Expert Witness Report

75 Langley Park Drive, Donnybrook

Planning Scheme Amendment C241
(Shenstone Park Precinct Structure Plan)

1 November 2020

Report by: **Stormy Water Solutions**

www.stormywater.com.au/

Document Verification

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Document History

Issued To	Date	Version	Author	Reviewer
Terrain Consulting	1/11/2020	1.	V. Mag	Terrain Consulting

Accreditation

Valerie Mag

- Bachelor of Engineering (Honours) 1989
- Master of Engineering Science 1993
- Registered as a Professional Engineer (Civil and Environmental Engineering), National Engineering Register (Engineers Australia).

Climate Change Statement

Unless otherwise stated, the information in this report does not take into consideration the current understanding of climate change and its consequences on our current engineering practices. This may lead to a under (or over) estimation of hydrological calculations and as such may result in under (or over) design of aspects of this design compared to a design in which climate change is considered.

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Contents

1 Preliminaries

Report Author

Valerie Mag

Principal

Stormy Water Solutions

PO Box 3313

Wheelers Hill 3150

Qualifications

Bachelor of Engineering (Honours), Monash University, 1989

Master of Engineering Science, Monash University, 1993

Affiliations

Registered as a Professional Engineer (Civil and Environmental Engineering), National Engineering Register (Engineers Australia).

Member of Stormwater Victoria.

Area of Expertise

- Hydrology, Hydraulic and Water Sensitive Urban Design
- Preparation of drainage strategies and Melbourne Water Drainage Schemes
- Stormwater Industry Trainer
- Expert witness for drainage and flood related issues at planning panels and VCAT hearings.

Statement of Expertise

With my qualifications and experience, I believe that I am well qualified to provide an expert opinion on drainage, water sensitive urban design and flood matters for Planning Scheme Amendment C241.

Instructions

As per an email dated 19/9/2020 from Terrain Consulting my instructions were as per below.

Whilst Michael Prior of the VPA advised the VPA will be working with MW to relocate the Merri Creek tributary closer to its natural water course, further east within our clients property (at the base of the slope), he suggested we engage a drainage consultant to draw up the conceptual alignment of the tributary further east to that proposed by the VPA and MW to minimise its impact on our client's property.

We understand this would entail a 45m wide drainage channel with a road. Our client prefers this to be located as far east as possible, preferably on the quarry land.

As mentioned, we are required to confirm any expert witnesses we intend to call at the Panel Hearing by 4pm next Wednesday 23 September.

Whilst we hope the creek alignment will be resolved to everyone' s satisfaction prior to the hearing, thus avoiding the need to call any witnesses, we prefer to keep the option of calling an expert witness open.

Accordingly, can you please confirm:

- *Your availability to present evidence at the panel hearing at our allocated time of **1.45 – 4.30 pm Tuesday 8 December 2020** (should this be required**) .***
- *Any initial high order advice – particularly with relation to what would be a reasonable location for the drainage channel having regard to our client's preference,*
- *Your fees for pre - panel hearing discussions and design work , and fees to prepare and present evidence before the Planning Panel if required.*
- *Your availability for a zoom meeting with VPA, MW , ourselves and our client in the next couple of weeks*

Since my instructions, I have undertaken the tasks identified in the second and forth dot point above.

This expert witness report documents the outcomes of these tasks to 31 October 2020, given it is the desire of my client to negotiate an agreed outcome with Melbourne Water prior to the panel hearing.

2 Scope of Report

This report documents my high order advice in regard to what would be a reasonable location for the drainage channel/waterway having regard to my client's preference to relocate the Melbourne Water waterway to the eastern boundary of 75 Langley Park Drive.

This report relies on:

- Two meetings with Melbourne Water Corporation (**MWC**), the Victorian Planning Authority (**VPA**), Terrain Consulting, Stormy Water Solutions (**SWS**) and the owners of 75 Langley Park Drive on:
    - 2 October 2020 and
    - 26 October 2020,
- Preliminary drainage analysis of the Future Urban Structure Plan (**FUSP**) as available in early October 2020 as per the SWS memo (by me) to MWC dated 13 October 2020 and reproduced in Appendix A;
- My advice to MWC given the updated FUSP (as advised by letter from the VPA to the panel on 12 October 2020). This advice is as per a SWS email from myself to MWC dated 18 October 2020 and reproduced as Appendix B.

Primarily I relied on following in regard to my evidence:

- The MWC August 2018 MWC Lockerbie East Drainage Scheme (**DS**) plan
- Meetings with MWC and the VPA as above,
- The FUSP available in early October 2020, and
- The updated FUSP available on 12 October 2020.

This report is also based on:

- Review of any additional publicly available information, including:
    - LiDAR and Vic Map information;
- High level analysis of probable 1% Annual Exceedance Probability (**AEP**) flood flows expected though the subject site (given the contributing DS catchment area); and
- Mannings Formula calculations in relation of probable waterway area and depth requirements.

3 Summary of Findings

In my opinion it is feasible to relocate and realign the waterway proposed in 75 Langley Park Drive to be located along the eastern boundary of the site as per Figure 5 (appendix A) and the figure in Appendix B.

The plan in Appendix B was discussed with MWC in the meeting on 26 October 2020.

MWC raised two main issues at this recent meeting being that that:

- YVW had not been consulted regarding the changes waterway proposed on their land located immediately south of 75 Langley Park Drive, and that
- There was one extra “bend” in the proposed waterway due to the suggested changes by the owners of 75 Langley Park Drive.

Currently is my understanding that the VPA is consulting with YVW regarding the change suggested.

In addition, it is my opinion that (possibly) any slight increase in waterway cost (due to (say) some rock requirements at the additional bend) could be covered by usual contingencies allowed for by MWC in their Drainage Scheme proposals.

It is my conclusion, given the high level analysis and discussions in Appendix A and B, that it is possible to realign the waterway to the eastern boundary of 75 Langley Park Drive.

In addition, I was of the understanding that this outcome is close becoming a mutually beneficial agreement between MWC and the owners of 75 Langley Park Drive as of the date of this report.

Once agreement to waterway realignment is obtained, the usual functional and detailed design processes of a constructed waterway will be required to be followed. This may slightly change the width and form of the reserve. However, the general alignments detailed in Appendix A and B should not be required to be changed significantly.

4 Exclusions

My expert opinion only relates to the drainage implications of Amendment C241 on 75 Langley Park Drive.

The SWS assessments detailed in Appendix A and B are relatively high level at this stage. This is because, in the meeting of the 2 October 2020, Melbourne Water indicated that detailed design, hydrological modelling and hydraulic analysis were not required at this time. Rather enough information should be submitted to allow a reasonable determination that relocation of the waterway is practicable and beneficial (or at least not detrimental) to the Shenstone Park Precinct Structure Plan, the MWC Drainage Scheme and adjacent landowners at this time.

5 Declaration

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.

Valerie Mag
B.E. (Hons), MEngSci,
1 November 2020

Appendix A – Memorandum from SWS to MWC – 13/10/2020

Memorandum

ABN: 95 656 703 998

13 October 2020

To: **Digby Richardson**
Melbourne Water Corporation

From: **Valerie Mag**
Principal
Stormy Water Solutions

Re: Shenstone Park Precinct Structure Plan
75 Langley Park Drive, Donnybrook

Stormy Water Solutions (**SWS**) has been engaged by the owners of 75 Langley Park Drive, Donnybrook (the **Subject Site**) to provide high level drainage design advice in relation to Victorian Planning Authority (**VPA**) and Melbourne Water Corporation (**MWC**) requirements for the site.

The subject site is affected by the Shenstone Park Precinct Structure Plan (**SPPSP**). The SPPSP is to be introduced via Amendment. C241 to the Whittlesea Planning Scheme. This is due to be considered by a Planning Panel at a hearing commencing 16th November 2020.

As shown in Figure 1, at this time the proposed revised Future Urban Structure distributed for discussion purposes by the VPA on 27 August 2020 shows a MWC drainage channel is proposed along the northern and western property boundaries. This is to discharge into an (assumed) wetland/retarding basin within the downstream 95 Langley Park Drive.

The owners of 75 Langley Park Drive understand that a drainage channel is required on their property. However, they have requested advice as to whether relocating the channel from the western to the eastern boundary of the subject site would result in an outcome which can meet all drainage authority requirements for the site and surrounding area.

It is noted that two wetland/retarding basin systems previously denoted on the MWC Drainage Scheme (**DS**) plan (August 2018) have been negotiated to be moved south into 95 Langley Park Drive. 95 Langley Park Drive is currently owned by Yarra Valley Water (**YVW**). It is also understood that MWC are investigating possible alternative sites for this wetland/retarding basin.

It should be noted that the SWS assessment is relatively high level at this stage. Melbourne Water have indicated (as per a meeting with the landowners and the VPA on 2 October 2020), that detailed design, hydrological modelling and hydraulic analysis were not required at this time. Rather enough information should be submitted to allow a reasonable determination that relocation of the waterway is practicable and beneficial (or at least not detrimental) to the SPPSP, the MWC DS and adjacent landowners.

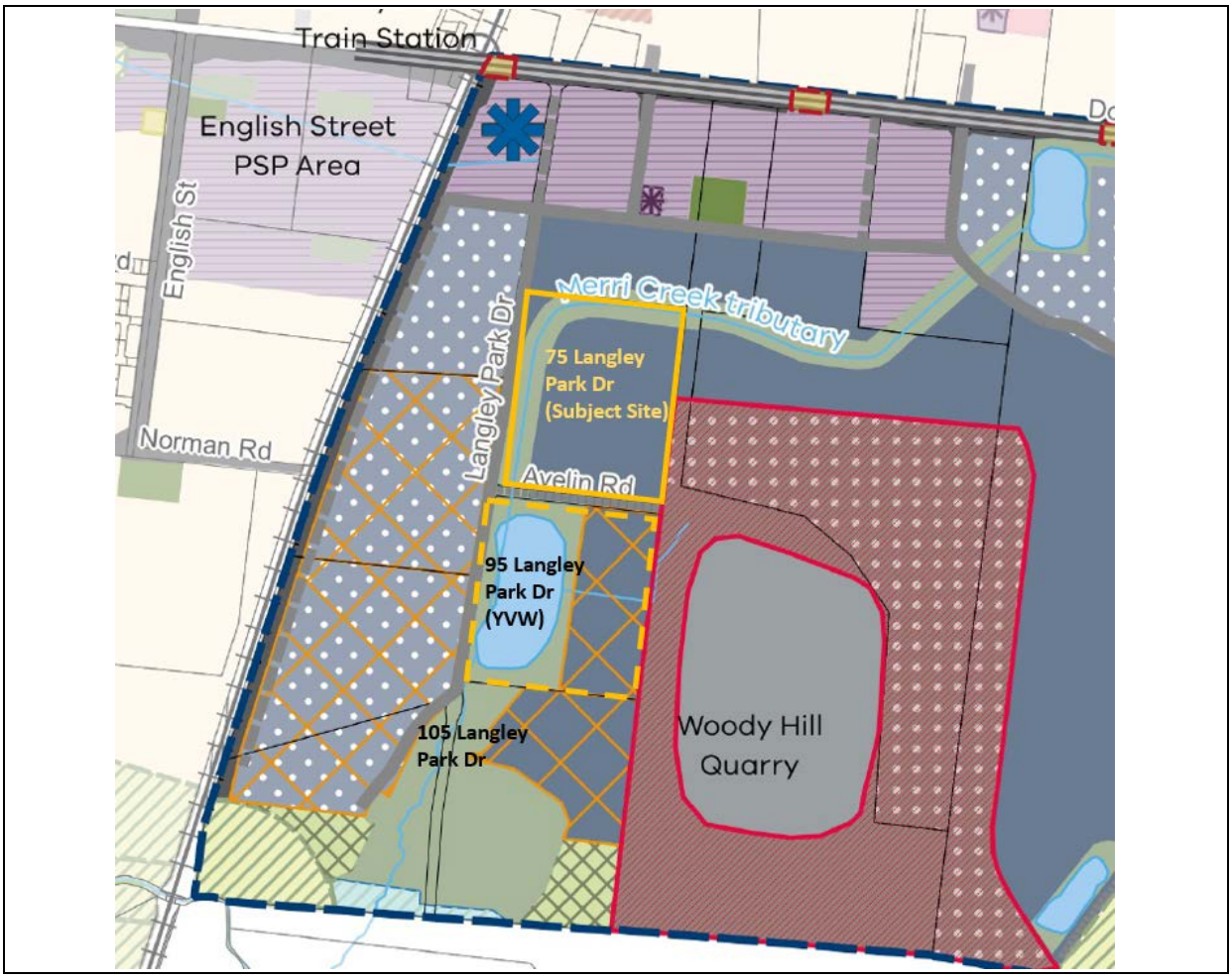


Figure 1 **Extract of Plan 3 Shenstone Park Precinct Structure Plan - Future Urban Structure Plan dated 27/8/2020 and noted as "for discussion".**

1. Current Structure Plan Land Take Estimates

Figure 2 below replicates a "trace" of the drainage reserve requirements in Figure 1 through 75 and 95 Langley Park Drive.

Figure 2 Approximate Existing SPPSP Drainage Reserve Land Take

As detailed:

- A 3.1 ha (60 metre wide) drainage reserve is currently specified as required for the channel in 75 Langley Park Drive; and
- A 6.7 ha drainage reserve is currently specified as required for the wetland/retarding basin in 95 Langley Park Drive.

It is not known if these shapes/areas were developed given detailed flow and water quality calculations.

However, in my opinion:

- The specified channel width of 60 m is generally what would be required for a catchment of the size (specified in Figure 3 below); and
- The wetland/retarding basin size allocated (as 2.7% of the catchment area) appears reasonable (based my general expectations on asset sizes given the catchments and flows expected (see below).

Of course, site analysis and design development would be required to accurately size these elements. This future design development should consider level constraints as detailed below.

2. Catchment Areas and Approximate Flow rates

Figure 3 below details the approximate catchment area discharging to the southern boundary of the subject site (247 ha). The MWC DS allows for an additional 36 ha catchment to discharge into the subject site midway along the eastern boundary.

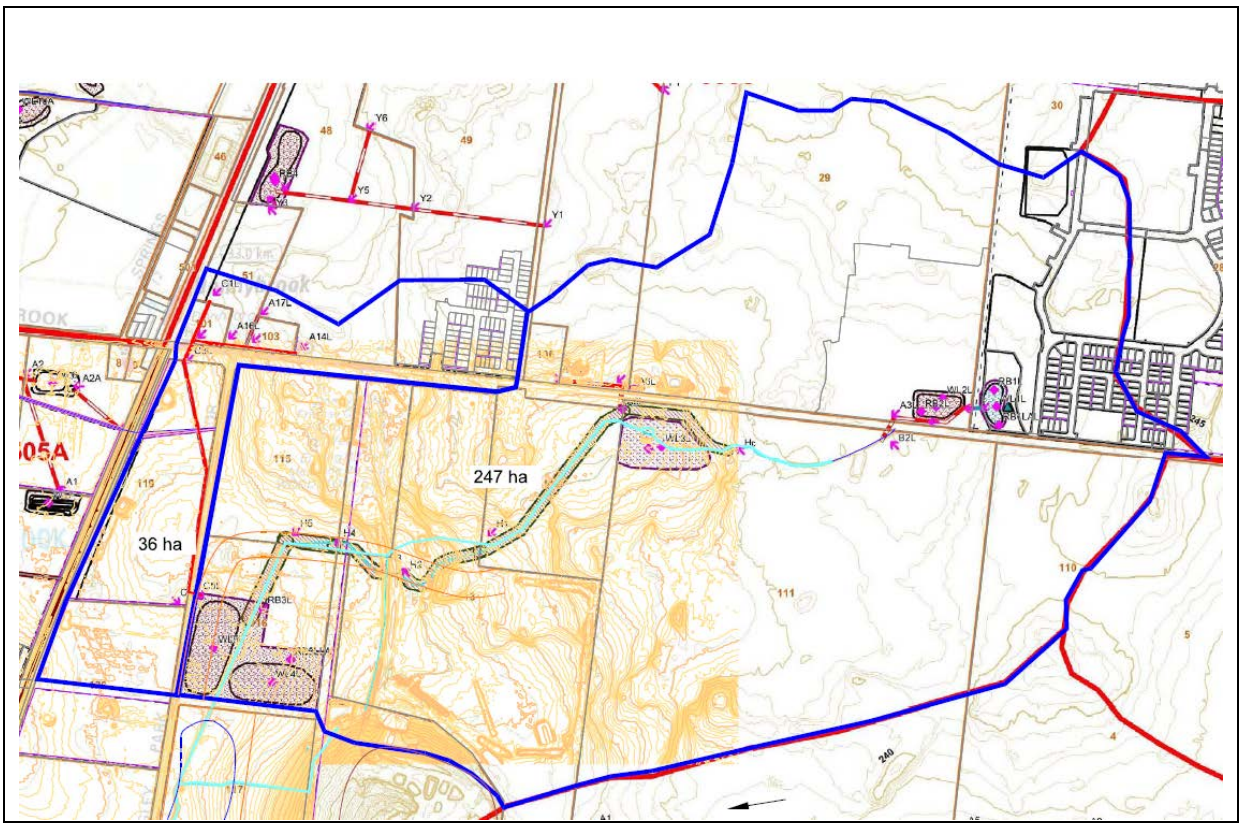


Figure 3 **Approximate Catchment areas**
Base extracted from the August 2018 MWC Lockerbie East DS plan

It is understood that MWC have working hydrologic and stormwater pollutant models for the DS. However, these have not been provided to SWS to undertake this high level analysis.

Given the above, the "rule of thumb" flow estimates have been made as per below.

- A 1% Annual Exceedance Probability (**AEP**) flow of 20 - 22 m^3/s (approximately) is assumed at this stage. This is based on the "Urban" flow regression curve developed by Nikolaou/von't Steen (P11, Melbourne Water Corporation Flood Mapping Projects Guidelines and Technical Specifications Version 9: Final, November 2018) being $Q_{1\% AEP} = 10.29 \times A^{0.71}$, where A is the catchment area in km^2; and
- The 4 events per year (**EY**) flow of 1.5 m^3/s (approximately) is assumed. This is based on commonly utilised rule of thumb relationships where:
    - The 20% AEP flow is about 1/3 of the 1% AEP flow; and
    - The 4 EY flow is about 20 % of the 20% AEP flow.

Although relatively rough, the above should be able to give a reasonable indication of applicable channel sizes and reserve widths required.

3. Outfall Constraints and Drainage System Slope Issues

Often in drainage system design, land and site constraints play a large part in the ultimate design levels and reserve extents. Of particular importance are outfall constraints. If the outfall invert level is high, then this affects the design drainage levels (often) for some distance upstream.

Examination of November 2017 LiDAR information (and google map site observations) shows a drainage outfall at the south east corner of 95 Langley Park Drive that is very shallow and exhibits the form of a minor drain (0.5 m deep of less).

MWC have also indicated that the tributary of Merri Creek becomes “high value” in terms of creek form and environmental attributes at the south east corner of 95 Langley Park Drive. As such, it is assumed that NO downstream cleanout works can occur south of 95 Langley Park Drive to facilitate a deep outfall for the upstream drainage system.

The “usual” minimum design slope of a working drainage system is in the order of 1 (vertical (**V**)) /300 (horizontal (**H**)) to 1V in 400H. Drainage channels are usually required to be at least 2 metres deep to facilitate pipe outfalls from the surrounding subdivisions.

If a channel is assumed to be 2 m deep at the north east corner of 75 Langley Park Drive, and that this channel is required to grade to the existing invert at the south west corner of 95 Langley Park Drive, the overall drainage system slope would be in the order of 1/850. In addition, the slight slope would also result in a very shallow trunk drainage system in its southern portion which could lead to subdivision pipe outfall issues.

Given this, designing a drainage system of slight slope from the north east corner of 75 Langley Park Drive to the South West corner of 95 Langley Park Drive is not a workable solution. This effectively results in the following design options **not** being feasible in this location:

- A channel of slight grade along the entire alignment of the SPPSP alignment though 75 and 95 Langley Park Drive; and or
- Designing a channel in 75 Langley Park Drive and an offline wetland with a bypass channel in 95 Langley Park Drive.

In my opinion the general arrangement detailed in Figure 1 is only feasible if the wetland in 95 Langley Park Drive in an online wetland system. If this is the case, a constant normal water level in the wetland can result in a relatively deep invert level at the upstream end of the wetland. This then can optimise the system slopes and depths in the proposed upstream channel system.

4. Wetland / Retarding Basin Configuration and Functions

Given the discussion above, the SPPSP proposals details in Figure 1 should be developed as:

- A constructed waterway channel, leading to;
- An online sediment basin; and
- An online stormwater treatment and habitat wetland system.

The sediment basin and wetland will be required located in the base of a retarding basin. This is the obvious location to place the flood retardation/wetland function. A wetland is required in 95 Langley Park Drive anyway to ensure that the upstream DS area can actually achieve an outfall (without downstream cleanout works.

Placing a wetland in a retarding basin is commonplace in current drainage design as it results in an asset which achieves the two major DS objectives being stormwater pollutant retention and flood retardation.

Online system wetland/retarding basin system of this type are commonly utilised within MWC drainage schemes. They have been shown to be self-sustaining, robust assets. Systems such as this can meet multiple objectives including:

- Retarding storm events (up to the 1% Annual Exceedance Probability (**AEP**)) event to control flood affects downstream;
- Retarding the 1.5 Year Average Recurrence Interval event to minimise erosion and ecological impacts downstream (which is important here due to the downstream Growling Grass Frog habitats);
- To treat the DS catchment to current best practice;
- Provide maintainable (to current Melbourne Water Wetland Manual Requirements) and self-sustainable WSUD elements;
- To potentially be designed to supplement ecological habitat objectives (including Growling Grass Frog considerations); and to
- Provide a major/drainage WSUD element which will fit into the SPPSP proposals and significantly add to the landscape appeal of the ultimate reserve.

5. Preferred Drainage Design/Optimisation

Figures 4 and 5 below details the preferred design configuration of the owners of 75 Langley Park Drive.

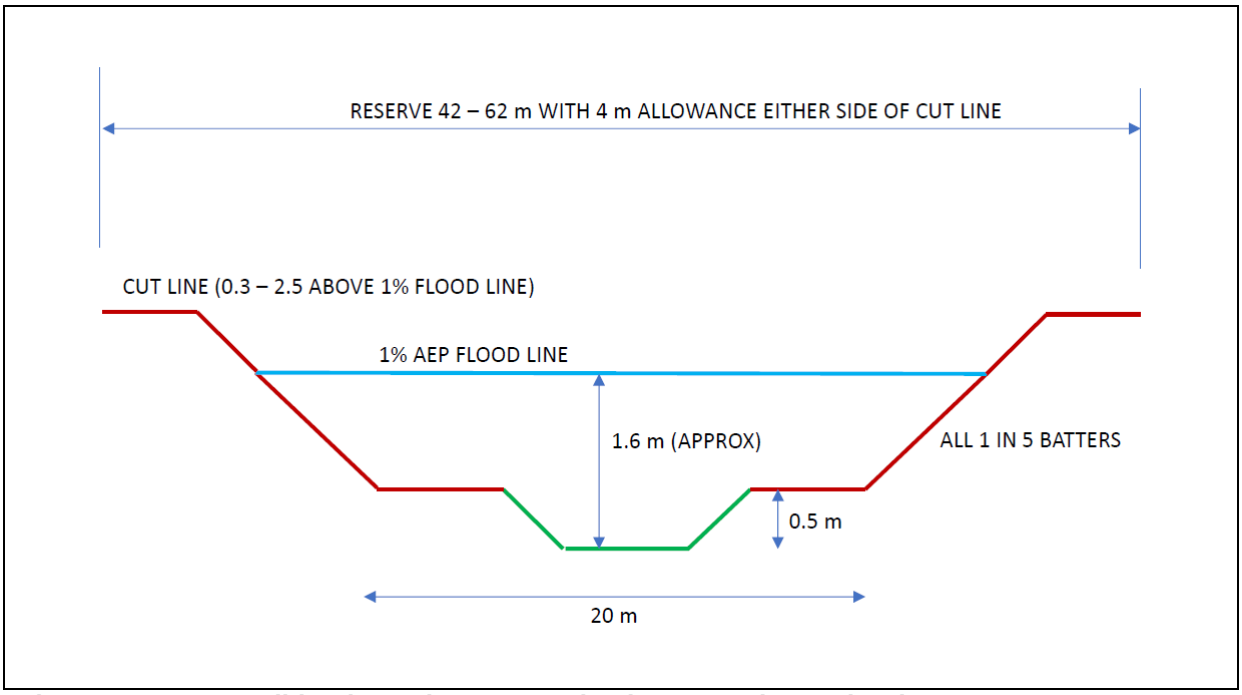


Figure 4 **Possible Channel Cross Section in 75 Langley Park Drive**
Vegetated channel
n (pilot channel) = 0.06 (As per MWC Waterways Design Manual)
n (main channel) = 0.05 (As per MWC waterways Design Manual)

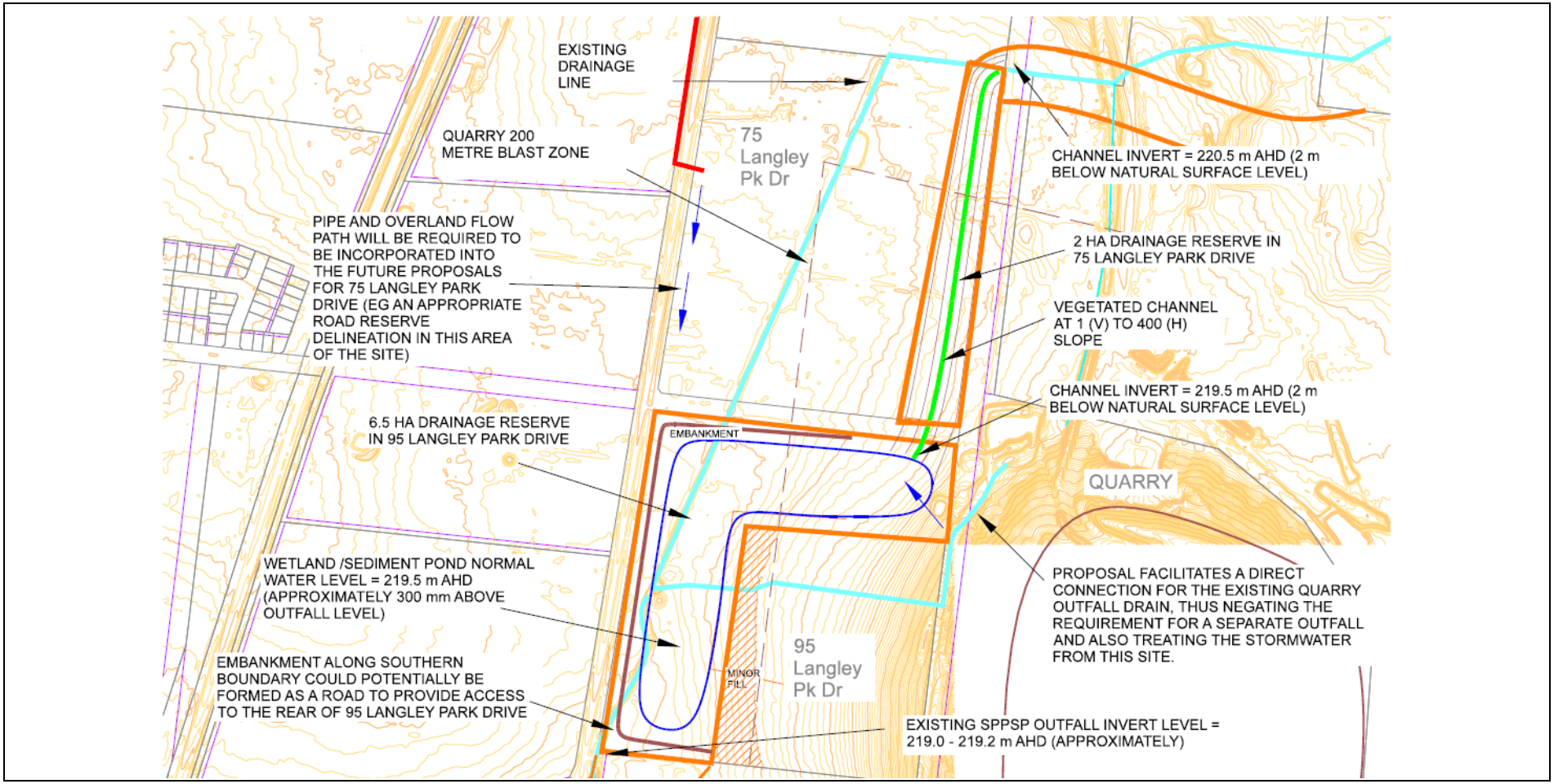


Figure 5 **Preferred Drainage System Design Configuration (as advocated by the owners of 75 Langley Park Drive)**

Consideration of the lidar information to actually "designing to site" and high-level calculations by SWS have determined that:

- The proposal can physically fit both horizontally and vertically into the reserves proposed in Figure 5;
- Requires **NO** cleanout works in the drain located downstream of 95 Langley Park Drive thus protecting the "high value" assessment of this watercourse;
- Allocates the same wetland area (and it is assumed) flood storage provisions of the SPPSP plan detailed in Figure 1 (2 m of flood storage above normal water level in the wetland is assumed at this time, but this is required to be proven);
- Can contain the 1% AEP flow within the cut lines of the proposed channel (in fact the channel width is actually wider as the width is set by the cut to obtain the invert rather than containing the 1% AEP flow with freeboard);
- Allows for 4 metres either side of the cut line in the channel reserve to facilitate shared paths/maintenance paths (if required);
- Can result in a wetland where the usual 1% AEP and 4EY flow velocities over the online wetland system can be met (the 4EY velocity usually sets the width of the wetland and the estimate above has been used to determine a reasonable wetland width at this time);
- Allows for 1V in 5H batters on all embankments and cut lines;
- Allows for a 4-metre crest on the retarding basin embankment (although this could be increased slightly along the southern embankment to incorporate a road as the embankment); and
- Allows for the usual 15 metre offset from water extents in the wetland to the site property boundaries.

It is noted that MWC have indicated that they do not prefer right angles in channels. However, there is already a right angle in the current SPPSP proposals for the channel in 75 Langley Park Drive. It is anticipated within the reserves allocated, the angles at required direction changes can be minimised.

Given the above, as much as possible SWS has tried to show that, in designing to site (even at this very early stage) the proposal in Figures 4 and 5 is feasible.

It should be noted that online wetland and sediment basins within retarding basins are proven technologies. Preliminary site analysis indicated that the "usual" flood flow velocity requirements for online systems (as per the MWC Wetland Design Manual) can be easily met as the width of the systems are generous. As per the requirements of the MWC Wetland Design Manual, design development going forward will ensure that the ultimate sediment pond/wetland system can be taken offline for maintenance via construction of maintenance bypass pipes.

In addition, it is my opinion that given this reserve allocation detailed, all the "usual" MWC design requirements (as per the retarding basin, wetland and waterway design manuals) can be met going forward. Meeting the relevant manual condition could be a requirement of Melbourne Water Going forward (whatever drainage design configuration is ultimately adopted in the SPPSP).

6. Benefits of the Proposal

In designing to site, this proposal:

- Provides a 2-metre outfall to all developable areas upstream of the PSP outfall at the south East corner of 75 Langley Park Drive;
- Potentially results in a major culvert system not being required to cross Avelin Road;
- Reduces the land take required for a drainage channel in 75 Langley Park Drive;
- Reduces the land take required for a drainage channel in the property directly to the north of 75 Langley Park Drive being 840 Donnybrook Road;
- At worst, results in no addition land take for the drainage channel in all properties upstream of 75 Langley Park Drive;
- Results in no addition land take for the wetland/retarding basin required in 95 Langley Park Drive;
- Increases the developable area in the DS thus potentially reduces the ultimate MWC DDs rate;
- Decreases the length of channel required, thus potentially providing additional cost savings to the MWC DS;
- Concentrates more drainage assets in the 200-metre blast zone of the Woody Hill quarry, thus optimising SPPSP developable land; and
- Allows development along the frontage of 75 Langley Park Drive, thus optimising development potential of the site which fits in with the VPP objective of providing industrial land within walking distance of the Donnybrook Railway station.

Once agreement on the reserve widths and alignment can be confirmed, it is anticipated that master planning of the site can commence.

In line with best practice, boulevard roads adjacent to drainage reserve etc are envisaged.

In addition, a site stormwater management strategy will ultimately be developed to meet all MWC guidelines and manual requirements.

7. Proposed Solutions Going Forward

The owners of 75 Langley Park Drive see the proposal detailed in Figures 4 and 5 as a "win/"win" situation for all authorities and interested parties.

In line with the VPP preference to negotiate the drainage outcome for the subject site, SWS respectively, on behalf of the landowners, request that Melbourne Water agree a change in wetland/channel configuration and location in 75 and 95 Langley Park Drive to be as per Figure 5 of this memo.

It is noted that in the meeting of 2 October 2020, MWC specially advised that detailed drainage calculations and analysis were not required. MWC indicated that the site analysis as detailed above would be enough at this time for them to respond to the proposals within this memo.

If MWC require any changes to the configuration, the owners of the subject site would prefer slight increases in the reserve width allocation (to accommodate future meandering, landscape proposals (etc, if required), rather than moving the reserve away from the eastern boundary of the site. As advised in the meeting of the 1 October 2020, the owners of the subject site are not in a position at the moment to undertake detailed options analysis or costings for MWC.

On behalf of our team I think you for your time and consideration in this matter. Please email or phone me if you have any additional queries.

Regards,

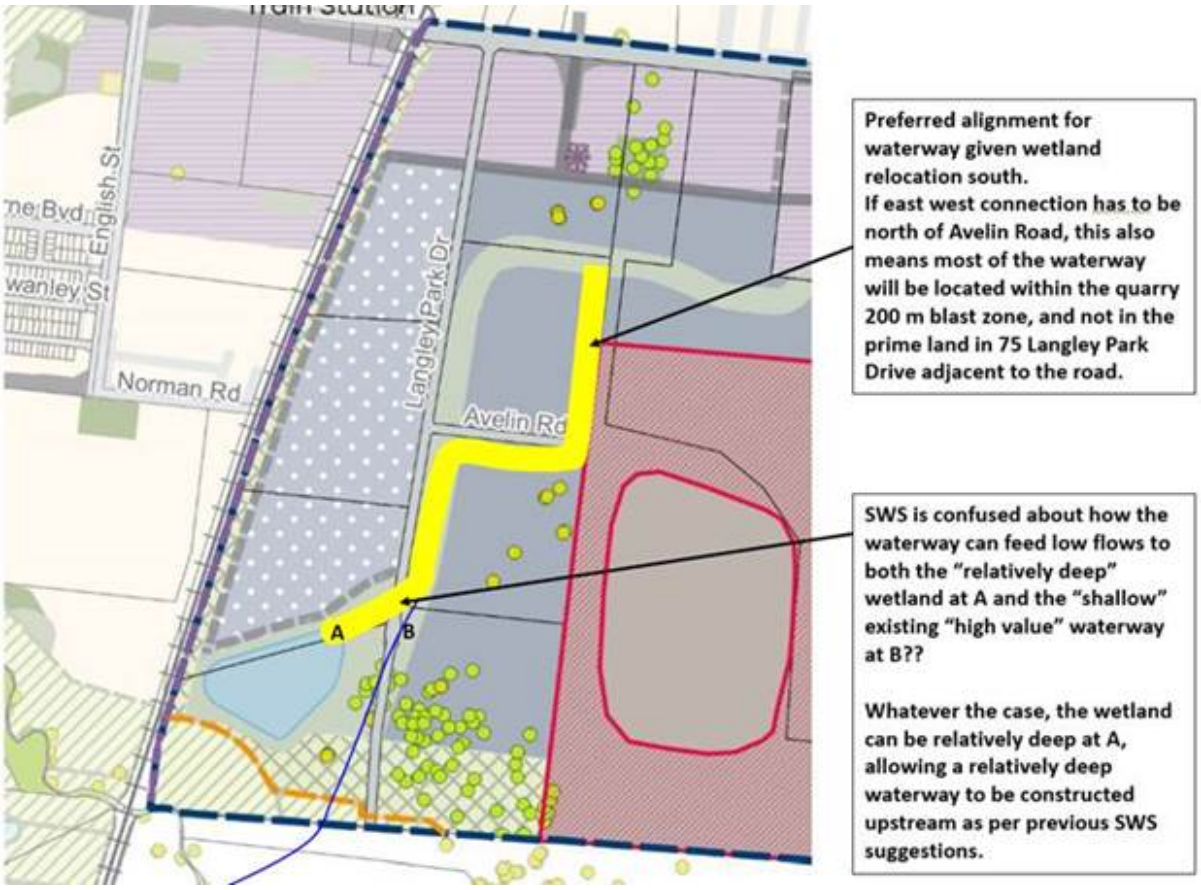
Valerie Mag
Stormy Water Solutions
val.mag@stromywater.com.au
0412 436 021

Appendix B – Email from SWS to MWC – 18/10/2020

From: val.mag@stormywater.com.au
Sent: Sunday, 18 October 2020 2:52 PM
To: Digby.Richardson@melbournewater.com.au; Laurence.Newcome@melbournewater.com.au
Cc: Michael.Prior@vpa.vic.gov.au; conniep008@gmail.com; rclconsult@bigpond.com; michael.mag@stormywater.com.au
Subject: 75 Langley Park Dr Donnybrook_ Val Mag's response to change in FUSP

Digby and Laurance

I refer to my memo dated 13 October 2020 and my phone conversation with Laurance on 16 October in which he advised that the Future Urban structure Plan (FUSP) proposals had changed.
I have reviewed my proposal as per my memo, and conclude that the waterway alignment can still be as per the waterway/wetland proposal I previously advocated. This is marked up on the FUSP plan below.



I note again that, in the meeting of 2 October 2020, MWC specially advised that detailed drainage calculations and analysis were not required. MWC indicated that the site analysis as detailed above would be enough at this time for them to respond to the proposals within this memo.

In review of the FUSP, I conclude that, if the upstream end of the wetland is within 1.5 – 2 m cut, a waterway upstream of this point can be constructed to an adequate depth to convey flows and provide adequate outfall for development pipes.

As noted in the drawing, the wetland location may compromise somewhat the low flow (at a high invert level) feed to the "high value" waterway at B. But this is a compromise for MWC to work out…

Again, in line with the VPP preference to **negotiate the drainage outcome** for the subject site, SWS respectively, on behalf of the landowners, request that Melbourne Water agree the a change in wetland/channel configuration and location in 75 and 95 Langley Park Drive to be as per Figure 5 of Stormy Water Solutions 13/10/20 memo.

What is of a concern to my client (and their team) is the constantly changing goal posts in relation to this area. In this case, not only the change to wetland location, but also the apparent increase in blast

zone impact on 75 Langley Park Drive from previous proposals. It is hoped that the constant changes do **NOT** undermine the VPA's preference for a negotiated outcome.

Regards

Val

Valerie Mag
Principal – Stormy Water Solutions
Mob: 0412 436 021
Website: www.stormywater.com.au