



Amendment C387ggee to the Greater Geelong Planning Scheme

Expert Witness report provided to Planning Panels Victoria

Drainage Evidence

Prepared for the Developer Group (Stockland Land Lease Pty Ltd, Curlewis
Bellarine Pty Ltd, Curlewis Land Pty Ltd)

Prepared by Jonathon McLean

April 2024

1 Witness Details

I, Jonathon McLean of Alluvium Consulting Australia (Alluvium), 176 Wellington Parade, East Melbourne, Victoria 3002, prepared this report. I hold the position of Principal Consultant.

I have a Bachelor of Engineering (Civil) from Monash University 1990, Graduate Diploma Water Resources and Environmental Engineering Monash University 1994, Graduate Diploma MBA Program Technology Management APESMA Deakin University 2001.

I am a member of Stormwater Victoria and a former 10 year committee member of the Victorian Stormwater Industry Association (2001-2010).

My major fields of expertise and interest are hydrology, hydraulics, urban drainage, catchment planning and management, flood estimation, surface water modelling, stormwater treatment and waterway management.

Related Experience:

- Over a period of more than 25 years I have regularly been involved with the design and strategic planning of drainage strategies and systems within residential, commercial and industrial developments.
- My expert advice has been sought by both the private sector (eg developers) and the public sector (catchment management authorities and local government).
- I have been actively involved in the development of the Best Practice Environmental Guidelines for Urban Stormwater
- I have been a key contributor to Melbourne Water's "Waterway Corridors – Guidelines to greenfield development areas" and a lead author of Melbourne Water's "Constructed Waterways Design Manual".
- I provide hydrology advice to agencies such as Melbourne Water and the Department of Environment, Land, Water and Planning (DELWP) to assist with technical guidelines to deliver appropriate habitat designs for threatened species such as Growling Grass Frogs and Dwarf Galaxias.
- I have attended and presented at various industry conferences and seminars.
- I have a sound understanding of the role of Local Government, Catchment Management Authorities, Department of Energy, Environment and Climate Action (DECA), and other agencies in stormwater planning and management.

Therefore my expertise and experience in flood modelling, waterways and urban stormwater management associated with civil engineering and development projects, qualifies me to make this report.

2 Instructions

I have been instructed by Linda Choi of Norton Rose Fulbright to provide expert evidence advice on the drainage issues related to the proposed Amendment C387ggee to the Greater Geelong Planning Scheme, taking into account:

- the exhibited C387ggee documents, background reports and submissions

In particular I have been briefed to:

- review the exhibited Amendment documents, background reports and submissions;
- consider the appropriateness of the proposed Amendment, from a drainage engineering perspective and express my opinion on the key issues;
- express my opinion, as relevant to my expertise, on the following specific issues:
 - The Coriyule Road drainage outfall arrangement and its nexus with respect to the Jetty Road Urban Growth Area – Stage 2
 - The batter and edge treatments for the constructed wetlands and waterways within the southern drainage reserve (DR04)
 - The potential impact of the cultural heritage salvage (occurring on Property 15) on the drainage strategy

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

3 Facts, Matters and Assumptions

In preparing this evidence Jonathon McLean has had regard to:

Exhibited Amendment documents

- Explanatory Report (undated)
- Instruction Sheet (undated)
- Schedule 9 to Clause 45.06 (Development Contributions Plan Overlay) (undated)
- Schedule 46 to Clause 43.04 (Development Plan Overlay) (undated)
- Schedule to Clause 72.03 (What Does This Planning Scheme Consist Of) (undated)
- Schedule to Clause 72.04 (Documents Incorporated In This Planning Scheme) (undated)
- Jetty Road Urban Growth Area Stage 2 - Development Contributions Plan (October 2023)
- Development Plan Overlay – Schedule 46 (17 March 2023)
- Development Contributions Plan Overlay – Schedule 9 (21 September 2022)
- General Residential Zone 1 (21 September 2022)
- Environmental Audit Overlay (28 August 2023)

Supporting documents

- Minutes of Council Meeting 24 May 2022
- Jetty Road Urban Growth Plan 26 June 2007
- Schedule 2 to Clause 45.06 (Development Contributions Plan Overlay), Jetty Road Urban Growth Area Stage 17 December 2020
- Bellarine Peninsula Statement of Planning Policy July 2023
- C387ggee Rail Trail North – Infrastructure Servicing Assessment October 2021
- C387ggee Rail Trail North – Flood Study June 2020
- C387ggee Rail Trail South – SWMS – Water Technology 6 September 2023
- C387ggee Rail Trail South – Existing Conditions Flood Study June 2020
- C387ggee Rail Trail South – Infrastructure Servicing Report 20 July 2022
- C387ggee Overall - Coriyule Road Drain Report 29 September 2023
- C387ggee Overall - DPO Schedule 46 – Background Landscape Report November 2022
- C387ggee Overall - Jetty Road Rezoning – Stage 2 Stormwater Management Strategy 15 February 2023
- Jetty Road Urban Growth Area – Stage 1 – Development Contributions Plan September 2011
- Drysdale - Clifton Springs Structure Plan September 2010

Background Documents

- Valuation report by Westlink (August 2023)
- SMEC letter to Council (DR-04) (12 September 2023)
- CPG Jetty Road Infrastructure Plan (February 2010)
- TGM Site SWMS – part of Jetty Road Stage 1 endorsed DP (April 2011)
- Memorandum from City of Greater Geelong Coriyule Road Drain – Cost Recoupment via DCP or Agreement (July 2022)
- Proposed Drainage Improvements, Coriyule Road (plans 25 January 2016)
- Drainage Improvement Works (plans 23 June 2021)
- Scarborough Road Outfall Drain (plans 16 April 2020)
- Jetty Road South of Rail Trail, Stormwater Management Strategy (earlier version, 14 December 2022)
- Jetty Road Structure Plan – Stormwater and Stream Rehabilitation Concept (Ecological Engineering, April 2005)
- Jetty Road Structure Plan – Civil Engineering Report (Youngs October 2004)
- Melbourne Water – Waterway Corridors – Greenfield Development Guidelines (2013)
- Jetty Road Stage 2 Land Valuation Report – March 2024 Update – Westlink Consulting

Submissions

- Developer Group submission (18 December 2023)
- Council's response to submission (14 February 2024)

Other Information:

- Site Inspection (21 March 2024)
- Aerial Photography
- Lidar survey (2013)
- Australian Rainfall & Runoff (2019) – Engineers Australia
- Urban Stormwater Best Practice Environmental Management Guidelines (1999)
- Melbourne Water's "Constructed Wetlands: Design Manual (2020)";
- Melbourne Water's "MUSIC Guidelines (2018)";
- Wyndham WSUD Asset Selection and Design Standards Guideline (September 2018)
- Water by Design, 2017, Wetland Technical Design Guidelines, South East Queensland Healthy Waterways Partnership, Brisbane
- Lake Macquarie City Council, 2013, Batter and Fencing Guidelines for Squids and Detention Basins
- SMEC, 2 April 2024, MDG vs Rev F SMEC Wetland, Exhibited Drainage Reserve

Assumptions

I have reviewed the hydrologic/hydraulic model inputs and results prepared by Water Technology but I have not reviewed the models or created my own hydrologic/hydraulic models.

Declaration

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

At all times, I have been aware of the requirements of Planning Panels Victoria (PPV) Practice Note 1 – Expert Evidence.

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.

4 The Site

Amendment C387ggee aims to facilitate residential development of land on the western edge of Drysdale, Clifton Springs and Curlewis in the Greater Geelong Planning Scheme. This area is known as Jetty Road Urban Growth Area (JRUGA) Stage 2. The neighbouring area, known as Jetty Road Urban Growth Area Stage 1 (Stage 1), was rezoned in December 2009 via Amendment C152 and C230 to the Greater Geelong Planning Scheme. Stage 1 has now been fully developed with over 1700 dwellings. Stages 1 and 2 each comprises 50% of the Jetty Road Urban Growth Area.

The focus of my brief and drainage expert evidence relates to the landholdings belonging to the Developer Group (Stockland Land Lease Management Pty Ltd, SOHO Living/Curlewis Bellarine Pty Ltd, APD Projects/Curlewis Land Pty Ltd). The Developer Group controls a significant portion of the land within the JRUGA Stage 2. The Developer Group's landholdings are shown in Figure 1. Stockland, SOHO Living and APD Projects' landholdings are represented within the purple, blue and black boundaries respectively.

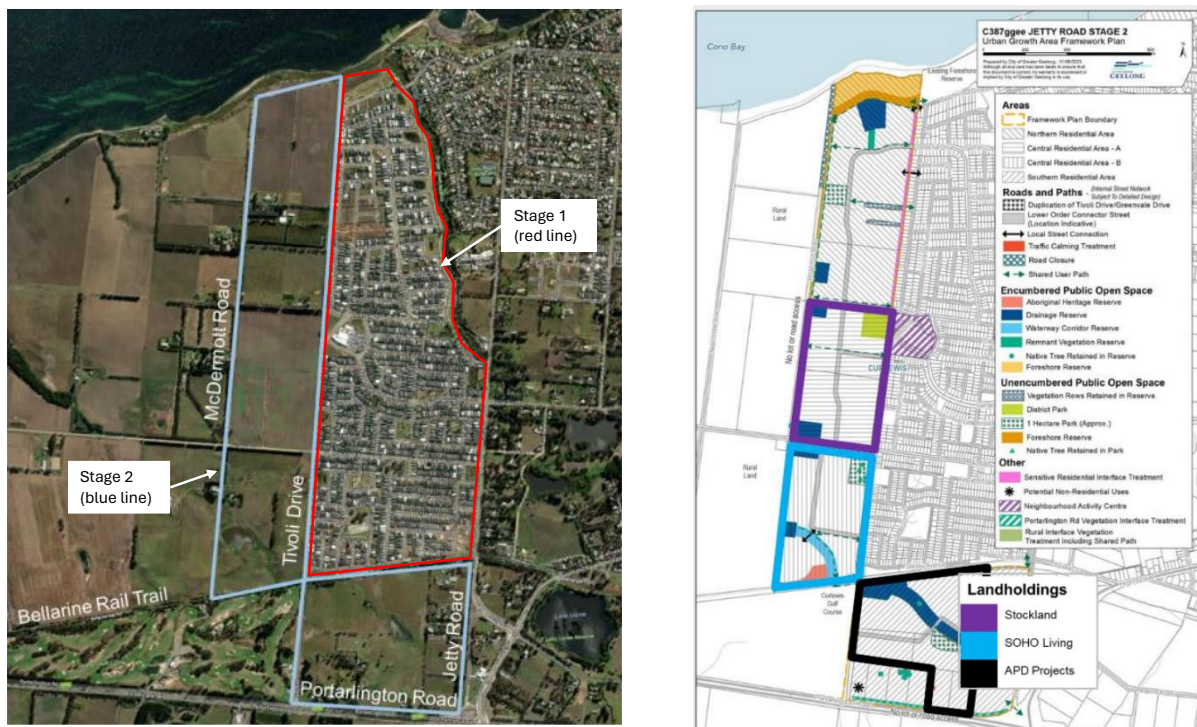


Figure 1: Jetty Road Urban Growth Area Stage 1 & Stage 2 (left image); Developer Group landholdings (right image)

5 Review of the Proposed Amendment

The Jetty Road Urban Growth Plan (UGP) sets the strategic direction for the development of land in the Jetty Road growth area. The UGP was adopted by the City of Greater Geelong in 2007 and sets out the key principles and objectives that need to be considered for future development planning responses (eg the Urban Framework Plan for Stage 1 and Stage 2). From a drainage perspective the relevant principles and objectives are:

- Principle 25: The Jetty Road growth area is to exemplify best practice in water sensitive urban design.

Objective 25.1:

Flooding and drainage management must achieve best practice as outlined in Urban Stormwater – Best Practice Environmental Management Guidelines (CSIRO 1999), including:

- impact minimisation by limiting waterway disturbance caused by the alternation of flow regimes;
- protection of the natural drainage system by protecting channel form and aquatic ecosystems from flow related impacts;
- an integrated approach to stormwater system management that meets both hydraulic capacity and waterway projection objectives, and is designed and implemented on a catchment basis, including consideration of development staging impacts and proposals for interim management;
- retarding basins will be sized to contain the entire volume of a 100 year flood event and prevent uncontrolled discharge to the foreshore;

Objective 25.3:

Stormwater management must achieve best practice water sensitive urban design, including:

- complying with the water quality objectives of the State Environment Protection Policy;
- detention of stormwater, rather than rapid conveyance;
- investigate the integration of stormwater wetlands with the flood retarding basins;
- use of vegetation for filtering purposes;
- protection of water-related environmental, recreational and cultural values;
- a stormwater management system which ensures that the peak discharge rate, volume and pollutant load of stormwater leaving a site after a development is no greater than pre-development;

- Principle 26: Stormwater quality, treatment and flow management must ensure no negative impacts on downstream properties, ecology and geomorphology.

In my opinion the above principles and objectives remain generally consistent with current best practice stormwater management and for the most part are appropriate criteria to assess the proposed Amendment.

From a drainage perspective the Amendment has been informed by the following exhibited two documents:

- Final Report Jetty Road Rezoning – Stage 2 SWMS, Water Technology, Version 07, 15 February 2023
- Final Report, Jetty Road South of Rail Trail SWMS, Water Technology, Version 06, 6 September 2023

My evidence included a review of the above two reports. Based on my assessment I believe that the approach, recommendations and drainage outcomes contained within the two SWMS reports achieve the general intent associated with the principles and objectives identified in the Jetty Road Urban Growth Plan. In particular the SWMS reports consider and address the three key metrics around stormwater quality treatment, peak flow rate mitigation (retardation) and volumetric impacts on downstream landowners (diversion drains). Since these exhibited reports have informed the Stage 2 Framework Plan, Infrastructure Plan and DCP and provide an appropriate site response I am generally supportive of the proposed Amendment. However I have identified a few specific items that in my opinion require either further consideration, clarification or resolution as follows:

- “Schedule 46 to Clause 43.04 Development Plan Overlay”.
 - Amendment to the wording for stormwater quality treatment
- DCP item DR02 – Coriyule Road Drain Outfall
 - The nexus associated with JRUGA Stage 2 and the DR02 outfall infrastructure
 - The potential apportionment model
- DCP item DR04 – Southern Drainage Reserve
 - The approach for determining the “unencumbered land area”
 - Consideration of batter and edge treatments for the constructed wetlands and waterways

My opinion on each of the above drainage items is provided in the following sections.

6 Schedule 46 to Clause 43.04 Development Plan Overlay

The fourth dot point of the Integrated Water Management (IWM) Plan provisions, within “Item 4.0 Requirements for development plan” of the Schedule 46 to Clause 43.04 Development Plan Overlay, states:

A stormwater management system that ensures peak discharge rates, pollutant loads of all stormwater leaving the site post development are no greater than pre-development and that ensures no adverse impacts to any surrounding area, upstream or downstream of the volume of stormwater discharged over time from any stormwater asset.

However Schedule 46 also states that the IWM plan must be guided by the *Final Report Jetty Road Rezoning – Stage 2 SWMS, Water Technology, Version 07, 15 February 2023*, which is based upon stormwater quality treatment to meet the Best Practice Environmental Management Guidelines (CSIRO 1999) and not pollutant loads back to pre-development. These two metrics for pollutant load reductions are not the same. The Best Practice Pollutant load reduction targets are based on meeting performance objectives based on the expected improvement required to meet SEPP (State Environment Protection Policy (Waters of Victoria)) objectives and what can be achieved by current best practice techniques. Pre-development pollutant loads are very difficult to determine and define without monitoring data due to land use management practices. In my experience the approach taken in the Water Technology SWMS report is consistent with industry practice for stormwater strategy planning in growth areas.

The fourth dot point above is also inconsistent with dot points three and five within the same IWM provisions which only refer to stormwater quality to meet best practice.

Identification of all land to be set aside for drainage purposes, detailing the approximate size and location of all drainage reserves and system components, including retarding basins, treatment and sediment ponds, drying areas and access tracks to provide for the required stormwater assets and meet Best Practice Environmental Management Guidelines. The land required may include unencumbered land (as calculated in the Jetty Road Stage 2 DCP Land Budget) once functional designs have been approved.

Treatment to achieve best practice pollutant removal targets in accordance with relevant standards and guidelines (including Design Note 3 and Melbourne Water guidelines).

Therefore based on the above, and given that the Amendment, Framework Plan, Infrastructure Plan and DCP have relied upon the Water Technology SWMS report, in my opinion the fourth dot point should be re-worded as follows:

*A stormwater management system that ensures peak discharge rates, ~~pollutant loads~~ of all stormwater leaving the site post development are no greater than pre-development and that ensures no adverse impacts to any surrounding area, upstream or downstream of the volume of stormwater discharged over time from any stormwater asset. **Post development pollutant loads must ensure that the load reduction targets in the Best Practice Environmental Management Guidelines are met.***

7 DCP item DR02 – Coriyule Road Drain Outfall

7.1 Drain Outfall History

Residential subdivision in Stage 1 of the JRUGA commenced in 2011 and the detail stormwater management strategy (SWMS) did not include consideration of how to reduce the impact of post development stormwater volumes on the downstream system. Whilst consideration of volume was not common practice around this era (ie 2011), in my view Stage 1 of the JRUGA should have addressed this issue as the principles and objectives in the Jetty Road UGP (2007) had previously identified the need to consider volume impacts on the downstream environment (see Section 5). As construction progressed in stage 1 the deficiencies in the SWMS became evident as frequent flows resulted in nuisance flooding, erosion and sediment deposition within private property and along the Coriyule Road reserve¹.

In an attempt to address this issue Council constructed (and funded) the first stage of drainage outfall works along Coriyule Road in 2017. This first stage consisted of approximately 1000m of pipe drainage from Greenvale Drive to the downstream ephemeral waterway (see Figure 2). As development of Stage 1 was almost complete, Council did not seek to obtain reimbursement from the developers of that stage. Based on my review, the supplied documents (see Section 3) did not include calculations or a description on how the pipe was sized for the Stage 1 (or Stage 2) drainage works. In my view (see Section 7.3) it appears that the pipe in the Stage 1 outfall works had capacity to accommodate a flow greater than just the 1% AEP retarded flow from the Stage 1 JRUGA precinct.

However the Stage 1 drainage outfall works did not completely alleviate the downstream issues, in particular the impact on private property, as the pipe discharged all volumetric flows directly to the ephemeral waterway downstream of Coriyule Road. As a result Council constructed the second stage of the outfall works along Coriyule Road/Scarborough Road in 2021. This second stage consisted of approximately 1800m of pipe drainage from the ephemeral waterway to an ocean outfall. Council has apportioned part of the cost associated with the second stage of the ocean outfall works to the JRUGA Stage 2 DCP. The sizing rationale and calculations adopted by Council for the Stage 2 drainage outfall works has not been provided in the supplied background information (see Section 3), however based on my assessment (see Section 7.3) it appears to be significantly less than the Stage 1 outfall drainage works.



Figure 2: Coriyule Road drainage outfall works

¹ Memorandum from City of Greater Geelong Coriyule Road Drain – Cost Recoupment via DCP or Agreement (July 2022)

7.2 Is there a nexus between JRUGA Stage 2 and Coriyule Road Drain Outfall?

Properties 13 to 30 all naturally discharge to the west and into the ephemeral waterway (CMA designated waterway) either directly or in-directly through low points/depressions located within private property external to the Jetty Road Urban Growth Area. The process of urbanising a catchment increases the fraction imperviousness (eg hard stand or sealed surfaces) which results in an increase in peak flows, volumes and pollutants. The SWMS for Stage 2 (Water Technology) includes wetlands/retarding basins which mitigates peak flow rates and pollutant loads.

However retarding basins do not reduce the volumetric impacts on downstream landowners. This is illustrated in the conceptual diagrams below which demonstrate the impact of a retarding basin. Figure 3 shows the unmitigated post-development hydrograph (flow versus time) in blue and the pre-development hydrograph in green. The area under each curve (ie the hydrograph) is the volume of runoff generated for a rainfall event. Figure 3 shows that the peak flow rate and volume under the curve is much greater for the post-development scenario compared to the pre-development scenario. In contrast Figure 4 demonstrates that the retarding basin is effective in reducing the post-development peak flow rate to the equivalent pre-development peak flow rate, however the post-development volume (ie blue shade) remains the same as Figure 3 as the blue curve is "flattened" and the volume discharges at a low rate but for a must longer period of time.

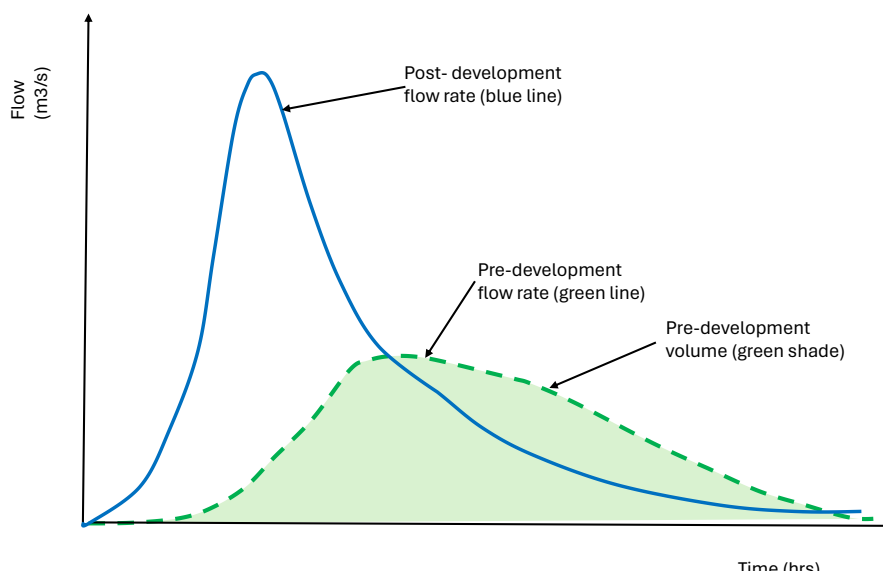


Figure 3: Post-development vs pre-development (no mitigation)

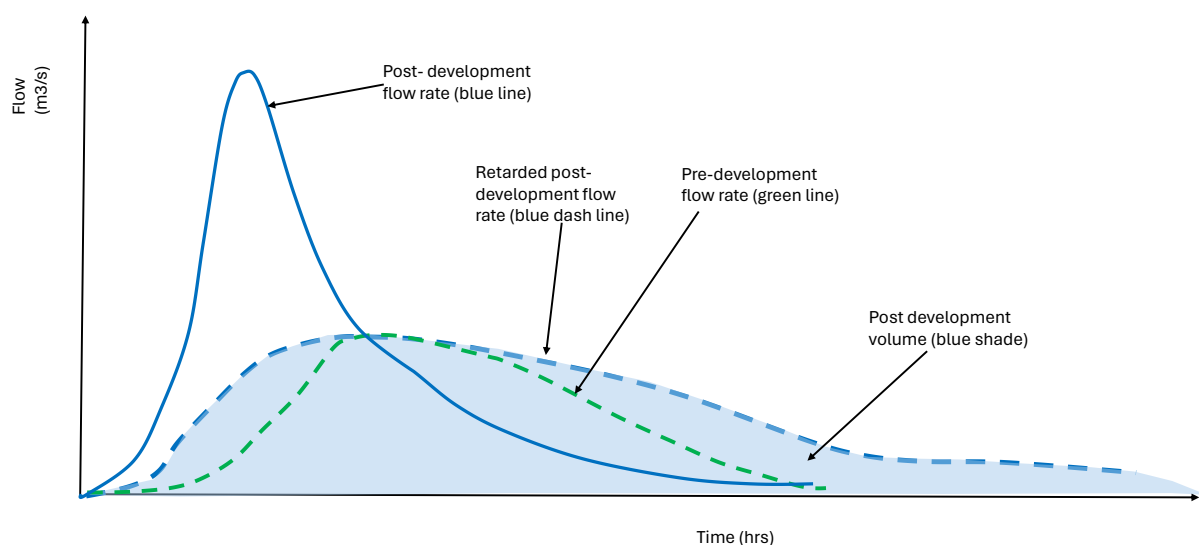


Figure 4: Post-development vs pre-development (with retardation)

The SWMS for Stage 2 (Water Technology) considered and investigated three options to remove the excess volume (ie blue shade minus green shade in Figure 3 and Figure 4) generated from developing the JRUGA Stage 2 precinct. These options included stormwater harvesting, evaporation basins and ocean outfalls. Based on my experience, I agree with the findings that the first two options are not feasible which results in the recommendation for an ocean outfall. For properties 13 to 30 the ocean outfall would be via the Coriyule Road drain system, which is required to meet the principles and objectives of the Jetty Road UGP (as outlined in Section 5). Therefore in my opinion there is a clear nexus between the JRUGA Stage 2 precinct and the Coriyule Road drain system.

The ocean outfall is essentially a diversion pipe that transfers frequent urban flows away from the ephemeral waterway and private property to ensure that the post development volume discharged is at or below the volume under pre-development conditions. The hydrologic response associated with urban catchments is “peaky” (ie peak flow rates of short duration) which generally means that the vast majority of the base volumetric load is contained at much lower flow rates. Figure 5 demonstrates the conceptual function and role of the diversion system to achieve the volumetric targets downstream.

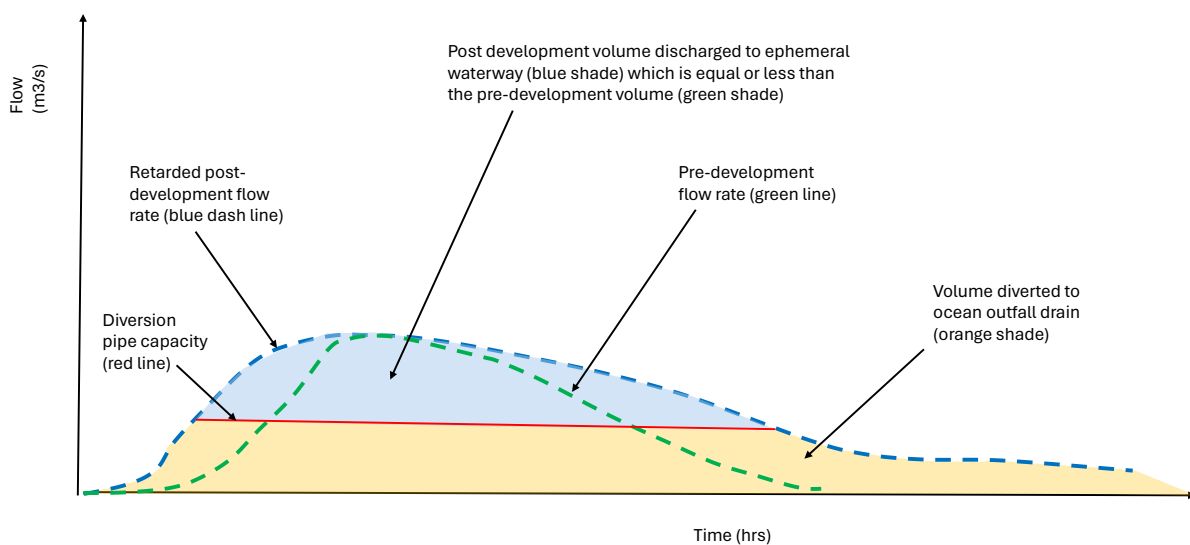


Figure 5: Post-development vs pre-development (with retardation and the diversion pipe)

7.3 Does the Outfall Drain have capacity for JRUGA Stage 2?

In my opinion the capacity of the Coriyule Road outfall drainage system needs to be considered in two parts, as the role and function of each section is different.

Stage 1 outfall works (Greenvale Road to the ephemeral waterway)

This section of the outfall drainage system needs to have capacity to convey the 1% Annual Exceedance Probability (AEP) event from both the JRUGA Stage 1 and JRUGA Stage 2 precinct areas. This is because Coriyule Road is in the lowpoint of the catchment but does not have the capacity to contain and convey overland flows.

Based on the construction plans (25/01/2016) for the Stage 1 drainage works along Coriyule Road the drainage reach essentially consists of:

- A 1200mm pipe with a 1% pipe grade (minimum)
 - Pipe full capacity for this configuration is 3.9 cumecs

Or

- Triple 750mm pipes with a 1% pipe grade
 - Pipe full capacity for this configuration is 3.33 cumecs

Based on the hydrologic RORB modelling undertaken within the SWMS for Stage 2 (Water Technology) the peak 1% AEP flow rate contributing from both the JRUGA Stage 1 and JRUGA Stage 2 precinct areas is 3.09 cumecs (1.5 hour critical storm event). This is less than the minimum pipe capacity within the Stage 1 outfall works of 3.33 cumecs.

Therefore based on the above assessment in my opinion the Stage 1 outfall drainage system in Coriyule Road has the capacity to accommodate both the JRUGA Stage 1 and JRUGA Stage 2 precinct areas.

Stage 2 outfall works (ephemeral waterway to ocean outfall)

In my opinion this section of the outfall drainage system does not need to convey the peak 1% AEP event to the ocean outfall. The role and function of this pipe reach is to act as a “diversion pipeline” so that the volume discharged to the ephemeral waterway is equivalent or no greater than the volume under pre-development conditions (refer to Figure 5 above). That is the diversion pipe needs to convey the excess volume above pre-development conditions and will therefore require a much lower design capacity than the Stage 1 works. The hydrologic modelling associated with this scenario has not been completed within the SWMS for Stage 2 (Water Technology), however based on my experience I would expect a diversion flow rate that is in the order of a 4EY event (ie 3 month event).

Based on the as-constructed plans (25/01/2016) for the Stage 1 drainage works along Coriyule Road the drainage reach essentially consists of:

- A 1200mm pipe with a 0.1% pipe grade (minimum)
 - Pipe full capacity for this configuration is 1.23 cumecs

Or

- Triple 750mm pipes with a 0.15% pipe grade
 - Pipe full capacity for this configuration is 1.29 cumecs

The hydrologic modelling associated with this scenario has not been completed within the SWMS for Stage 2 (Water Technology), however based on experience and “rule of thumb” ratios the 1.23 cumecs would perhaps be in the order of a 20% AEP (ie 1 in 5 year) event.

Therefore based on the above assessment in my opinion the Stage 2 outfall drainage system in Coriyule Road should have more than sufficient capacity to perform as a “diversion pipeline” for both the JRUGA Stage 1 and JRUGA Stage 2 precinct areas and ensure that the volume discharged to the ephemeral waterway is equivalent or no greater than the volume under pre-development conditions.

I note that in Section 3.6 of the SWMS for Stage 2 (Water Technology), the report confirms that the Stage 2 outfall works to the ocean does not have the capacity to convey the 1% AEP peak flow. However as I discussed above, I do not believe that the Stage 2 outfall pipeline system needs to convey this event and its function is to divert excess flow volumes above pre-development conditions. For larger events (such as the 1% AEP event) flows can surcharge at the low point of the pipe system and discharge to the downstream ephemeral waterway. Section 3.6.4 of the SWMS (Water Technology) identified this approach as a potential option.

7.4 What is a reasonable and fair cost apportionment?

Whilst Section 7.2 of my evidence report identified a nexus between the JRUGA Stage 2 precinct and the Coriyule Road drain system, it is beyond my expertise to assess whether due planning process or consultation was undertaken by Council regarding the proposed DCP funding of the stage 2 drainage outfall works.

On the assumption that a contribution from the JRUGA Stage 2 precinct towards the stage 2 drainage outfall works is lawful and appropriate, the question remains “what method of cost apportionment is fair and reasonable?”. The DCP has apportioned cost for the DR02 asset based on a “per hectare” of development basis. This has been informed by advice from Afflux Consulting (29 September 2023) which stated:

It has been suggested that a 1/3 split between the blue, orange and green (Council funded) catchments as shown below (Figure 16) could be applied. Given the similarity in areas this would seem a reasonable approach.



Figure 6: Cost apportionment as proposed by the DCP for DR-02 (source: Afflux Consulting, Figure 16)

I note that the cost apportionment plan (see Figure 6) for DR-02 does not include the complete catchment area associated with property 13. As per the SWMS for Stage 2 (Water Technology), all flows from property 13 are retarded and diverted to the Coriyule Drain outfall (ie DR-02).

The approach suggested by Afflux of apportionment on a “per hectare” basis is typical and the usual approach for drainage schemes and contribution plans. It is something that I would normally support. However the DR-02 drainage system and infrastructure is far from typical or usual. The area contribution approach is reasonable if all landholders are discharging flows to the shared asset based on the same drainage criteria. This is not the case for the DR-02 system as outlined below:

- JRUGA Stage 1
 - Discharge to DR-02 based on the 1% AEP peak flow rate back to pre-development peak flow rate
- JRUGA Stage 2
 - Properties 16-30 and 15 (part)
 - Discharge to DR-02 based on a low flow diversion rate only
 - Properties 15 (part), 14, 15
 - Discharge to DR-02 based on the 1% AEP peak flow rate back to less than the pre-development peak flow rate

Given the above differences in design discharge criteria to the DR-02 shared asset, in my opinion a bespoke drainage contribution method is required in order to provide a fair and equitable approach to what is a unique catchment situation. In my view an alternative approach would be a contribution method based on a properties peak flow rate contribution to the DR-02 asset. This would account for the different discharge criteria that each property and catchment is expected to meet and be in-line with the SWMS for Stage 2 (Water Technology). The size of the drainage pipe constructed was governed by peak flow rate therefore a contribution system based on a discharge rate provides a direct nexus to the cost of the infrastructure.

Table 3-8 and Table 3-10 in the SWMS for Stage 2 (Water Technology) provides the contribution of peak flow rates from the relevant catchments for the 1% AEP event. The catchments have been grouped in properties that contribute to each outfall connection. This is summarised in Table 1 below.

Table 1: Alternative Cost Apportionment for DR-02 based on Peak Flow Rate (1% AEP)

Catchment	Properties	Peak Flow (m3/s)	% Contribution
Outfall 3 Connection	15 (part)	0.58	18.5
Outfall 4 Connection	13,14	0.50	16.0
Outfall 2 Connection	16-30, 15 (part)	0.04	1.3
Jetty Road Stage 1	-	2.01	64.2
Total		3.13	100

I acknowledge that the percentage contribution in Table 1 is based on the 1% AEP peak flow event and stage 2 of the drainage outfall works is sized to convey around 1.23 cumecs (estimated to be in the order of a 20% AEP event). The SWMS for Stage 2 (Water Technology) should be updated to provide the contributing peak flow rates in a 20% AEP event. In my opinion the modelling is likely to show proportions that are similar to Table 1.

8 DR-04 Designated Waterway and Calculation of Encumbered Land

A designated waterway flows through properties 16, 18 and 23 (see Figure 7). According to the SWMS for Stage 2 (Water Technology) the Corangamite CMA advised that a minimum 20 metre setback and a corridor width in accordance with Melbourne Water's "Waterway Corridor Guidelines" was required. This resulted in a waterway corridor with of 40 metres.



Figure 7: Designated waterways (source: SWMS for Stage 2 (Water Technology); original source: CCMA)

In calculating the land valuation for the DR-04 asset, which includes a corridor wider than 40 metres to accommodate wetland treatment assets, the 40 metre designated waterway corridor has been considered as encumbered and excluded from the valuation. Whilst I agree with the principle of this approach, there appears to be an issue associated with the alignment of the 40 metre waterway corridor. The plan used by Westlink Consulting (see Figure 8) in their document "Land Valuations" appears to have adopted an alignment for the invert of the existing waterway to be central to the proposed DR-04 drainage reserve. However in my opinion the actual existing invert of the waterway should be shown closer to the northern boundary of property. This is based on my assessment of field survey (see Figure 9), site inspection (see Figure 10) and Lidar survey data (see Figure 11).

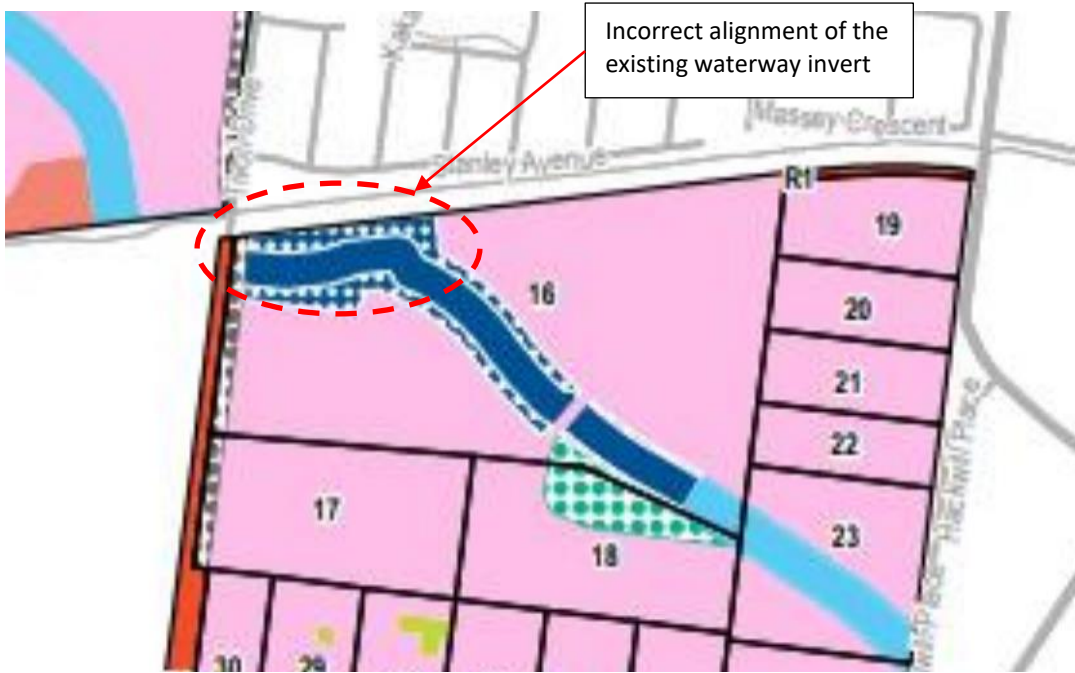


Figure 8: Plan used by Westlink to define the land valuation for DR-04

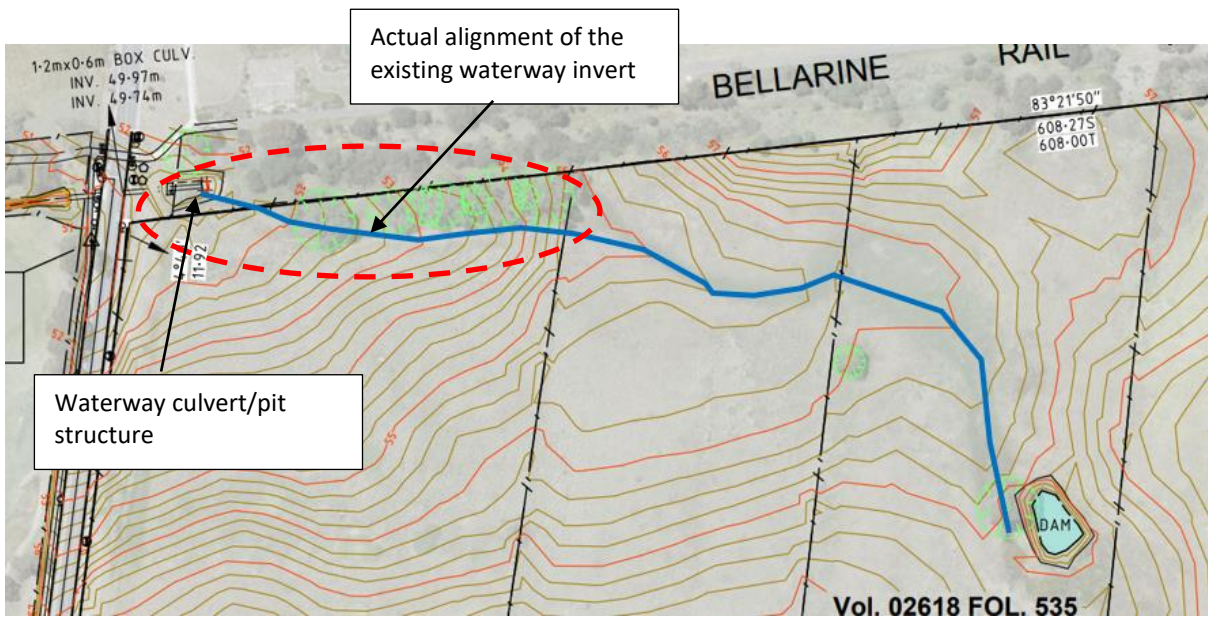


Figure 9: Actual alignment of waterway invert based on field survey

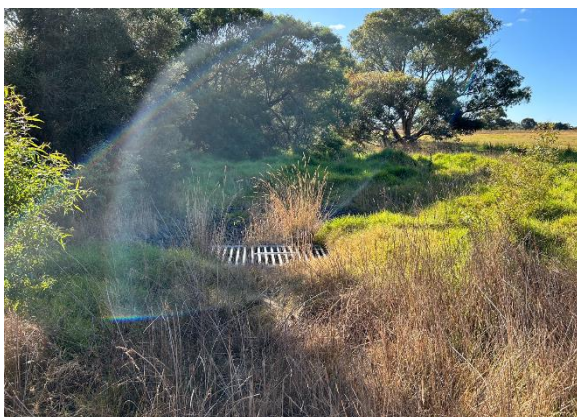


Figure 10: Waterway culvert/pit structure located within Bellarine Rail Reserve

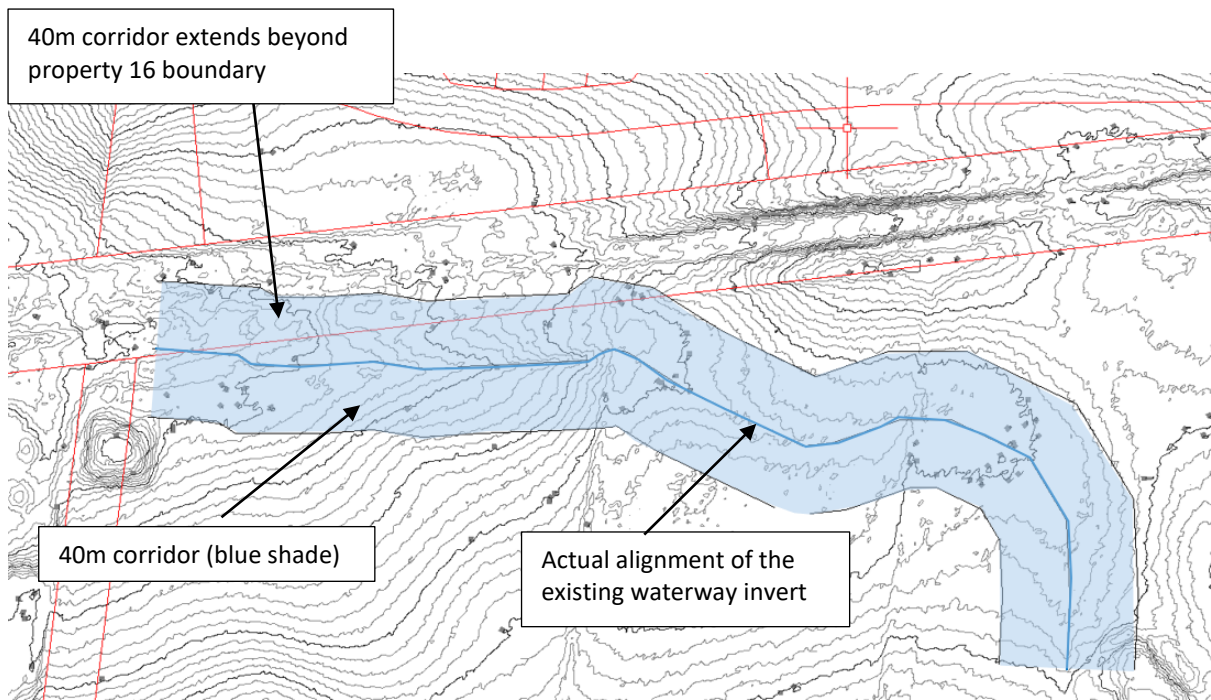


Figure 11: Actual alignment of waterway invert based on Lidar survey

In my opinion the alignment of the waterway encumbrance (40m) used to determine the Land Valuation by Westlink Consulting should be adjusted to follow the actual existing waterway invert. This is depicted in the plan prepared by SMEC (see Figure 12), which shows that the land outside the existing waterway encumbrance is 1.71ha compared to 1.544ha as shown by Westlink Consulting for the DCP valuation.



Figure 12: Actual alignment of waterway invert based on Lidar survey

9 DR04 Wetland and Waterway Batters

Constructed wetlands and waterways undoubtedly provide potential benefits to the community in terms of amenity and biodiversity. However growth area structure plans and DCP's define these natural assets as a drainage encumbrance and that their primary role is to function for stormwater quality treatment, retardation and waterway health outcomes. By giving no land credit for their contribution to the open space network it is reasonable to expect that the land take to accommodate these assets should be planned efficiently as possible.

Drainage reserve land budgets for growth area framework plans are generally informed by limited high level conceptual design. In these situations it is often common practice to adopt a drainage reserve based on a ratio of the treatment area required (eg 2.5 times) and take a conservative approach to batters (eg uniform 1in 6 grass) to ensure sufficient space to accommodate the necessary treatment, retardation and physical form processes as well as maintenance access and drying zones.

However if a wetland/retarding basin design has progressed way beyond high level concept and towards a preliminary functional design (eg 3d earthwork modelling), then in my opinion it is appropriate to consider optimisation of the batters. The reason for this is two fold:

- To increase biodiversity into the nature based system by having a variety of edge profiles and vegetation at different batter slopes. That is move away from a uniform and homogeneous mowable grass batter of 1 in 6
- To optimise the land take and overall drainage reserve encumbrance

Batters can consume a significant portion of the land take for a drainage reserve. The opportunity to incorporate steeper vegetated batters (eg 1 in 4) is relatively common place within constructed wetland environments across Australia. Many drainage authorities and Council's (eg Melbourne Water, Water by Design (Brisbane Council) and Wyndham Council) incorporate steeper vegetated edge profile sections in their design guidelines.

Steeper vegetated batters does not necessarily mean that exclusion fencing or safety is compromised. For example Lake Macquarie City Council has prepared a document titled "Batter and Fencing Guidelines for SQUIDS² and Detention Basins (2013)". This document incorporates a risk assessment process for edge profiles and batters around wetlands. It assigns a risk rating associated with various wetland characteristics to determine the appropriate design response. This is a useful tool and has been adapted or referenced by a number of other drainage authorities and Councils (eg Wyndham Council, Water by Design (Brisbane Council)).

Given that the design process for DR-04 has progressed to a preliminary functional level, in my opinion it would be reasonable in this situation to consider a variety of edge profiles to optimise the landscape function and drainage reserve land budget. For example this could be in the form of principals and guidance around the percentage (range) of grass batters (eg 1in6), densely vegetated batters (1 in 4) and rock edges (1in 2). This guidance could be incorporated into Map 1 of the Development Plan Overlay (DPO) Schedule.

In my opinion the issue of batters to optimise the drainage reserve land budget does not apply for constructed waterway corridors. This is because the width of the waterway corridor is not defined by the batter slope but by a sliding scale relative to the hydraulic width which incorporates a portion of the core riparian zone and buffer.

² SQUID is the acronym for Stormwater Quality Improvement Device

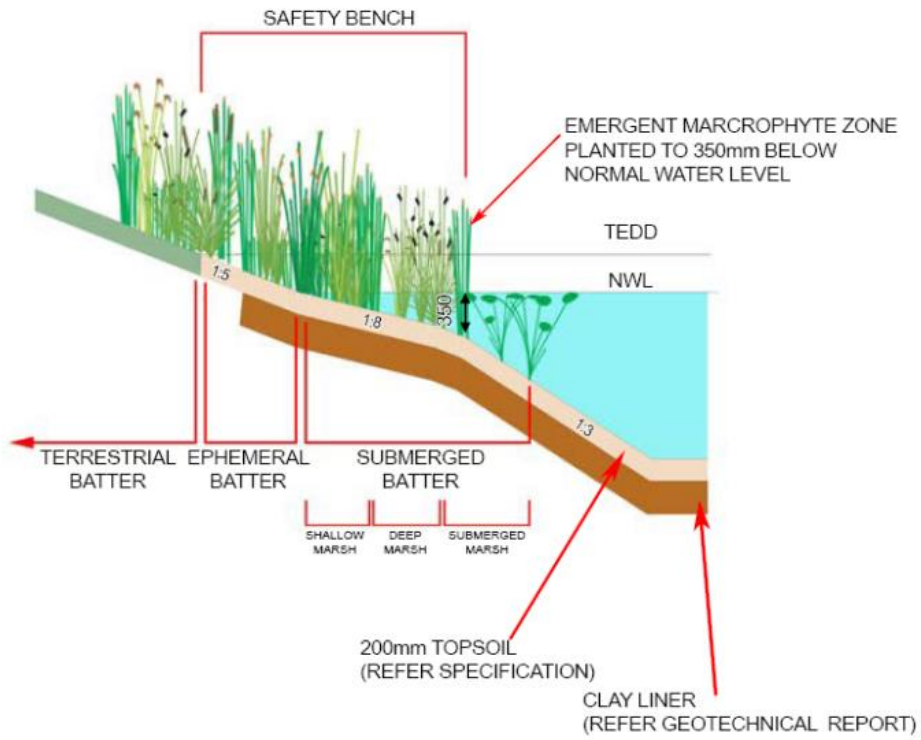


Figure 6: Indicative cross-section of vegetated wetland edge with safety bench (Refer to Melbourne Water Standard Drawing [7251/12/010](#) for more details).

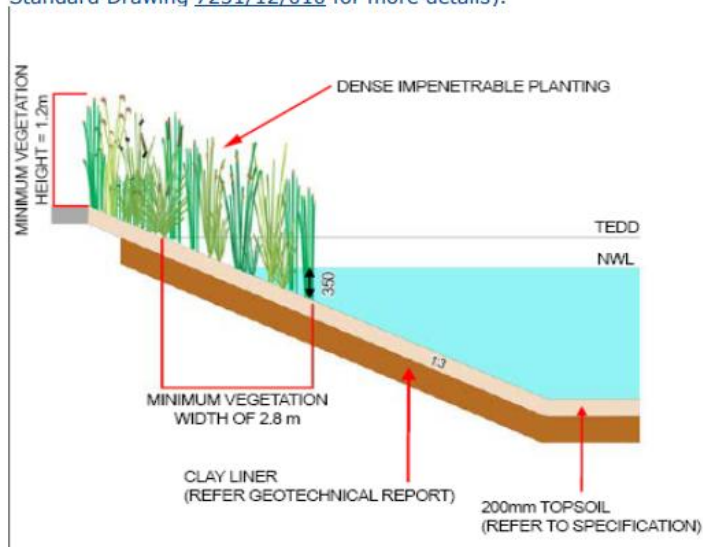


Figure 7 Indicative cross-section of vegetated wetland edge with impenetrable planting.

Figure 13: Example of edge profile and batters within Melbourne Water's Constructed Wetland Design Manual

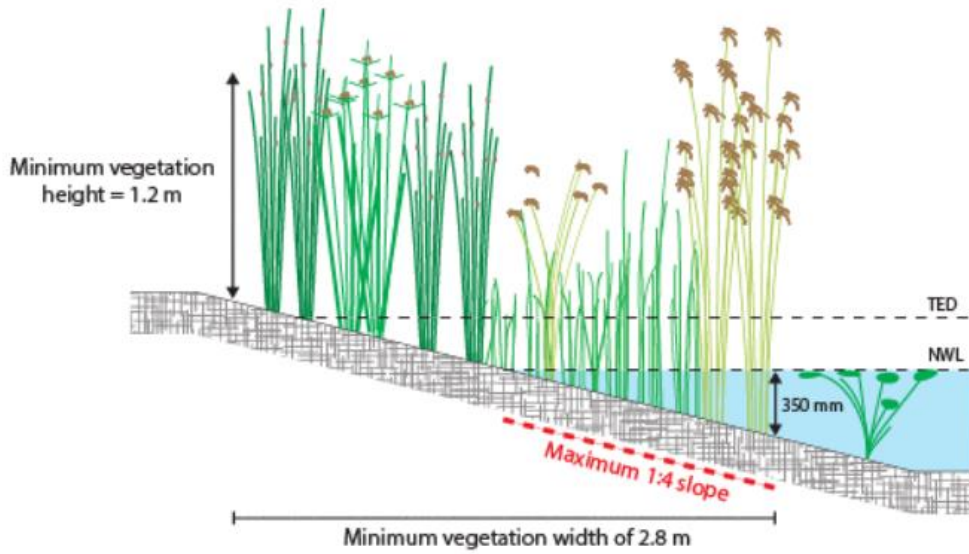


Figure 25 Wetland batter with densely vegetated edge barrier.

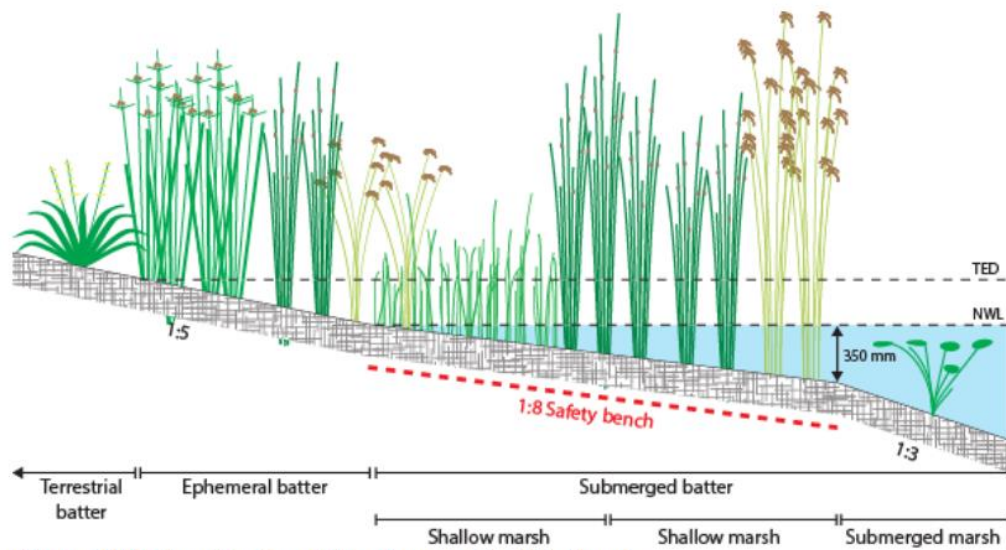
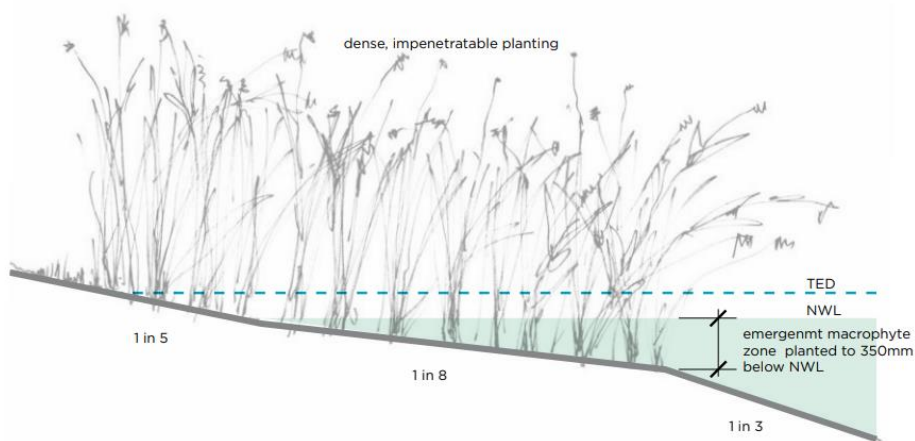


Figure 24 Wetland batter with submerged safety bench.

Figure 14: Example of edge profile and batters within Wyndham Council's WSUD Guidelines



SHALLOW MACROPHYTE ZONES

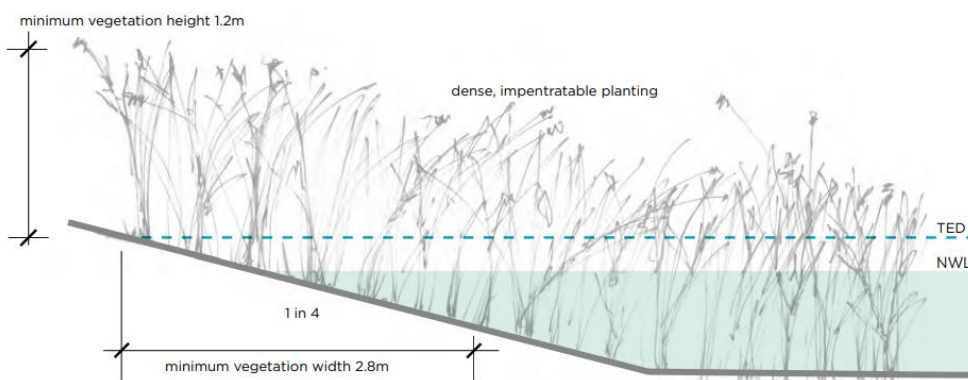


FIGURE 26: Example of Edge Design to a Constructed Wetland System

Figure 15: Example of edge profile and batters within Water By Design’s Technical Guidelines for Wetland Design

Recommendation

Given the extent of design work undertaken for the DR-04 asset, in my opinion it would be reasonable to consider a variety of edge profiles to optimise the landscape function and drainage reserve land budget. For example this could be in the form of principals and guidance around the percentage (range) of grass batters (eg 1in6), densely vegetated batters (1 in 4) and rock edges (1in 2). This guidance could be incorporated into Map 1 of the Development Plan Overlay (DPO) Schedule.

The optimisation process of steepening batters could occur above the 1% AEP flood level, which would not impact or influence the primary drainage function of the wetland/retarding basin asset.

10 Cultural Heritage Salvage at Property 15

I have been advised by Norton Rose Fulbright that cultural heritage salvage is currently occurring on Property 15 in accordance with the approved CHMP for the site (see below aerial map).

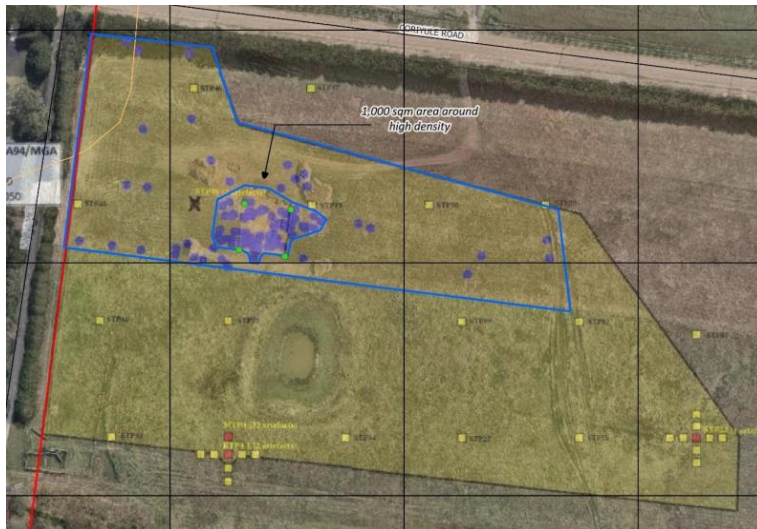


Figure 16: Cultural heritage salvage at property 15 (currently underway)

The outcome of the salvage operation may lead to a need to relocate the proposed drainage basin on the northwest corner of the property to avoid the Aboriginal heritage extent area outlined in blue (see Figure 16).

The impact on the local drainage strategy is difficult to define at this stage as it will depend upon the completion of the salvage works and be influenced by the revised urban design and civil engineering servicing. At worst it may require the wetland/retarding basin to be split (one to the south and one to the north-east). The key issue is that construction of a drainage pipeline will be required along the western boundary of Property 15 to enable the delivery of the DCP item known as DR-03. However in my opinion it is unlikely to have a material impact on the overall SWMS for Stage 2 (SWMS) as the overall discharge criteria for connection to the drain in Coriyule Road will remain unchanged.

11 Summary

In summary, my findings with respect to the proposed Amendment are provided below.

1. Based on my assessment I believe that the approach, recommendations and drainage outcomes contained within the SWMS for Stage 2 (Water Technology) achieves the general intent associated with the principles and objectives identified in the Jetty Road Urban Growth Plan. In particular the SWMS report considers and address the three key metrics around stormwater quality treatment, peak flow rate mitigation (retardation) and volumetric impacts on downstream landowners (diversion drains). Since these reports have informed the Stage 2 Framework Plan, Infrastructure Plan and DCP and provide an appropriate site response I am generally supportive of the proposed Amendment. However I have identified a few specific items that in my opinion require either further consideration, clarification or resolution as follows:
 - “Schedule 46 to Clause 43.04 Development Plan Overlay”.
 - Amendment to the wording for stormwater quality treatment
 - DCP item DR02 – Coriyule Road Drain Outfall
 - The nexus associated with JRUGA Stage 2 and the DR02 outfall infrastructure
 - The potential apportionment model
 - DCP item DR04 – Southern Drainage Reserve
 - The approach for determining the “unencumbered land area”
 - Consideration of batter and edge treatments for the constructed wetlands and waterways
2. In my opinion the fourth dot point of the Integrated Water Management (IWM) Plan provisions, within “Item 4.0 Requirements for development plan” of the Schedule 46 to Clause 43.04 Development Plan Overlay, should be re-worded as follows:

*A stormwater management system that ensures peak discharge rates, ~~pollutant loads~~ of all stormwater leaving the site post development are no greater than pre-development and that ensures no adverse impacts to any surrounding area, upstream or downstream of the volume of stormwater discharged over time from any stormwater asset. **Post development pollutant loads must ensure that the load reduction targets in the Best Practice Environmental Management Guidelines are met.***

3. In my opinion there is a clear nexus between the JRUGA Stage 2 precinct and the Coriyule Road drain system.
4. In my opinion the capacity of the Coriyule Road outfall drainage system needs to be considered in two parts, as the role and function of each section is different.

Stage 1 outfall works (Greenvale Road to the ephemeral waterway)

This section of the outfall drainage system needs to have capacity to convey the 1% Annual Exceedance Probability (AEP) event from both the JRUGA Stage 1 and JRUGA Stage 2 precinct areas.

In my opinion the Stage 1 outfall drainage system in Coriyule Road has the capacity (ie 3.33 cumecs) to accommodate both the JRUGA Stage 1 and JRUGA Stage 2 precinct areas (ie 3.09 cumecs).

Stage 2 outfall works (ephemeral waterway to ocean outfall)

In my opinion this section of the outfall drainage system does not need to convey the peak 1% AEP event to the ocean outfall. The role and function of this pipe reach is to act as a “diversion pipeline” so that the volume discharged to the ephemeral waterway is equivalent or no greater than the volume under pre-development conditions

In my opinion the Stage 2 outfall drainage system in Coriyule Road should have more than sufficient capacity to perform as a “diversion pipeline” for both the JRUGA Stage 1 and JRUGA Stage 2 precinct areas and ensure that the volume discharged to the ephemeral waterway is equivalent or no greater than the volume under pre-development conditions.

5. On the assumption that it is lawful and appropriate for the DCP to require a contribution for the outfall drainage system for the JRUGA Stage 2 precinct area, I have considered how that contribution might be fairly determined. The approach suggested by Afflux of apportionment on a “per hectare” basis is typical and the usual approach for drainage schemes and contribution plans. It is something that I would normally support. However the DR-02 drainage system and infrastructure is far from typical or usual. The area contribution approach is reasonable if all landholders are discharging flows to the shared asset based on the same drainage criteria. This is not the case for the DR-02 system and therefore in my opinion a bespoke drainage contribution method is required in order to provide a fair and equitable approach to what is a unique catchment situation. In my view an alternative approach would be a contribution method based on a properties peak flow rate contribution to the DR-02 asset. This would account for the different discharge criteria that each property and catchment is expected to meet and be in-line with the SWMS for Stage 2 (Water Technology). The size of the drainage pipe constructed was governed by peak flow rate therefore a contribution system based on a discharge rate provides a direct nexus to the cost of the infrastructure.
6. In my opinion the alignment of the waterway encumbrance (40m) used to determine the Land Valuation by Westlink Consulting should be adjusted to follow the actual existing waterway invert.
7. Given that the design process for DR-04 has progressed to a preliminary functional level, in my opinion it would be reasonable in this situation to consider a variety of edge profiles to optimise the landscape function and drainage reserve land budget. For example this could be in the form of principals and guidance around the percentage (range) of grass batters (eg 1in6), densely vegetated batters (1 in 4) and rock edges (1in 2). This guidance could be incorporated into Map 1 of the Development Plan Overlay (DPO) Schedule.
8. In my opinion the issue of batters to optimise the drainage reserve land budget does not apply for constructed waterway corridors. This is because the width of the waterway corridor is not defined by the batter slope but by a sliding scale relative to the hydraulic width which incorporates a portion of the core riparian zone and buffer.
9. The salvage operation at Property 15 may lead to a need to relocate the proposed drainage basin on the northwest corner of the property to avoid the Aboriginal heritage extent area. The impact on the local drainage strategy is difficult to define at this stage as it will depend upon the completion of the salvage works and be influenced by the revised urban design and civil engineering servicing. At worst it may require the wetland/retarding basin to be split (one to the south and one to the north-east). The key issue is that construction of a drainage pipeline will be required along the western boundary of Property 15 to enable the delivery of the DCP item known as DR-03. However in my opinion it is unlikely to have a material impact on the overall SWMS for Stage 2 (SWMS) as the overall discharge criteria for connection to the drain in Coriyule Road will remain unchanged.

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.



Jonathon McLean