SUMMER HILLS FLOUR MILLS
2-32 Smith Street and 16-32 Edward Street
Summer Hill

STORMWATER MASTER PLAN

Prepared for:

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A	Draft Report	Liam Diamond				
B	Report	Liam Diamond	Phil Diversi			

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1 EXECUTIVE SUMMARY

The following stormwater master plan report aims to describe what civil engineering elements are required to facilitate the proposed re-development of the Summer Hills Flour Mills (SHFM) site.

The proposal we have developed in conjunction with E.G. Funds Management and Hassell for the SHFM site, we believe strikes a balance between applying best management engineering principals whilst providing a commercial outcome.

The stormwater master planning information contained herein is comprised of two main elements:

- Trunk drainage mater plan; and
- Site stormwater master plan

In essence, the trunk drainage stormwater system and modifications proposed for the northern section of the SHFM site will aim to:

- Improve flows within the canal and under Longport Street resulting in less inundation and improved flow characteristics within the site;
- Improve external overland over land flows from the Railway corridor travelling through the SHFM site prior to entering in to the canal, providing improved flow characteristics, which will enable the northern section of the site to be developed;
- Improve the minor drainage from Smith Street to comply with current best stormwater practise. This will also provide safety, yield and aesthetic benefits for the site; and
- Improved major surface flows from Smith Street such that overland flows up to 1 in 100 year ARI are safe, shallow and can be accommodated in the open space and public domain areas within the site.

The site stormwater master plan proposed for the whole of the SHFM site will aim to address:

- The provision of On-site Stormwater Detention (OSD) within the site to detain flows in accordance with Ashfield Council requirements; and
- Provide Water Sensitive Urban Design (WSUD) initiatives to improve the water quality of water leaving the site and reduce the consumption of water.

2 INTRODUCTION

2.1 General

Meinhardt Infrastructure and Environment (MI&E) was engaged by E.G. Funds Management to undertake a stormwater master plan for the site, which included a preliminary flood assessment on the existing Hawthorne Canal open channel owned by Sydney Water Corporation (SWC), which traverses the SHFM site.

The information contained herein is a supplementary report to the Summer Hills Flour Mills Flood Assessment Report (Revision B) issued on 29th July 2010.

2.2 Scope of the Report

The aim of this report is to provide a stormwater master plan for the site. In particular the master plan comprises two parts, viz:

- Trunk Drainage
- Site Stormwater

2.3 Background

Over the past two years Meinhardt Infrastructure & Environment have developed the stormwater master planning concept described within this report and the plans appended at Appendix 'A'.

During this process we have worked closely with, and benefited from the architectural, urban design and landscaping input provided from Hassell, under the guidance and direction from E.G. Funds Management.

Through our united approach, we have aimed to produce a quality master plan, which we believe strikes a balance between applying best management engineering principals whilst providing a commercial outcome that enhances the public's use of the site.

2.4 Consultation with Sydney Water Corporation (SWC)

During the final stages of preparation of the Hawthorne Canal flood assessment, E.G. Funds Management, Meinhardt and Hassell held a meeting with the Sydney Water Corporation (SWC) to discuss the trunk drainage improvements proposed within the master plan.

At the close of this meeting, SWC gave their in-principal support for the building of residential apartments between the canal rail corridor (northern apartment building), the bridging of the canal for access and the amplification of the Longport Street culvert.

The amplification of the Smith Street branch of the canal and the acceptable flood characteristics to be imposed within the site was not discussed in any detail, as SWC considered these items to be subject to Local Government approval.

SWC also suggested we co-ordinate and integrate our proposal with Transport NSW and Rail Corporation regarding how these authorities might deal with overland flows originating on the southern side of the rial corridor. Refer Sketch 27 at Appendix 'A' for the location of where the Hawthorne Canal becomes covered as it travels below the railway corridor (Node K from previous report).

3 SUMMER HILLS FLOUR MILLS SITE

3.1 The Proposed Development

The future development of the SHFM site is expected to comprise a mix of retail, commercial and residential uses including townhouses, apartments and adaptive reuse of existing buildings and some of the silos. Additional areas will also be provided for pedestrian linkages through the site, public open space and community facilities.

For full details of the development proposal, refer to the Summer Hill Flour Mill Precinct Master Plan – Rezoning Proposal produced by Hassell (July 2010).

4 TRUNK DRAINAGE MASTER PLAN

4.1 General

The aim of trunk drainage master plan is to address the likely trunk drainage improvements that are required to facilitate the proposed re-development of the SHFM site, these include:

- Reduce the main canal flood levels, flow velocities and flow-path widths to allow the northern section of the SHFM site to be developed;
- Upgrade and potential amplification of the existing culvert under the Longport Street overpass;
- Provision for the safe passage of Over Land Flows (OLF) from Smith Street and the rail corridor into the main branch of the canal;
- Upgrade of the existing Smith Street branch of the Hawthorne Canal to a 1 in 20 year ARI capacity in line with current Australian stormwater best practise;
- Provision of all weather access to the flat area of land on the eastern side of the main canal (adjacent to the rail corridor) should that portion of the site be selected for future development;
- Co-ordination with any future Greenway and light rail development within the adjacent rail corridor with particular attention paid to site access and pedestrian linkages, flood levels and the safe passage of OLF.
- Stabilisation of any exposed overbank areas within the site to protect against the erosive forces of water.
- Incorporation of fencing, covers and other appropriate barriers to prevent the public from entering (or being washed into) the canal;
- Management of potential debris within the canal that has the potential to block the canal and cause an increase in flood level.

4.2 Reduce Flood Affection within the SHFM Site

In order to allow the northern section of the site to be developed, the 1 in 100-year ARI flood level, flow velocity and flow path widths need to be reduced. This may involve the potential amplification of the existing culvert under the Longport Street Overpass.

Based on calculations undertaken in the previous MI&E Flood Assessment (July 2010), the existing 3.8m diameter culvert under the Longport Street overpass does not have sufficient capacity to cater for runoff generated by the upstream catchment.

As such, under existing conditions the water level must rise to generate the required head (or pressure) to drive these flows through the existing culvert. Consequently, under existing conditions, the northern section of the SHFM will flood during a 1 in 100 year ARI storm event, and extent of this flooding will limit the development potential in the northern corner of the site.

In order to reduce the flood level, and allow the land adjacent to the canal to be developed, the capacity of the Longport Street must be increased. Given the site's spatial constraints, we have assessed that pipe jacking is the most appropriate means

of providing this additional capacity. Essentially, this work involves tunnelling or pushing additional pipes under the Longport Street overpass.

Based on our feasibility assessment, providing an additional 2100mm diameter circular culvert under the Longport Street will be sufficient to reduce 1 in 100 year ARI flood levels to an acceptable level. Refer Summer Hills Floor Mills Site – Trunk Drainage Master Plan at Appendix 'A'.

The operation of pipe jacking also requires a jacking chamber in which the jacking rig can be accommodated at the base level of the pipe to be installed.

In case of the SHFM site, this jacking pit will involve a large excavation at the north eastern corner of the site adjacent to the canal, up to a depth of up to 5m depending on the results of further flood modelling and detailed design. This excavation will require shoring and de-watering provisions for during construction of the jacking chamber and during its operation as well as a by-pass facility for the canal during of the culvert amplification.

We note the amplification of the Longport Street culvert will need to consider and be co-ordinated with the existing connection of the Petersham Branch which joins the main canal beneath the Longport Street overpass.

4.3 Bank Stabilisation

Based on the HEC-RAS analysis undertaken in the previous MI&E Flood Assessment (July 2010), the calculations indicate flow velocities within the Hawthorne Canal of between 0.57 – 4.27m/s during the peak 1 in 100 year ARI storm.

These velocities coupled with the top water surface being above the concrete lined channel section, suggest that the existing earth batter slopes either side of the main channel could be subject to erosion and sediment transport downstream during large storm events.

Accordingly, these banks within the canal could be stabilised with rock, concrete or vegetation to ensure the stability of these batter slopes is maintained.

4.4 Smith Street Branch Pipe Amplification

Following calculations performed in the previous MI&E Flood Assessment (July 2010) and the SWC Capacity Assessment (May 1998), we have determined that the existing Smith Street branch of the Hawthorne Canal has capacity to convey between the 1 in 2 to 1 in 5-year ARI storm event.

According to the Major/ Minor concept adopted by Australia Rainfall and Runoff and our anticipation of Ashfield Council's requirements, the capacity of the Smith Street Branch of the Hawthorne Canal will need to be upgraded to a 1 in 20-year ARI capacity in accordance with current best stormwater practice.

Based on our feasibility calculations, approximately 60m of the existing Smith Street Branch (1.37m high x 1.3m wide oviform pipe line) upstream of the SHFM site will need to be upgraded or amplified to a 3000 x 1800 a Reinforced Concrete Box Culvert (RCBC)

This upgrade will also involve the construction of special inlet structure at the Smith Street low point (adjacent to the site) to increase the inlet capacity of the Smith Street drainage network up to a 1 in 20 year ARI capacity. Refer figures 4.3.1 and 4.3.2 overleaf for sketches indicating the master plan concept for the Smith Street inlet.

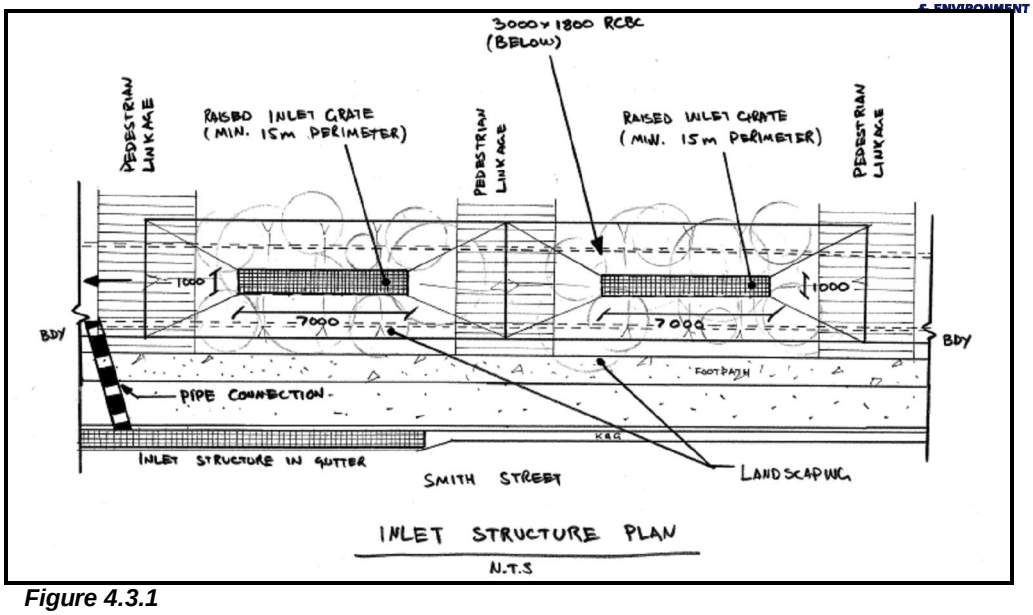


Figure 4.3.1

At this feasibility stage, the inlet structure concept will require a weir length of 15m at a flow depth of 0.45m, however to provide a factor of safety of 2.0 a weir length of 30m has been shown to allow for in the event of blockage.

Given the structures position between Smith Street and proposed public open space within the SHFM site, the inlet structure will need to facilitate the important pedestrian linkages required between these two spaces, as well as be aesthetically pleasing. As such, the inlet structure will need to be softened with landscaping.

The final configuration of the inlet structure will be subject to detailed design, coordination with the project architect, landscape architect and consultation with Council.

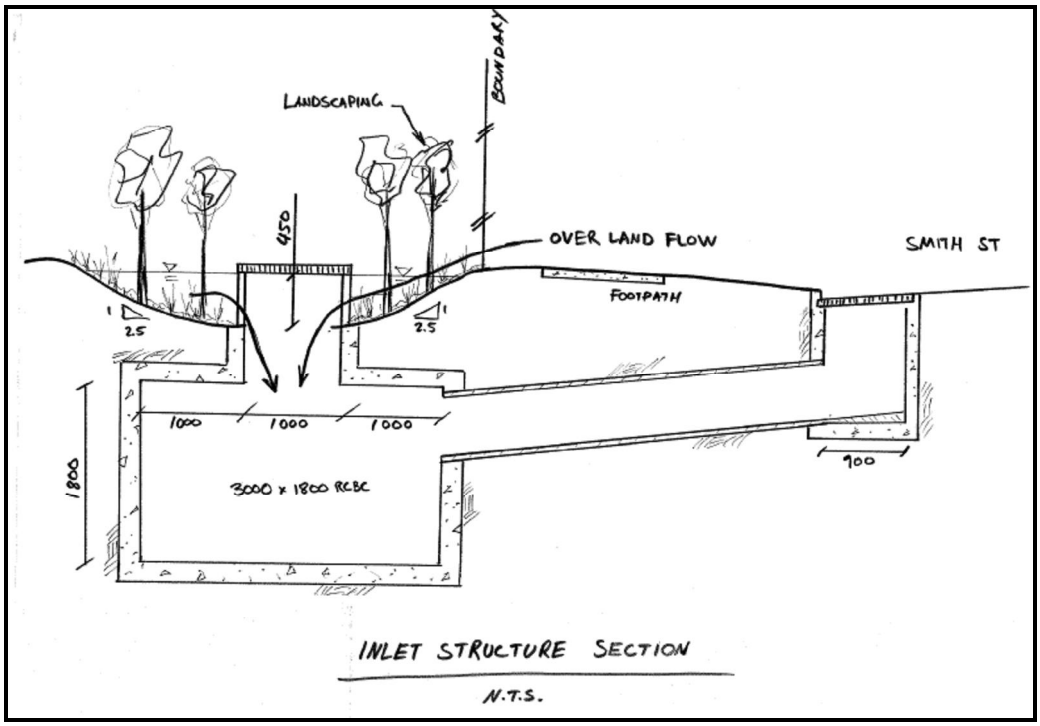


Figure 4.3.2

4.5 Safe Passage of Over Land Flows (OLF)

Aside for the trunk drainage infrastructure upgrades discussed in previous sections, one of the major considerations with respect to developing the northern section of the SHFM site, will be the safe passage of external overland flows entering the site travelling through the site to re-join the main branch of the Hawthorne Canal.

Following completion of the MI&E Flood Assessment (July 2010) we have determined two such external OLF from the Rail Corporation owned Railway Corridor and the Ashfield Council owned Smith Street.

4.5.1 Railway Corridor OLF

Based on calculations undertaken in the MI&E Flood Assessment (July 2010) we have determined approximately 27.8 m^3/s of OLF originating on the southern side of the rail corridor (where the Hawthorne Canal becomes covered as it travels below the railway corridor (Node K from previous report)), will enter the SHFM site across the sites southern boundary (adjacent the Railway Corridor).

Using the Manning's Formula and the available OLF width of 50m (with an assumed gradient and flow roughness of 1% and 0.035 respectively), this OLF will result in a flow depth of approximately 380mm and a Velocity x Depth (VD) of 0.56m^2/s.

From inspection of Figure G1 of the NSW Government Flood Plain Management Manual (Refer Appendix 'B' for an extract), a VD above 1.0m^2/s is listed as being of excessive Velocity or excessive Depth.

However, as the manual does not specifically address trunk drainage, we have interpreted a VD below 1.0m^2/s as being reasonable for the trunk drainage design of a dedicated channel, however particularly not suitable for OLF in areas accessible to the public.

Should Council wish this VD of flow across this southern boundary to be below 0.4m^2/s, based on the same parameters mentioned above, the railway corridor OLF would need to be reduced to approximately 20m^3/s and this would require the construction of an additional culvert (or amplification of the existing culvert) under the railway line near Mungo Scott building.

We note the current work being undertaken by Transport NSW and Rail Corporation on the future Greenway and Light Rail development being proposed within the rail corridor adjacent to the SHFM site.

Given these transport development uses will need to be suitable for pedestrians, we would suggest that the rate of OLF upstream of the SHFM site will need to be addressed by these authorities and their designers; and made safe for members of the public (i.e. have an OLF with a VD below 0.4m^2/s prior to entering the SHFM site).

As such, during the detailed design for the development of the SHFM site, Transport NSW, Rail Corporation and several other stakeholder authorities will be consulted during the design process to produce a fully integrated, considered and safe OLF path from the railway corridor through the SHFM site to the main channel of the Hawthorne Canal.

4.5.2 Smith Street OLF

Based on feasibility calculations the upgrade of the Smith Street branch of the Hawthorne Canal to 3000 x 1800 RCBC and construction of the Smith Street Inlet

Structure, we note the OLF from Smith Street will be in the order of 17.4m^3/s and comprise the Q_{100} less the Q_{20} flow

Using the Manning's Formula and the available open space width of 43m (with an assumed gradient and flow roughness of 1% and 0.035 respectively), this OLF will result in a flow depth of approximately 310mm and a VD of 0.4m^2/s, from Smith Street and is within acceptable limits.

4.6 Access to Northern Apartment Building

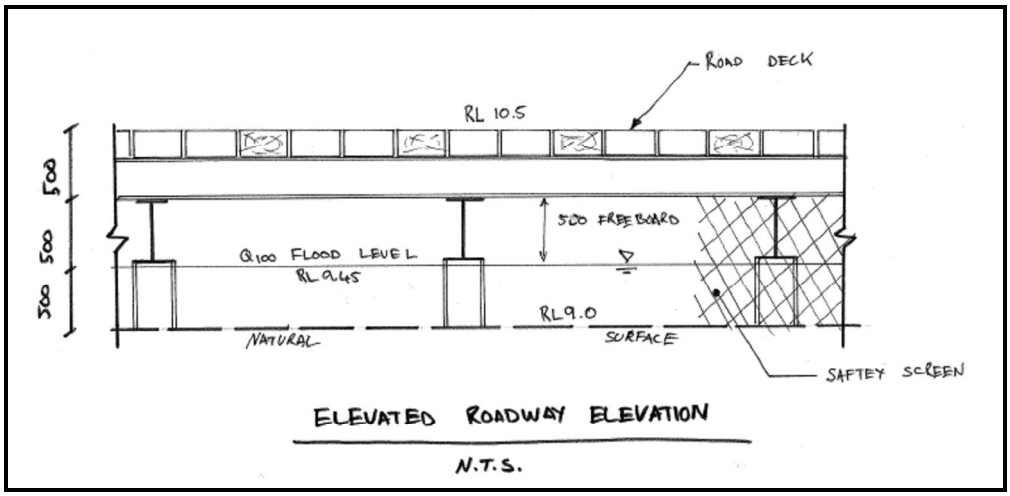
According the site development master plan it is proposed to construct a mixed height apartment building of up to 10 stories east of the main channel of the Hawthorne Canal, adjacent to railway corridor and south of the Longport Street overpass (refer Trunk Drainage Master Plan at Appendix 'A' for location).

This section of land will need to be accessed from Smith Street, however is effectively cut-off from Smith Street by the Hawthorne Canal. As such, an elevated roadway above the 1 in 100-year ARI flood level will be required to access this Northern Apartment Building while still allowing the passage of flood waters below.

At this master planning stage, we would envisage this elevated roadway may comprise a lightweight steel framed structure with a roadway deck over.

With the roadway structure being constructed of a steel frame, this will allow the passage of OLF (from the Railway Corridor and Smith Street) to pass beneath the roadway without impacting on the emergency egress requirements for the residents of northern apartment building. Refer Figures 4.5.1 & 4.5.2 (below and overleaf) respectively for an elevation and section showing the elevated roadway master plan concept.

Further, the natural ground surface immediately below the elevated roadway will form a broad crested weir to control the OLF floodwater entering the canal and this weir will need be co-ordinated with the site landscaping to soften its appearance. We note any landscaping proposal will need to consider flow velocities and erosion on steep batter slopes.



Figrue 4.5.1

Based on feasibility calculations, the 1 in 100-year ARI flood level (in the vicinity of the front face of the elevated roadway) will be in the order of RL 9.45 (37.4m^3/s of OLF crossing a 70m long weir at a depth of 0.45m).

We note the access road between proposed northern apartment building adjacent to the Railway Corridor and Greenway will also need to be elevated above the 1 in 100-year ARI flood level.

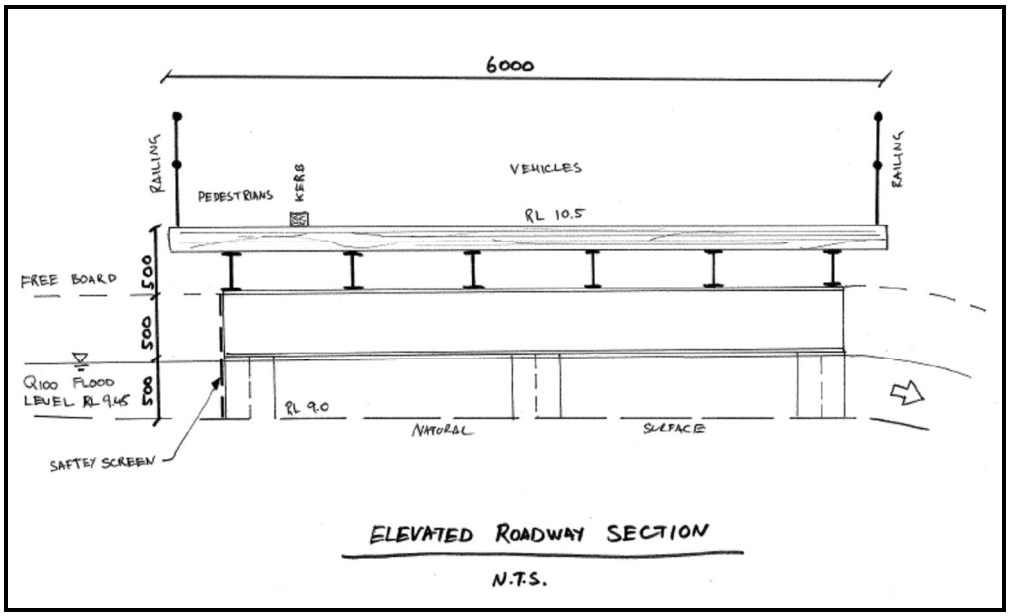


Figure 4.5.2

Based on providing 0.5m free-board above the 1 in 100-year ARI flood level of the OLF crossing the eastern boundary (boundary adjacent to the railway corridor), this access roadway will need to be at an approximate height of RL 10.50.

This RL is approximately 500-700mm above the existing boundary level between the SHFM site and the Railway Corridor, and will require the construction of a retaining wall inside the boundary to facilitate the raised roadway level.

We also note the final configuration of the elevated roadway will be subject to detailed flood modelling, detailed design and consultation with Ashfield Council, SWC and other interested approval authorities.

4.7 Site Safety Considerations

Aside from controlling 1 in 100-year floodwaters to within acceptable limits as described above, several other safety issues must be considered within the re-development of the SHFM site. These include:

- Incorporation of an appropriate permeable barrier system, beneath the elevated roadway (above the broad crested weir) to prevent members of the public from entering (or being washed into) the canal;
- Provision of appropriate screens, fencing, guard rails and hand rails to limit and control the movement of pedestrians away from un-safe areas of the site, steep batter slopes and large changes in level.
- Management of potential debris within the public open spaces areas of the developed site as well as the main canal. This debris has the potential to block the OLF path or main canal, which could cause an increase in site flood levels.

5 SITE STORMWATER MASTER PLAN

5.1 General

The second part of the report will aim to address the site stormwater master planning for the whole of the re-developed SHFM, and will include:

- The provision of On-site Stormwater Detention (OSD) within the site to detain flows in accordance with Ashfield Council requirements; and
- Providing Water Sensitive Urban Design (WSUD) initiatives to improve the water quality of water leaving the site and reduce the consumption of water.

5.2 Minor Drainage

In general, the site's stormwater system will feature a pit and pipe system that has been designed in accordance with AR&R's Minor/ Major system requirements as described below:

- Minor System: Flow accumulated from roof water, pavements and roads directed into pipes. Pipe network flow to have a capacity for the 1 in 20-year ARI; and
- Major System: Over Land Flow (OLF) paths to be provided for the 1 in 100-year ARI.

The site's pit and pipe system as well as the OLF paths will generally follow the internal road layout, and finally discharge to the receiving waters through a direct connection into the Hawthorne Canal within the SHFM site.

Prior to discharge to the canal, minor site flows will be treated in the Water Sensitive Urban Design (WSUD) elements that will be incorporated in to site landscaping and engineering features.

In general, stormwater drainage design concepts are as follows: -

- Site stormwater flows and surface runoff will be detained in the site's proposed On-Site Detention (OSD) facilities in accordance with Council Requirements;
- Overland flow paths will be provided through the site to safely convey overflows to the OSD facilities;
- WSUD initiatives will be provided to improve the water quality of water leaving the site and reduce the consumption of water;
- UPVC (sewer grade) will be used for pipes diameters between 100 mm and 300 mm; and
- RCP will be used for pipes greater than or equal to 375 mm in diameter.

Refer Sketch 27 at Appendix 'A' for the SHFM site Stormwater Master Plan drawing.

5.3 On-Site Detention (OSD)

OSD for the developed SHFM site will be provided in accordance with "Supplement 4" of Ashfield Council's Stormwater Management Code (April 1995), which requires 150m^3 of storage to be provided per 1.0 ha catchment in the Strathfield Catchment. Where as in the Ashfield Catchment, the required OSD volumes are to be determined by hydraulic modelling. From enquires with Council's engineering staff, they have suggested adopting the Strathfield parameters for use during the master planning stage.

However, based on our experience with OSD, we would expect storage requirements in the order of 200-250m^3/s are likely for the development of then SHFM site. As such, a Site Storage Requirement (SSR) of 230m^3/ha has been assumed for use during the master planning of the OSD storages within the site.

As a result of site topography, and the position of the Hawthorne Canal, which isolates the northern section site (adjacent to the railway corridor), OSD will be provided in three (3) distinct catchments, refer Sketch 28 at Appendix 'A' for catchment locations.

These include the Mungo Scott Catchment, Smith Street Catchment and Hawthorne Canal Catchment.

5.3.1 Mungo Scott Catchment

The Mungo Scott catchment is approximately 1.4ha in area and drains through the Hawthorne Canal Catchment until it ultimately drains into the canal.

Based on the assumed SSR, approximately 320m^3 OSD storage is required to serve this portion of the site and this will be provided in an underground beneath Edward Street access road.

5.3.2 Smith Street Catchment

The Smith Street catchment is approximately 0.39ha in area and drains to the Smith Street Branch of the Hawthorne Canal

Based on the assumed SSR, approximately 90m^3 OSD storage is required to serve this portion of the site and this will be provided in an underground tank at the north western corner of the Edward street apartment building. The tank will be located below the ground floor slab above the basement carpark.

5.3.3 Hawthorne Canal Catchment

The Hawthorne Canal catchment is approximately 0.95ha in area and drains to the directly to the Hawthorne Canal

Based on the assumed SSR, approximately 220m^3 OSD is required to serve this portion of the site and this will be provided in an underground tank at the north eastern corner of the northern apartment building.

The tank will be located below the apartment building access road (adjacent to the railway corridor) above RL 9.50. This is to ensure the storage is situated above the 1 in 100-year ARI flood level at this section of the canal to avoid any potential hydraulic backwater effects.

5.4 Water Quality

It is envisaged that stormwater runoff from the developed SHFM site will need to be treated to remove pollutants such as litter, nutrients and hydrocarbons.

As such, the site stormwater system will comprise WSUD initiatives using treatment train approach (refer example below) including water retention, re-use and the removal of gross and fine pollutants in accordance with industry best practise.

At this master planning stage, we have assumed 4% of the total site area (1,080m^2) will be sufficient to achieve the Environmental Protection Authorities (EPA) water quality treatment objectives, however these initiatives (as listed below) will need to be verified with water quality modelling such as the MUSIC model.

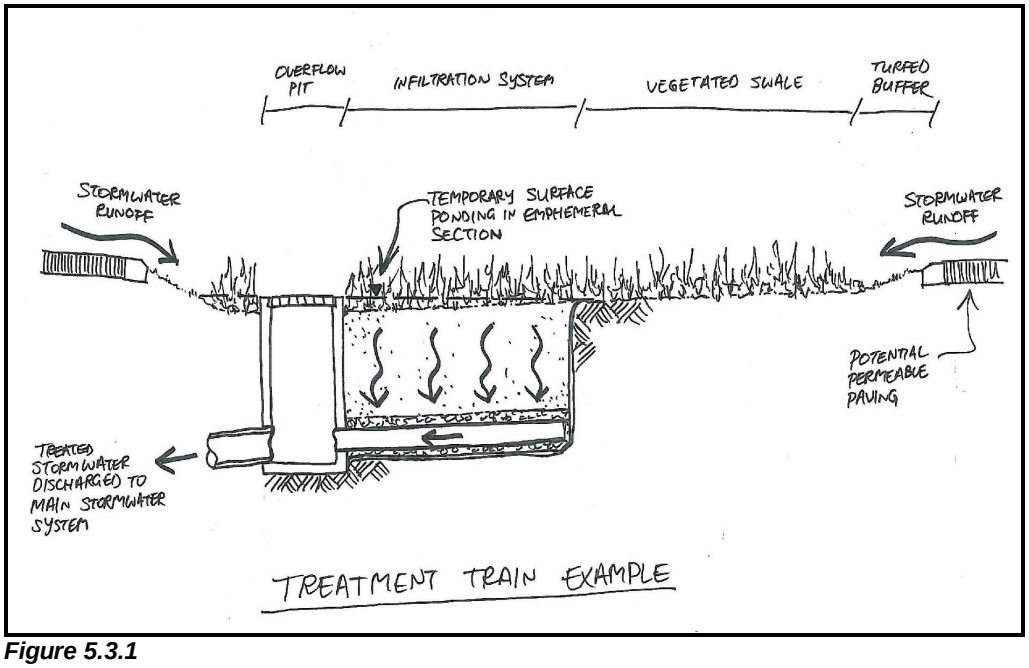


Figure 5.3.1

Refer Sketch 28 at Appendix 'A' for the SHFM Site Stormwater Master Plan, which shows the location of the proposed WSUD initiatives to be incorporated within the developed site.

The following WSUD initiatives and their respective areas will be incorporated within the SHFM site (subject to confirmation by MUSIC modelling):

- Ephemeral Rain Gardens (860m2)
- Bio-swales (185m2)
- Permeable Paving (1,257m2)
- Rainwater Tanks (subject to BASIX requirements)
- Gross Pollutant Traps

6 APPENDIX 'A'

7 APPENDIX 'B'