



ABN: 57 650 394 899

Memorandum

8th October 2024

Memo to:

Marnabeck Management Pty Ltd,
C/- Moremac

Memo From:

Michael Mag
Director
Stormy Water Solutions Consulting Pty Ltd

Re: Croskell PSP

High-level review of provided drainage strategies

It is understood that Marnabeck Management Pty Ltd (the **Client**) controls Croskell (Employment) Precinct Structure Plan (**PSP**) properties 15E, 15R & 16.

The Client has engaged Michael Mag of Stormy Water Solutions Consulting Pty Ltd (**SWSC**) to undertake a high-level review and comparison of the following two documents which relate to potential drainage strategies for the PSP:

- The report "Croskell PSP Proposed Drainage Strategy, Drainage Strategy Concept Design Report, Water 4 Good, 28/06/2024" (the **PSP Drainage Strategy**); and
- The memorandum "350 Narre Warren Cranbourne Road, Clyde North, 30/09/2024, Incitus" (the **Incitus Memorandum**).

This review has excluded:

- Review of any modelling associated with the PSP Drainage Strategy or the Incitus Memorandum;
- A complete detailed review of the PSP document "1051 Croskell (Employment) Precinct Structure Plan, Bunurong Country, September 2024, Public Consultation" (the **Draft PSP**), noting that this review does reference parts of the Draft PSP;
- Review of any of the associated Draft PSP 'supporting documentation' documents available on the VPA website as of the 04/10/2024; and
- Any in-person site visit to the Clients properties or the general PSP region.

Given the above, if/when the above additional information is reviewed, the recommendations of this memorandum may change.

Given the Clients properties are located within the western catchment of the PSP, the review focuses predominantly on the western catchment of the PSP.

Design Objectives

Hydrology – Climate Change

Both Standard W1 of Clause 53.18-4 and Standard C25 of Clause 56.07-4 of the Casey Planning Scheme (the **Scheme**), among other things, requires that the “*stormwater management system should be: ... Designed to ensure that flows downstream of the subdivision site are restricted to pre-development levels ...*”.

Table 5-1 of the PSP Drainage Strategy shows that for the 1% Annual Exceedance Probability (**AEP**) event, the PSP Drainage Strategy generally retards the year 2100 1% AEP climate change flow estimates back to current 1% AEP flow estimate targets.

It is my opinion that this target is in excess of the Scheme requirements. The target adopted results in the PSP Drainage Strategy proposals mitigating the effects of both the change in land use (due to the PSP implementation), and the theoretical increase in rainfall intensity which may occur due to climate change (which is outside the control of the PSP).

The result of this is likely an oversizing of drainage assets.

Hydrology – 50% AEP Retardation

Both Standard W1 of Clause 53.18-4 and Standard C25 of Clause 56.07-4 of the Scheme, among other things, requires that the “*stormwater management system should be: ... Designed to meet the current best practice performance objectives for stormwater quality as contained in the Urban Stormwater - Best Practice Environmental Management Guidelines (Victorian Stormwater Committee, 1999).*” (**BPEMG**).

Table 5-3 of the PSP Drainage Strategy includes four of the five BPEMG performance objectives but omits the fifth objective which is to “*maintain discharges for the 1.5-year ARI at pre-development levels*” (noting the 1.5-year ARI event is approximately equal to the 50% AEP event).

Given this, it is likely that the PSP Drainage Strategy is not achieving the requirements of the Scheme, or requirement R29 of the Draft PSP.

Hydrology – Mean Annual Impervious Runoff Volume Reduction

Section 25(1) of the Environmental Protection Act 2017, specifies a general environmental duty (**GED**). The Environmental Protection Agency Victoria (**EPA Vic**) have provided the “Urban Stormwater Management Guidance”, publication 1739.1, June 2021” (the **EPA Guidance**) which is a guide “*for developers who create new impervious surfaces, such as roads, subdivisions and other developments*” in how to achieve the GED as far as reasonably practicable.

The additional mean annual impervious runoff volume reduction targets from the EPA Guidance are not referred to (or met) within the PSP Drainage Strategy despite these targets being referenced within requirement R27 of the Draft PSP.

Diversion Pipe – Draft PSP Plan 11 Asset E

The PSP Drainage Strategy refers to this pipe as the “northwest catchment diversion” and sizes the pipe(s) to convey the 5% AEP with climate change flow estimate as 2No x 1650 mm dia pipes at 1V:333H.

The Incitus Memorandum sizes the pipe(s) to convey the 1% AEP with climate change flow estimate as either as 2No x 1650 mm dia pipes at 1V:215H or 2No x 1800 mm dia pipes at 1V:300H.

Table 1 below details the advantages and disadvantages of each of the diversion pipe proposals.

Based on Table 1, I conclude that both proposals have advantages and disadvantages and believe further work should be undertaken prior to either proposal for the pipe being adopted. This work should include (but is not limited to):

- Confirmation that the apparent alignment does or does not intersect with vegetation;
- Analysis of the constructability of the pipe through the ridge; and
- Determination of a suitable mechanism to deliver the works outside of the PSP.

Table 1 Advantages and Disadvantages to the various diversion pipe proposals

Proposal	Advantages	Disadvantages
PSP Drainage Strategy	<ul style="list-style-type: none"> - Smaller pipes are likely easier to construct within a 20-metre road reserve. 	<ul style="list-style-type: none"> - It can be difficult to ensure the entire design flow is captured within the pipe(s), however this can likely be managed within the future civil design. - Requires the 1% AEP gap flow to be 'split' with some 1% AEP flows to be conveyed east (see OF3 on Figure 10-6). - This overland flow, OF3, to be conveyed east needs the road to be cut through an approx. 4 to 5 metre high ridge (see Figure 10-2 of the PSP Drainage Strategy). - The earthworks required for the road to convey OF3 are not shown within the Draft PSP. - The park LP-02 (Draft PSP Plan 7) bisects the OF3 flow path which would likely make the OF3 hard to construct. - The OF3 flow path, and pipe proposals, intersects with many trees that Plan 8 of the Draft PSP recommends retaining. - The proposal involves works external to the PSP region. - Waterway H1 (Draft PSP Plan 11) is still required. - Potential timing and delivery issues for the pipe due to the various parcels involved.
Incitus Memorandum	<ul style="list-style-type: none"> - Removes the need for the OF3 road to convey flows east. - Removes the theoretical need for waterway H1 (Draft PSP Plan 11), however good practice would be for the PSP to specifically place a wide road west to east along the general alignment of the valley floor that H1 previously followed. 	<ul style="list-style-type: none"> - It can be difficult to ensure the entire design flow is captured within the pipe(s), however this can likely be managed within the future civil design. - The pipe proposals intersect with many trees that Plan 8 of Draft PSP recommends retaining. - The proposal involves works external to the PSP region. - Potential timing and delivery issues for the pipe due to the various parcels involved.

Waterways G and H – Draft PSP Plan 11 Asset H1

The Incitus Memorandum removes the need for Waterways G and H of the PSP Drainage Strategy given the Incitus Memorandum proposal for the 1%AEP plus climate change diversion pipe.

As I believe further work is required surrounding the diversion pipe I cannot comment on the suitability of the waterways as the pipe proposals directly impact the need for waterways G and H.

Notwithstanding, I make the following notes:

- Regardless of the pipe proposal adopted, provision will be needed within the PSP to convey extreme flows larger than the 1% AEP event down the existing valley floor within property 16.
 - Under the PSP Drainage Strategy, the waterway would provide this function.
 - Under the Incitus Memorandum, the PSP should be updated to specifically include a wide road along the existing valley floor.
- The PSP Drainage Strategy, Table 10-6 specifies the waterways as 55 metres wide, but the Draft PSP appears to show both waterways as 70 metres wide. This variation in widths should be investigated.

Outfalls into Waterways - Incitus Memorandum Asset SP3A

I agree with the Incitus Memorandum that primary treatment should be provided upstream of waterway connections. The Incitus Memorandum proposal for sediment basin SP3A appears reasonable and should be incorporated into the Draft PSP regardless of whether waterways G and H are retained.

WLRB2 (west) – Draft PSP Plan 11 Asset B

The PSP Drainage Strategy states *“WLRB2 west is required to meet target peak flow rates at Thompsons Road outfall WLRB2 west was introduced because adding storage within WLRB3 was having diminishing returns on peak flow retardation under climate change conditions”*.

The Incitus Memorandum removes the stormwater treatment wetland, and (it is assumed given the smaller reserve shape) reduces the retarding basin component of WLRB2 west. The Incitus Memorandum replaces WLRB2 west with a stand-alone sedimentation basin.

The result of this is the Incitus Memorandum proposes a significantly smaller reserve allocation of 3.0 ha compared to PSP Drainage Strategy’s 12.4 ha for the WLRB2 west asset.

I have not reviewed the modelling which supports either the PSP Drainage Strategy or the Incitus Memorandum, but assuming the modelling is sound, the Incitus Memorandum proposal appears preferable given the land saving.

WL2 (east) – Draft PSP Plan 11 Asset C

Similar to WLRB2 (west) the Incitus Memorandum removes the stormwater treatment wetland aspect of the asset compared to the PSP Drainage Strategy. This reduces the reserve allocation from 3.7 ha (PSP Drainage Strategy) to 0.54 ha (Incitus Memorandum).

My main concern with this asset, regardless of the proposal, is the fill that would be placed on PSP properties 12 and 13E to make the asset function as proposed (and ensure the PSP Drainage Strategy catchments can actually outfall to WL2 (east)) is excessive. The catchment fill plan of the PSP Drainage Strategy places up to 5 metres of fill on each of these properties (see Figure 1). This has the potential to cause implementation and integration issues with Thompsons Road, the transmission easement, and/or PSP properties 12, 13E and/or 14.

The Incitus Memorandum does not talk to the fill implications, but I would expect the Incitus Memorandum proposal for WL2 (east) to have less fill requirements compared to the PSP Drainage Strategy. Noting potentially large amounts of fill still may be required under the Incitus Memorandum.



Figure 1 Extract of the PSP Drainage Strategy Fill Plan showing up to 5-metres of fill

It is my opinion that the western catchment plan should be updated generally as per Figure 2 to send more catchment into the eastern catchment of the PSP (as currently would occur based on the topography).

In my opinion, this change would be in general accordance with the Principle 2 of the Melbourne Water Principles for Provision of Waterway and Drainage Services for Urban Growth that “*the best boundary for a scheme is the natural drainage topography of the sub-catchment itself*”.

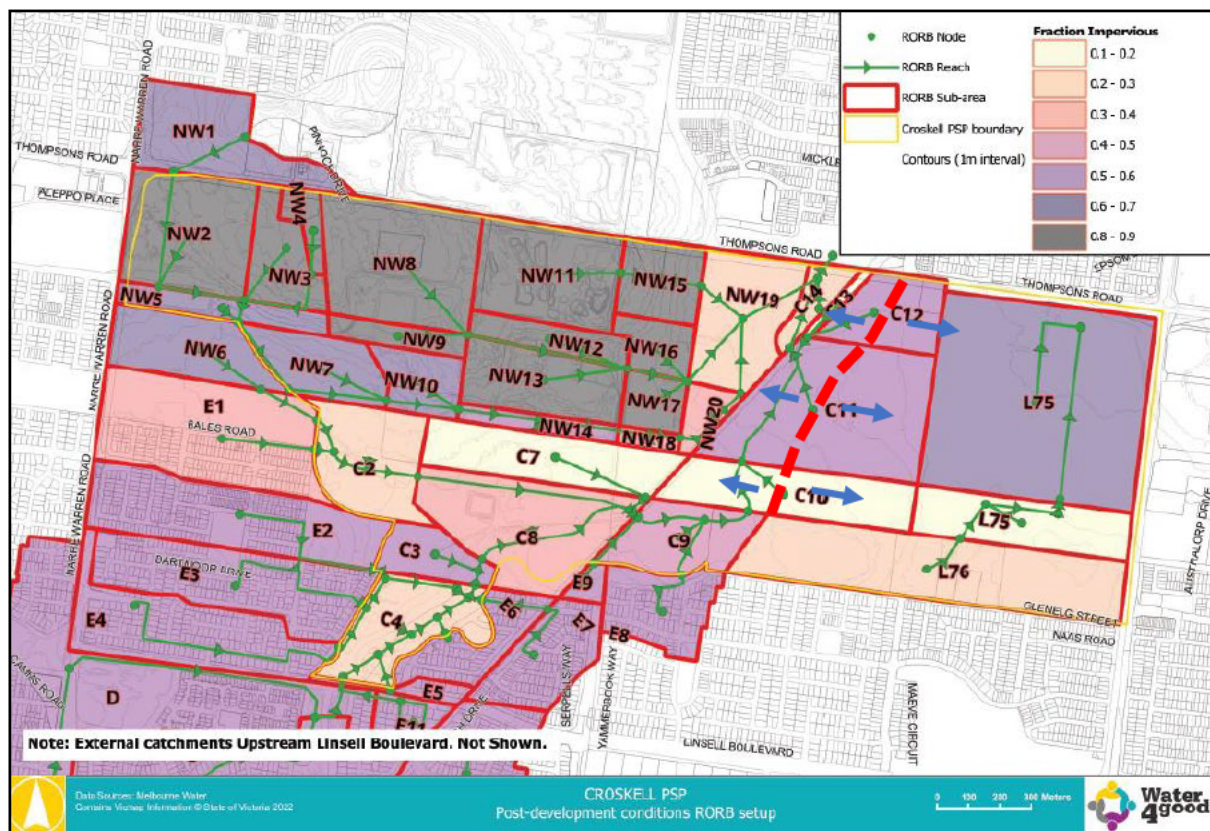


Figure 2 Extract of the PSP Design Report Figure 10-4 with my approximate annotation (red dashed) as to catchment which should be directed into the eastern catchment based on the natural topography (general flow direction are blue arrows).

WLRB3 – Draft PSP Plan 11 Asset K

The Draft PSP reserve allocation for WLRB3 includes an additional land allocation north of the embankment that is a “20% buffer for potential site conditions (i.e. shallow groundwater)” (see the note on the PSP Drainage Strategy Drawing 0111).

In my opinion, the Draft PSP should be clear that this additional approx. 2.1 ha of land within PSP property 16 may not be needed, and can be developed as residential land, if groundwater constraints are not found to impact the sizing of WLRB3.

General Wetland Sizing

Basic principles are that stormwater treatment wetlands are sized to treat a volume of runoff every storm event (summed over a year to obtain BPMEG compliance). This wetland treatment volume is comprised of the wetland macrophyte zone area, the extended detention depth (EDD) and the residence time.

The Melbourne Water Corporation, Wetland Design Manual allows for EDD of up to 350 mm (Criteria MZ2). Table 10-10 of the PSP Drainage Strategy shows that all wetlands proposed have an EDD of between 200 to 250 mm.

I would recommend that the PSP Drainage Strategy be revised to have all wetlands with an EDD of 350 mm. I would expect this to reduce the required macrophyte zone areas of each wetland by between 25% to 40%, which could result in large land savings across the PSP (provided the flood storage provisions can still be met).

Drainage Investigation Area 1

I agree with the Incitus Memorandum that Drainage Investigation Area 1 is likely not a suitable location for a retarding basin as the natural grades across the area vary between approximately 1V:30H to 1V:10H.

This is further supported by the options analysis within the PSP Drainage Strategy including an asset at Drainage Investigation Area 1 (SBRB1) within the non-preferable options 1, 2, 3, 3A, and 3C. Hence it appears the suitability of Drainage Investigation Area 1 to supplement the PSP Drainage Strategy has already been found to not be preferable.

Drainage Investigation Area 4

Based on the approximate natural surface grade of 1V:400H across Drainage Investigation Area 4, it is likely a suitable retarding basin and wetland location. This is likely why it was included within the non-preferable options 2, 3, and 3B (partially) of the PSP Drainage Strategy. But similar to Drainage Investigation Area 1, Drainage Investigation Area 4 was found not to be preferable in the options analysis undertaken.

Given this, I recommend that Drainage Investigation Areas 1 and 4 be removed from the Draft PSP. Alternatively, the Draft PSP should be made clearer regarding a scenario that if a drainage asset from the PSP Drainage Strategy is being moved into a Drainage Investigation Area, that the total development yield on each individual parcel within the PSP should not be reduced.

Summary

I have undertaken a high-level review of the PSP Drainage Strategy and the Incitus Memorandum and conclude:

Common to both the PSP Drainage Strategy and the Incitus Memorandum:

- There is further work required surrounding the diversion pipe before a preferable alignment and size can be found. The sizing of the diversion pipe may negate the need for Draft PSP Plan 11 Asset H1 provided suitable extreme flow provisions are still made; and
- The designs of WL2 (east) require excessive fill that will likely have practical implementation issues at property boundaries, given this, the PSP catchment boundaries should be revised to follow the natural topography;

PSP Drainage Strategy Specific Comments:

- The design objectives applied within the PSP Drainage Strategy likely do not reflect the requirements of the Scheme;
- The design objectives applied within the PSP Drainage Strategy likely do not reflect the requirements of the Draft PSP, specifically R27 and R29;
- The Draft PSP should be clearer around the excess additional reserve allocation provided within WLRB3, and what should happen to this land allocation if it is ultimately not required;
- That the PSP Drainage Strategy be revised to have all wetlands with an EDD of 350 mm, provided the flood storage provisions can still be achieved;
- Drainage Investigation Area 1 would likely be a difficult site to place any stormwater asset; and
- Drainage Investigation Area 4 is likely a reasonable site for a stormwater asset. However, the options analysis within the PSP Drainage Strategy has already shown that it is not required for drainage purposes. Thus, Drainage Investigation Areas 1 and 4 should be removed from the Draft PSP, and/or the Draft PSP be made clearer as to what is to occur (to the land budget) if an asset is moved into a Drainage Investigation Area.

Incitus Memorandum Specific Comments:

- The Incitus Memorandum proposal for SP3A should be adopted within the Draft PSP; and
- Noting that I have not reviewed the supporting modelling, the Incitus Memorandum appears to provide a saving in land-allocations for WLRB2 (west) and WL2 (east) which would be beneficial to the PSP.

Regards,



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