in the floodplain. These headwater streams flow through the Craigieburn West PSP area which abuts the western edge of the Urban Growth Boundary (UGB) and is itself bounded by current or planned development on three sides with a rural landscape to the west (see **Error! Reference source not found.**).

Figure 1. Aitken Creek main channel and the North Eastern tributary as they flow through the Craigieburn West PSP. Showing the mapped waterway and 100 year flood extent.

2.2.1 Aitken Creek's value as a Headwater Stream

Aitken Creek and its North Eastern tributary as they flow through the Craigieburn West PSP are mapped as designated waterways and exhibit the characteristics of headwater streams (see Figure 2), such as:

- Areas of broad depression in the landscape that act as sponges to infiltrate to groundwater slowly following rainfall.
- Small flow lines (swales/wetlands), creeks and streams that are closely linked to adjacent slopes.
- Areas of poorly defined channel that flow ephemerally, closely linked to the surrounding catchment.
- Closely linked to groundwater (groundwater dependent ecosystem (GDE) mapping indicates a high potential for groundwater interaction with Aitken Creek).

Drained section of Aitken Creek Main Channel east of Mickleham Road (Aitken Creek Main Channel).

Partly confined channel with basalt boulder riffle (Aitken Creek Main Channel).

Broad drainage depression/valley fill north of Olivers Road (North Eastern tributary).

Broad drainage depression/valley fill south of Olivers Road (North Eastern tributary).

Figure 2. Aitken Creek and tributaries, images from fieldwork August 2020 showing headwater stream characteristics.

As headwater streams, Aitken Creek and the North Eastern tributary provide the ecological services and values outlined previously in this statement and are considered natural

waterways that form a critical component of the waterway network. The provision of each of these services by Aitken Creek and the North Eastern tributary is described below.

2.2.1.1 Infiltration to groundwater, maintenance of base flows and reduction of flood peaks

Groundwater is close to the surface along much of the waterway (from <5 m to 10-20 m below ground level) and the Aitken Creek main channel is mapped as having a high potential for groundwater interaction under the GDE National Atlas (Visualising Victoria's Groundwater - https://www.vvg.org.au/) . There are also mapped areas of high potential terrestrial GDEs nearby, including a significant stand of mature River Red Gums trees marked as a reserve in the PSP. Aitken Creek is likely to be acting as a zone of infiltration or recharge to the local groundwater along much of its length in the DSS. This occurs by virtue of the large surface area associated with broad drainage depressions and low gradients that allow infiltration of rainfall and flows. This infiltration is likely to contribute to maintenance of groundwater levels and thus base flows in the creek downstream and support of the nearby terrestrial GDEs.

If Aitken Creek and tributaries lose the ability to recharge to groundwater (e.g. by being piped, channelised or lined), then the long-term viability of these potential GDEs may be at risk. Channelisation of Aitken Creek and tributaries also poses a risk to groundwater in the area due to the likelihood of groundwater being close to the surface as well as the highly erodible sodic subsoils present that present a high risk of erosion and incision. Channelisation and incision of the waterway could result in a direct hydrological connection being made between the waterway and the groundwater, leading to discharge of the groundwater directly to the creek – essentially changing the direction of flow from infiltration to the groundwater to discharge of groundwater to the creek. As well as increasing flows (with risks to the waterway and downstream ecological and drainage assets), this could have the impact of lowering groundwater levels to the stand of River Red Gums that have been identified as potential GDEs and are marked for protection from development. If groundwater levels decline there is a risk to the long-term viability of vegetation that is currently reliant on that groundwater for its water supply.

The infiltration of rainfall to groundwater also acts to retain that water higher in the catchment and slows the speed at which runoff progresses to downstream reaches. Any loss of infiltration potential means that runoff from the catchment flows more readily to downstream reaches. This can exacerbate potential downstream flooding, promote excessive erosion of the stream bed and transport excess nutrients to downstream reaches (see below). Increased frequency and duration of high flow events is a common outcome of urban development and is a recognised contributor to the degradation of waterway health.

2.2.1.2 Nutrient retention and cycling and stream stability

Headwater streams with an intact channel form and ephemeral flows help to retain nutrients and sediment in the upper catchment. If the channel form of Aitken Creek and tributaries are changed (e.g. by channelisation, establishing a constructed waterway or piping) there is likely to be a loss of ability to store flows in the upper catchment which will impact the catchment's ability to retain nutrients. Instead, flows to downstream will contain elevated concentrations of nutrients and contaminants, alter channel morphology and stability through erosion, reduce biodiversity and increase the dominance of pollution tolerant aquatic species. This has the potential to impact the Aitken Creek reaches downstream of the DSS area as well as the Merri Creek. The cumulative impact of increased nutrient transport to downstream reaches

has the potential to also impact the Yarra River and Port Phillip Bay. Further modelling would be required to confirm the magnitude of the nutrients loads from this specific area of catchment.

The stability of the streams in their current form is protecting the underlying soils from erosion. Both the Aitken Creek main channel and North Eastern tributary have been assessed as having a high sensitivity for erosion and stream form adjustment (incision and widening). This is largely attributed to the surface of the waterways being comprised of very fine-grained sediments, with highly erodible soils (sodosols) distributed throughout the catchment area. If increased flows initiated excessive erosion there would be further export of soils and nutrients to downstream reaches.

2.2.1.3 Biodiversity and habitat

As documented in the Aitken Creek Report, the creek supports:

- Patches of the endangered Ecological Vegetation Classes Heavier-soils Plains Grassland and Plains Grassy Wetland.
- Large mature native trees, including several River Red Gums.

Although not specifically surveyed for or recorded during the current project, Aitken Creek exhibits characteristics that mean it may also support:

- The EPBC Act listed flora species Matted Flax-lily (endangered) and River Swamp Wallaby-grass (vulnerable) (high likelihood of presence).
- The EPBC Act listed critically endangered fauna species Golden Sun Moth (high likelihood of presence).
- The EPBC Act listed Growling Grass Frog (vulnerable) (moderate likelihood of presence), along with 15 other threatened species of moderate likelihood of presence.

Note that the North Eastern tributary was not surveyed as part of the preparation of the Aitken Creek report due to lack of landholder permission to access the channel, so specific values could not be determined.

The Aitken Creek main channel also provides a link from inside the UGB area to the rural land outside it and the North Eastern tributary provides a link to a River Red gum reserve area at Dahlia Crescent to the north of the Craigieburn West PSP. These waterway corridors could therefore be key movement corridors for fauna from high value areas downstream (such as the Craigieburn Grassland Nature Conservation Reserve) as well as from adjacent conservation areas within the Craigieburn West PSP out to the rural landscape to the west and north. This will support long term viability of metapopulations and genetic diversity of species.

Improper development of these reaches (e.g. piping, channelising, loss of connection to catchment) may result in:

- Direct loss of endangered vegetation communities and flora species through clearing.
- Indirect loss of mature trees in or adjacent to the waterway, terrestrial GDEs and wetland communities from changed hydrology, including loss of groundwater connection and ‘drowning’ of some trees as the flow regime moves from ephemeral to perennial.
- Direct loss of habitat for threatened fauna.

- Reduced function as a habitat corridor linking populations within the UGB to larger areas of habitat outside it with impacts on the long-term viability of populations within the UGB.

2.2.1.4 Summary and measures to mitigate impacts of development

The waterways in the PSP area (Aitken Creek main branch and North Eastern tributary) are classified as first order streams that are mapped as natural waterways and meet the criteria for consideration as headwater streams. Headwater streams are increasingly recognised in the scientific literature for the important role they play in retaining flow, sediments and nutrients in upper catchments and this is reflected in the acknowledgement of the importance of headwater streams in Melbourne Water's Healthy Waterway Strategy. In recognition of the important role headwater streams play, Aitken Creek main channel and the North Eastern tributary should be managed as an integral part of the waterway network with objectives to protect their current geomorphological form and ecosystem function. In particular, they should be managed to maintain their ephemeral flow regime and the important function of flow, sediment and nutrient retention within the upper parts of the catchment. Where possible, the conversion to a constructed channel with permanent flow should be avoided.

To assist with the protection of their current form and function the application of Melbourne Water's waterway corridor guidelines for the protection of a natural waterway have been applied. The guidelines indicate a minimum setback width of 20 m each side of the active channel for a first-order headwater stream with provision for a wider corridor width where native vegetation is present or where a wider width would be beneficial to help protect the current stream form and function.

For the Aitken Creek main branch a total corridor width of 60 m has been recommended with sections that widen to 65 m where native vegetation is present that should be protected within the waterway corridor (Figure 3). The 60 m total width is based on a 20 m wide active channel and 20 m setbacks on either side of the active channel. The adoption of a relatively wide active channel is to account for the shallow, wide nature of the depression line and to enable the current stream form and function to be retained. The corridor width also allows for any drainage outfalls and any necessary modifications to the drainage line to enable the majority of the current waterway form and function to be retained.

For the North Eastern tributary, a total corridor width of 45 m has been applied along its entire length, in accordance with the waterway corridor guidelines. This accounts for a 5 m wide active channel and 20 m setbacks on either side of the active channel. A narrower active channel has been adopted for the North Eastern tributary based on observations at public road crossings (see Figure 2) compared to the Aitken Creek main channel. Despite its smaller dimensions, the North Eastern tributary still exhibits characteristics of a headwater stream that are worthy of protection.

The objectives of the waterway guidelines are to ensure that natural waterways can maintain their ecosystem functions. It is my opinion that Aitken Creek main channel and the North Eastern tributary are natural waterways and that the proposed waterway corridor widths are required to enable the protection of the current form and function of these waterways.

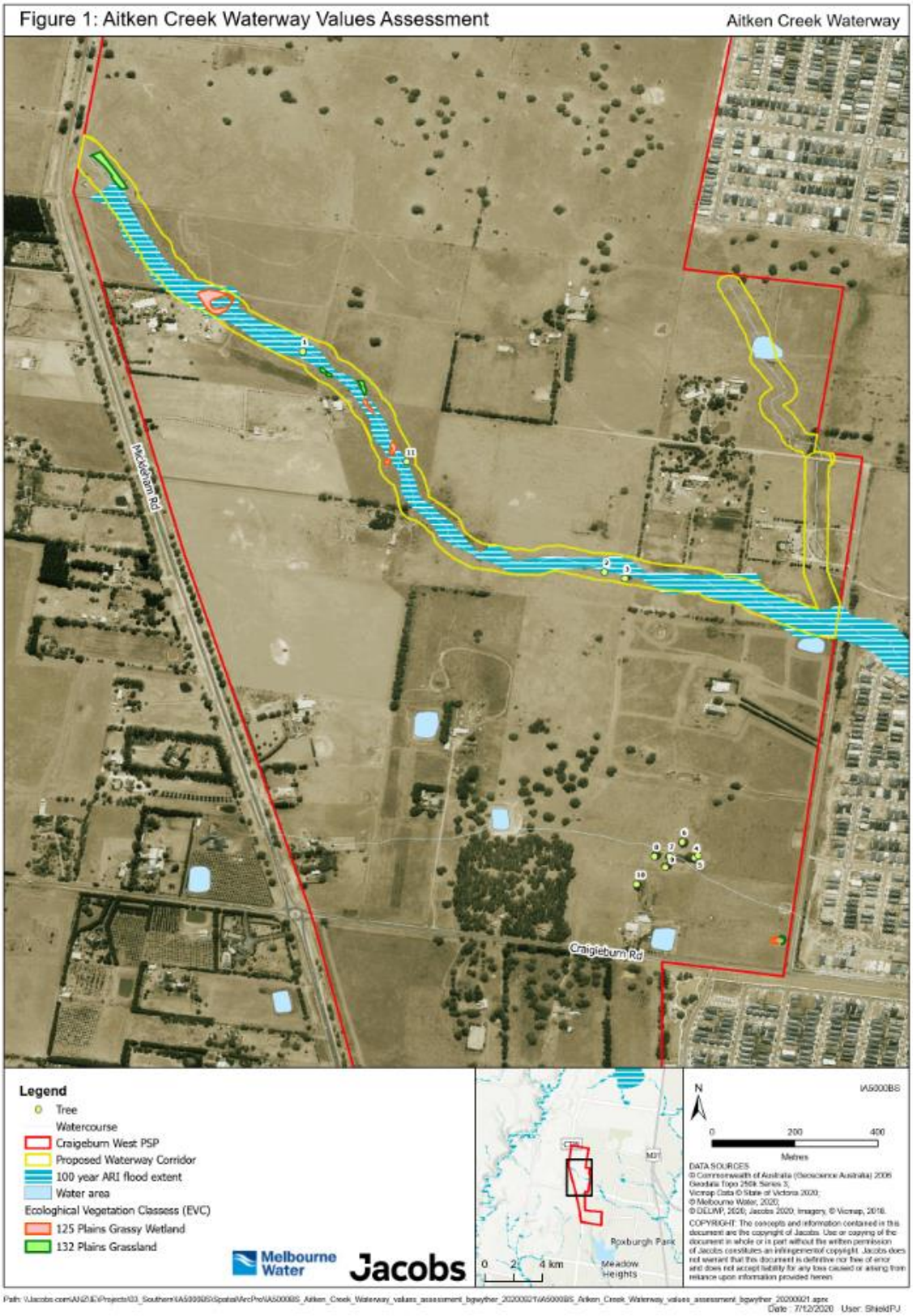


Figure 3. Proposed waterway corridors for Aitken Creek and the North Eastern tributary. Note wider widths have been applied at areas of predicted high ecological value

2.3 Response to Submissions

Relevant submissions have been received that query:

- The classification of the Aitken Creek main channel and North Eastern tributary as natural waterways
- The values of the waterways.
- The proposed corridor widths for each waterway.
- The location of some drainage assets.

A response to relevant submissions in provided in Appendix F. In summary, based on the assessments described above, the waterways meet the criteria for natural waterways and in particular exhibit the characteristics of headwater streams. As such the Melbourne Water waterway corridor width guidelines for natural waterways have been applied. In applying the guidelines, the setbacks have considered the width of the active channel and the presence of high value vegetation to propose a corridor width that maximises the likelihood of retaining the current form and function of these waterways as headwater streams. Any narrowing of the waterway corridor may impact on the ability to maintain the current form and function as headwater streams with consequent impacts to the waterways themselves and downstream reaches as outlined above and in the attached reports.

Narrower corridor widths and/or substantial modifications to the current stream geomorphology, for example in the form of a constructed waterway, may also introduce a range of risks including direct connection to groundwater, exposure of sodic soils, initiation of erosion and downstream transport of sediments, and the conversion of an ephemeral stream to a permanently flowing stream with consequent impacts on downstream hydrology and nutrient transport.

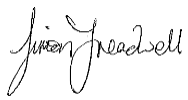
3. Summary

It is my opinion that the Aitken Creek main channel and the North Eastern tributary are natural waterways and that the proposed waterway corridor widths are required to enable the protection of the current form and ecosystem function of these waterways.

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

I include a signed *Direction for witnesses providing expert evidence through remote conferencing* as Appendix G to this report.

Yours Sincerely,



Dr Simon Treadwell
Principal Aquatic Ecologist

20th April 2021.

Appendix A. Simon Treadwell CV

Dr Simon Treadwell

PRINCIPAL AQUATIC ECOLOGIST

Simon is Global Technical Lead for Ecosystem Restoration and Principal Aquatic Ecologist in Jacobs People and Places Solutions business. He has over twenty years' experience in river, floodplain and wetland ecology, management and habitat rehabilitation, environmental flow assessments and restoration, environmental risk assessment and water quality monitoring and assessment. He has an under-graduate degree in Agricultural Science and extensive post-graduate research experience in aquatic ecology.

Simon specialises in water regime restoration investigations for rivers and wetlands systems and contributes to river and wetland restoration projects though the provision of advice on ecological and habitat related issues. He is author of national guidelines for the restoration of large wood habitat and prepared reports on the restoration requirements for native fish, including habitat restoration, fish passage remediation, environmental flow provisions and water quality requirements.

Simon has a particular interest in urban stream ecology and the impacts of urban development and stormwater management on urban stream health. He has recently completed projects identifying the environmental benefits associated with protecting headwater streams, methods for assessing and managing the impacts of stormwater runoff on environmental flows and the identification of waterways at risk from urban development.

Areas of Expertise

- Environmental flows requirements
- Urban stream ecology
- Ecosystem restoration
- Lowland river, floodplain and wetland ecology
- Ecological risk assessment

Relevant Project Experience

- Project Director and technical reviewer for Aitken Creek Waterway Values Assessment: Melbourne Water
- Project Director and co-author/technical reviewer for Headwater Streams Technical Report: The Importance of Protecting Headwater Streams: Melbourne Water
- Project Director and technical reviewer for Malcom Creek River Red Gum dieback investigation: Melbourne Water
- Member of Melbourne Water's 2018 Healthy Waterways Strategy Science Advisory Panel providing independent advice on the science underpinning the 2018 Healthy Waterways Strategy development: Melbourne Water
- Assessment of risks to native fish and habitat quality from changed hydrology as a result of urban development in Cardinia Creek: Melbourne Water
- Feasibility assessment and design of options for reconnecting floodplain wetlands along the Dandenong Creek, and daylighting of Dandenong Creek near Bayswater to offset impacts associated with urban development: Melbourne Water

EDUCATION/QUALIFICATIONS

BAgrSci (Hons) La Trobe University

MSc Monash University "Patterns of community metabolism within an upland stream ecosystem, Victoria"

PhD Monash University "Patterns in community metabolism and biomass of biofilms colonising large woody debris along an Australian lowland river"

MEMBERSHIPS AND AFFILIATIONS

Member of the Australian Freshwater Sciences Society

Member of River Basin Management Society

Fellow of the Peter Cullen Leadership Trust

YEARS EXPERIENCE

20

GEOGRAPHIC LOCATION

Melbourne

- Monetisation of environmental benefits associated with river health and environmental flow restoration, including for several Melbourne Water waterways.
- Development of wetland water management plans and water management options for wetland restoration in the Melbourne Water region, including Yarra River billabongs, Cockatoo Creek Swamp and Seaford-Edithvale Wetland: Melbourne Water
- Development of conceptual models for assessing amenity, recreation and community connection values across Melbourne's waterways: Melbourne Water
- Numerous environmental flow assessments for Melbourne's rivers, including the Dandenong Creek, Yarra River, Merri Creek, Olinda Creek, Stringybark Creek, Little River, Lang Lang River, Plenty River, Lollypop Creek and Werribee River: Melbourne Water
- Prioritisation of drought refuges and development of drought management plans: Melbourne Water
- Conceptualisation of the role of groundwater on river and wetland Groundwater Dependent Ecosystems, including within the Dandenong Creek catchment.

Selected papers and presentations

- Szemis, J.M, Edwards, C., **Treadwell, S**. and Sandercock, P. (2018) *Assessing long term climate change impacts on environmental flow compliance and shortfalls in the Yarra River*. In 38th Hydrology and Water Resources Symposium (HWRS), Melbourne, Australia
- Clifton, C. **Treadwell, S**., and van den Hove, R. (2018). River red gum dieback investigation, Malcolm Creek, Craigieburn. Proceedings of the 9th Australian Stream Management Conference, August 2018, Hobart. Published by the River Basin Management Society.
- **Treadwell, S**, Sandercock, P, (2017). Using science and hydraulics to inform stormwater management for improved river health outcomes: How much stream flow is too much? 2017 Victorian Stormwater Management Conference, Lorne, Victoria.
- Sandercock, P., **Treadwell, S**., Braszell, J., Polon, N. and Richardson, D. (2017). The importance of protecting headwater streams. 2017 Victorian Stormwater Management Conference, Lorne, Victoria.
- **Treadwell, S**, Dwyer, C, Watkins, S (2016) Urban waterway restoration: Daylighting Dandenong Creek. 8th Australian Stream Management Conference, July 2012, Luera, NSW.
- **Treadwell, S**. and Mitchell, P. (2013). The Victorian FLOWS method: using science to inform environmental water management. Australian Society of Limnology Annual Congress, December 2013, Canberra.
- Wettin, P. Simpson, D, **Treadwell, S** and Watts R (2009) Review of management plans. In (eds: Overton, I.C., Colloff, M.J., Doody, T.M., Henderson, B. and Cuddy, S.M.) Ecological Outcomes of Flow Regimes in the Murray-Darling Basin. Report prepared for the NWC by CSIRO Water for a Healthy Country Flagship. CSIRO, Canberra.
- **Treadwell, S**. (1999). *Managing snags or large woody debris*. In: Price, P. & Lovett, S. (eds.) Riparian Technical Guidelines. Volume Two: On-ground Management Tools and Techniques, pp 15-32. Land and Water Resources Research and Development Corporation, Canberra.

Appendix B. Instruction provided by Melbourne Water and limit of Expert Witness advice

Instruction provided by Melbourne Water (25 March 2021)

From: Katy Marriott <Katy.Marriott@melbournewater.com.au>
Sent: 25 March 2021 11:48
To: Gwyther, Bronwyn <Bronwyn.Gwyther@jacobs.com>
Cc: Treadwell, Simon A <Simon.Treadwell@jacobs.com>
Subject: [EXTERNAL] Craigieburn West / Aitken Creek Expert Witness

Hi Bron and Simon,

Thanks both for your time and discussion around best direction to present MW waterway requirements/drainage proposal for Aitken Creek.
We fully support your guidance on context of waterway retention (including general waterway retention and headwater retention in addition to ecological and soil preservation approach).

Please find attached latest correspondence regarding Vic Planning Authority – Standing Advisory Committee. Noting:

4. Any expert witness statement must be filed by 12 noon on Thursday 15 April 2021.
9. Hearing commences Monday 26 April and is schedule to run until Friday 7 May 2021

Gotta love fast-tracked planning!

Cheers,

Katy

Katy Marriott | Environmental Planner - Schemes | Catchment Strategies & Services, Development Services | **Melbourne Water** | M: 0439 719 776 | 03 9679 7218 | 990 LaTrobe St, Docklands | PO Box 4342 Melbourne VIC 3001 | melbournewater.com.au

We acknowledge the Victorian Traditional Owners and their Elders past and present as the original custodians of Victoria's land and waters and I pay my respects to their Elders past and present and to the ongoing living culture of Aboriginal and Torres Strait Islander Peoples.

Jacobs response to Melbourne Water instruction specifying tasks and limit of Expert Witness Advice (Email to MW on 6 April 2021).

Task	Description	Timeframe
Directions Hearing	(no Jacobs input)	Week ending 26th March 2021
Task 1 Project inception, approvals and management	A 1.5-hour project inception meeting will be held via Microsoft Teams with the Project Team and key Melbourne Water staff. Due to the compressed timeframes of the project, at this meeting Simon and Bron will provide a dot point list of key points to be included in the Expert Witness Statement and this meeting will be used to review these with the Melbourne Water Project Manager prior to drafting of the statement. This meeting will also be used to confirm project scope, coordination with other presentations and schedule. This task also includes project management time including ongoing project reporting, scoping and internal legal reviews.	Initial week of project
Confirmation of approval to proceed	Internal approval for Jacobs to present at the Hearing (check that any potential conflict of interest is manageable).	Week ending 9nd April
HOLD POINT		
Task 2 Expert witness statement	This task may involve the following (to be determined in the inception meeting): • review the Aitken Creek Waterway Values Assessment report (Jacobs 2020) as well as key submission documents from opposing parties' proposals. • meet with the Jacobs Project Team to determine approach and key content. • meet with the Melbourne Water project manager to confirm key technical points for the paper. As discussed, the key technical points being addressed by Jacobs are in relation to the role and importance of headwater streams in retaining water and nutrients in the landscape and the benefits of this retention to protecting downstream reaches. This advice will be of a general nature with reference to the identified values of Aitken Creek (from the recent Jacobs report), but at this stage we have not undertaken hydrological or water quality modelling to confirm the specific hydrological or water quality benefits to downstream reaches in Aitken Creek. Our expert witness advice does not extend to detailed technical advice around the specific management of sodic soils. • prepare an expert witness statement (approx. 3 pages) with technical review by Greg Hoxley. • The key points from this discussion paper will be made available to the Melbourne Water Project Manager in the first week of the project; once the paper is drafted Melbourne Water will have one day to provide review of the paper prior to submission, given the tight timeframes for submission.	Statement due to be uploaded by noon Monday 19th April (draft provided COB Wednesday 14th April).

Task 3 Present at hearing	• meet with Melbourne Water's legal counsel. • prepare a MS Powerpoint presentation to present at the Hearing (online Hearing) outlining key points and evidence. • prepare to present at the Hearing. • present at the Hearing, including cross-examination by legal counsel and being present for other Expert Witness presentations if required (assumed up to 8 hours). • Debrief with Melbourne Water project manager and legal counsel.	Week ending 30th April

Appendix C. Aitken Creek Waterway Values Assessment Report

Appendix D. Headwater Streams Technical Note – The importance of protecting headwater streams.

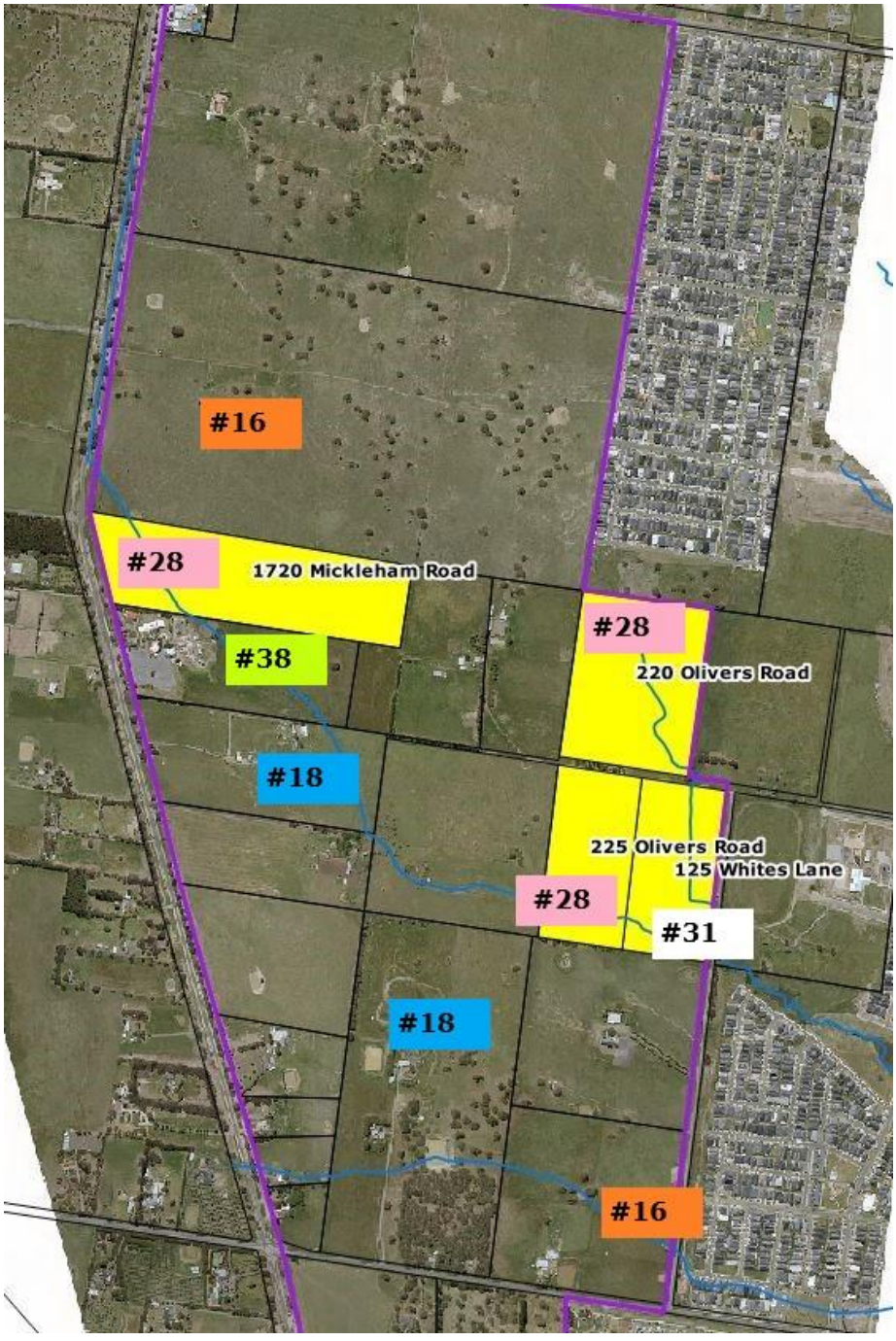
Appendix E. The Importance of Headwater Streams Factsheet.

Appendix F. Response to relevant submissions

This appendix provides a response to submissions (16, 28, 31, 38) querying:

- The classification of Aitken Creek and the North Eastern tributary as natural waterways.
- The proposed waterway corridor width.

Submission numbers are annotated on the map below. Yellow blocks were ones were Jacobs was denied permission for survey as part of the Aitken Creek Waterway Investigation. Hence waterway values in these locations (in yellow) have not been determined.



Submission 16

Land ownership on Aitken Creek main channel at 1760 Mickleham Road.

Submission 16	**Response**
The key changes proposed to the northern catchment are detailed below: 1. Consolidation of assets along the eastern boundary, resulting in the removal of sediment basin ACSB 01 and consolidating these drainage requirements into sediment basin ACSB 02; and 2. Consolidation of the northern reach of the constructed waterway, CW2 (within 1760 Mickleham Road) with wetland ACWL01 into a single asset.1	No comment on the location of assets – this is to be negotiated with MW. Note that the property to the south are arguing for the waterway to be moved to the west, which impacts on the location of the waterway in this package of land. As stated, the waterway is defined as a natural waterway, it's location should be retained and the corridor guidelines for a natural waterway should be applied.

Submission 28

Land ownership on Aitken Creek main channel (upper end) (at 1720 Mickleham Road) and North Eastern tributary (220 Olivers Rd).

Submission (28)	**Response**
Locate the waterway along Mickleham Road as it passes through properties 7 and 6. (1720 Mickleham Road) (pg 7)	Aitken Creek is mapped through this property – including the 100 year flood extent. Permission was not granted to access the property and assess values. Patches of Plains Grassland and Plains Grassy Wetland EVCs were identified along the creek line both north and south of this section – it is possible that those vegetation types are also present in the submitters block. Moving the waterway to alongside Mickleham Road would impact on the ability to maintain values identified on properties to the north and south, and also impact on the overall capacity to retain the ecosystem functions associated with a headwater stream.
Remove the North-south tributary (also referred to as North Eastern tributary), on the basis that the modelled flows from this catchment don't meet the hydraulic criteria for a waterway (pg 11).	The submitter argues to remove the waterway on the basis of its low flow and risks associated with constructing a waterway on potentially sodic soils. Headwater streams have inherently low-ephemeral flows, that's what contributes to the ecosystem values they provide – they slow flow down and infiltrate large volumes of water hence reducing the amount of water, and nutrients, that flow to downstream reaches. The objective of providing a waterway corridor is to protect the current stream and avoid the need to create a constructed waterway, along with the associated risks of exposing sodic soils. On this basis the stream and proposed corridor should be retained such that the current stream form and ecosystem function can be retained.

Submission 38

Land ownership on Aitken Creek main channel (upper end) (at 1690 Mickleham Road).

Submission (38)	**Response**
The drainage reserve traversing the site is not a natural waterway and should adopt a constructed waterway solution with a reduced width of 45 metres (35 metre hydraulic width and water depths of no greater than 450mm) appropriate to manage hydraulic functions. The constructed waterway could easily tie-in with other waterway outcomes upstream and downstream.	Aitken Creek is mapped through this property, including a 100 year flood extent. Furthermore, patches of Plains Grassy Wetland EVCs were identified in association with the current creek line. On this basis the creek has been defined as a natural waterway and the MW corridor guideline widths for a natural waterway should apply.
Melbourne Water's requirements to create a consistent corridor width will inappropriately inhibit developable land on the site. A 60 m wide corridor is not required from the point of view of hydraulic function.	The submitter argues that a narrower corridor can be accommodated on the basis of low hydraulic flow by **constructing** a waterway. Headwater streams have inherently low-ephemeral flows, that's what contributes to the ecosystem values they provide – they slow flow down and infiltrate large volumes of water hence reducing the amount of water, and nutrients, that flow to downstream reaches. The objective of providing a waterway corridor is to protect the current stream and avoid the need to create a **constructed** waterway, along with the associated risks of exposing sodic soils. On this basis the definition of a natural waterway and proposed corridor width should be retained such that the current stream form and ecosystem function can be retained.

Submission 31

Land ownership on the North Eastern Tributary (Whites Lane).

Seeking for any assets proposed to be minimised, particularly along the eastern portion of the site, on the basis of the following considerations:

Submission (31)	**Response**
The blunt application of the minimum corridor widths in the absence of a robust site-specific assessment does not represent a sophisticated solution for this section of the north-eastern tributary as it relates to our client's site;	MW's waterway corridor guidelines provide a "consistent, strategic approach to the management of riparian zones in greenfield developments" (pg3). The guidelines specify a 20 m minimum set back on each bank for 1st order streams, plus we have assumed a 5 m width, total width 45 m. The submission suggests that "…the Waterway Corridors Guidelines contemplate **narrower setbacks can be considered if it can be conclusively demonstrated that the objectives of waterway corridors will still be met**" (para 16 pg 6). While the guidelines do acknowledge that corridor widths could be narrower this applies to rare instances as per "It should be noted that in rare instances, the required waterway setback may be narrower than standard (minimum) width. Narrower setbacks will only be considered if it can be conclusively demonstrated that the objectives of waterway corridors (as outlined in these guidelines) will still be met" (pg 7). The submission argues that the justification for a narrow width is based on the lack of geomorphic or ecological values, absence of significant trees and absence of rare or threatened flora or fauna (para 18, pg 6) Access to the waterway was not granted in this property, so the presence or absence of specific values has not been confirmed. Furthermore,

	the submitter has not provided specific evidence to support their claim for the absence of values. Given the inability to access the site for the purposes of a more detailed assessment, the minimum watery corridor widths have been applied. These are considered necessary to maintain the general ecological function provided by headwater streams. If high value assets were recorded on site there could be justification for a wider corridor width.
This section of the north-eastern tributary has been assessed (by whom?) to have limited ecological values	Access not granted by the landowner to assess this, but it is argued that the waterway meets the criteria for a headwater stream with its associated ecosystem function values.
No presence of significant vegetation (such as River Red Gums) is located along this section of the north-eastern tributary;	Access not granted by the landowner to assess this.
No rare or threatened flora and fauna was found (or likely to be found) along this section of the north-eastern tributary;	Access not granted by the landowner to assess this.
There is merit in considering an 'online' stormwater treatment in lieu of the proposed 'offline' treatment for the north-eastern tributary given the steep topography, and therefore opportunity to reduce the minimum corridor widths associated with the proposed asset – e.g. the existing online treatment successfully utilised at Flax Lily Creek to the south of Craigieburn Road;	This is something for MW to consider in the drainage design.

Appendix G. Signed direction for witnesses providing expert evidence through remote conferencing

Planning Panels Victoria

Direction for witnesses providing expert evidence through remote conferencing

Declarations are required as standard practice in accordance with the PPV Guide to Expert Evidence (https://www.planning.vic.gov.au/panels-and-committees/planning-panel-guides)
All witnesses include a response to this in filing their evidence.

As some PPV matters are being held remotely, any person providing expert evidence must table (either verbally or in writing), this Declaration when called to give their evidence in chief:

In giving my evidence, I confirm I:

- *will be alone in the room from which I am giving evidence and will not make or receive any communication with another person while giving my evidence except with the express leave of the Panel;*
- *I will inform the Panel immediately should another person enter the room from which I am giving evidence;*
- *during breaks in evidence, when under cross-examination, I will not discuss my evidence with any other person, except with the leave of the Panel; and*
- *I will not have before me any document, other than my expert witness statement and documents referred to therein, or any other document which the Panel expressly permits me to view.*

Signed by: _____ **Date:** 14/4/21