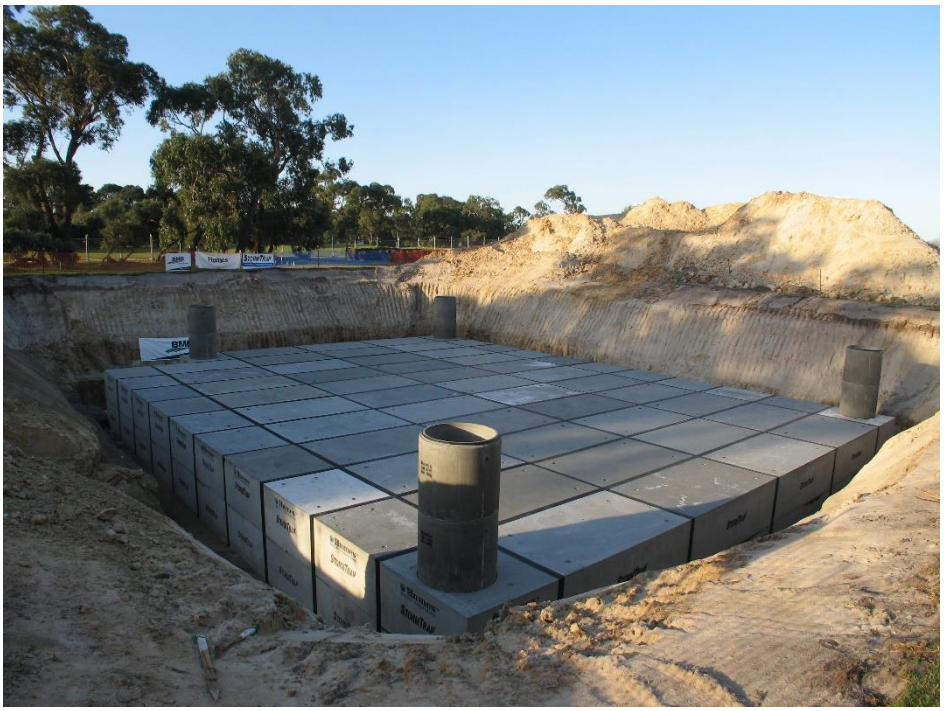
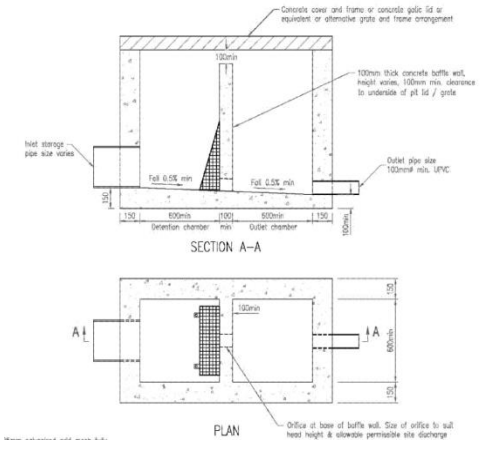
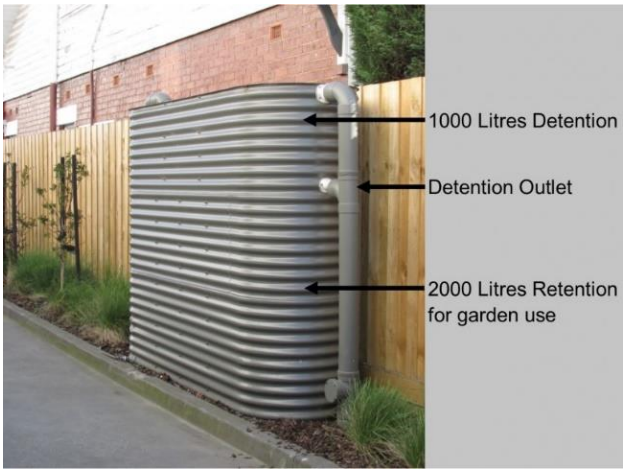
Melton City Council

On-site Storm Water Detention Guidelines (2024)







Melton City Council

Version Number	Date	Approved by	Position
1.0	May 2009	Voltaire David	Infrastructure Planning Coordinator
2.0	April 2024	Waseem Abid	Engineering and Landscape Development Coordinator

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1. INTRODUCTION

Redevelopment of a site usually increases the area covered by hard standing impervious surfaces such as roofing or paving. The change in the average permeability of the site significantly increases the volume and flow rate of stormwater runoff and the additional drainage loads may cause local flash flooding downstream of the site.

Due to the number of developments taking place within the municipality of Melton, it has become necessary to limit the peak rate of runoff reaching Council's drainage system.

On-site Stormwater Detention (OSD) is a stormwater management system that enables the runoff discharge rates of individual sites to be controlled.

OSD system requires a flow control device that limits the discharge to an acceptable rate by functioning as a storage infrastructure to hold the excess discharge until capacity becomes available in the downstream drainage system.

A well designed OSD system controls the peak discharge rates to match the capacity of the downstream drainage system. The total volume of stormwater leaving the site is not reduced but retained and then released when downstream drainage capacity becomes available. Installation of OSD systems on further development of established sites ensures there are no adverse impacts from stormwater runoff on downstream properties as a result of ongoing development of the catchment.

The above guideline does not apply to the following developments:

- Greenfield estate subdivisions/developments
- New developments in estate subdivisions where retardation has been provided at regional level.

2. PRINCIPLES

2.1 Principles of On-site Stormwater Detention

On-site Stormwater Detention Systems are used as part of the stormwater drainage system to reduce the impacts of site development on receiving drains and waterways.

At the onset of a storm, stormwater will commence to discharge from the site. The earliest flows will be from the areas nearest to the discharge point but will increase significantly as water from the furthest points of the catchment reaches the discharge point. As the intensity of the storm approaches its peak, the discharge rate will increase to a maximum and thereafter subside as the peak flow has passed.

Council as the local drainage authority have indicated that if the greatest discharge rate for the catchment's critical storm event exceeds the permissible site discharge

rate (PSD), then an On-site Stormwater Detention (OSD) system must be installed. The OSD system will temporarily store excess flows and release it at a lower controlled rate over a longer period.

An OSD system has two components. The first is a device that controls the flow rate of the stormwater discharge from the site and the second is a storage component for the excess stormwater being detained. The storage is to be provided in underground pipes or under certain circumstances specified in this document, a combination of underground pipes, aboveground tanks and ground level storage.

3. DESIGN

3.1 Design Parameters of On-site Stormwater Detention Systems

Key aspects of an OSD procedure are to determine the Permissible Site Discharge (PSD) and Storage Volume (Vs).

The following parameters are required to determine the PSD and Vs:

- Site area
- Weighted coefficient of runoff at the initial development of the estate (information to be sought from Council)
- Weighted coefficient of runoff at the post developed stage
- Time of concentration for the catchment that wherein the site is located (information to be sought from Council)
- Travel time from the site discharge point to the catchment outlet (information to be sought from Council)
- Average Recurrence Intervals:

    - For the permissible site discharge,
        - Residential area: 20% AEP rain event
        - Industrial/commercial area: 10% AEP rain even

    - Site storage requirement:
        - Residential area: 10% AEP rain event
        - Industrial/commercial area: 5% AEP rain event

3.2 On-site Storage Volume (Vs)

The minimum volume of an on-site storage depends on the following:

- Permissible site discharge,
- Adopted storage system and/or configuration, and
- Relevant parameters listed in Section 4.1.

NOTE: If storm events of the same AEP that has durations more than the catchment's specific critical duration which causes the storage to overflow, then it will be necessary to increase the storage volume. The OSD designer must "maximise" the storage volume to ensure the system does not fail in a storm event of any duration.

3.3 Storage Systems

3.3.1 Underground Storage System

Underground storage systems are suitable for use as OSD storage. They can take the form of pipes or multi-cell units. Any underground system should be in areas where it can be readily accessed for inspection and maintenance. The system must be watertight to ensure there is no water seepage to adjacent properties or structures. Where possible, a "visible overflow" should be built into the system.

Below is an example of an underground multi-cell storage system.

Figure 1 – Multi-cell Storage System

Council accepts the above shown propriety systems, given that relevant charts and calculations are submitted as part of the OSD plans. An example of a chart for a multi-cell unit is shown in Figure 6.

3.3.2 Above-ground Storage System

Above-ground storage systems such as rainwater tanks can be a solution in situations where the drainage discharge point is to the kerb of the road and not to an underground drainage pipe.

Note, maximum 50% of the total site storage volume can be accepted in rainwater tanks.

3.3.2.1 Rainwater Tanks Plumbed for Internal Reuse

A rainwater tank that is plumbed to a toilet or laundry is an acceptable arrangement, but use of this option is dependent on the size of the roof area directed to the tank and the amount required to be retarded within the site.

50% of the total site storage can be accepted in rainwater tanks if plumbed to toilets or other internal use.

This storage system may be used in conjunction with an underground system to meet storage requirements for the site.

Rainwater tanks plumbed to toilets have the added advantage of water reuse, and since it redirects the stormwater to the sewer system, it off-takes that quantum from the drainage system.

3.3.2.2 Rainwater tanks with an Orifice (without plumbing)

Rainwater tanks used for irrigation purposes may be acceptable for providing some of the OSD storage volume. If the developer or consultant proposes to use rainwater tanks, it must be modified to comply with Figure 1 and other comments listed below.

Council will accept the following types of design:

- A rainwater tank is provided for each building that collects rainwater from the roofed areas. The maximum temporary storage (airspace) in rainwater tanks cannot exceed one third of the total site storage.

- The roof area connected to the rainwater tank must be proportionately equal to the percentage of temporary storage within the rainwater tank.

- The controlled outflow from the airspace of the rainwater tank must be a maximum of 1 litre per second. This would require a 25-30mm diameter outlet from the rainwater tank,

- To avoid a closed system and the effect of additional water head, a 100mm diameter outlet pipe with a 25-30mm diameter orifice must be connected to the rainwater tank to restrict the flow. The outflow pipe must then be connected to a minimum of 450 x 450mm pit with a grated cover before connecting to a pipe that is directed to the site's drainage discharge point - (See Figure 2).

- Rainwater tanks may be used in conjunction with an underground system to meet storage requirements for the site.

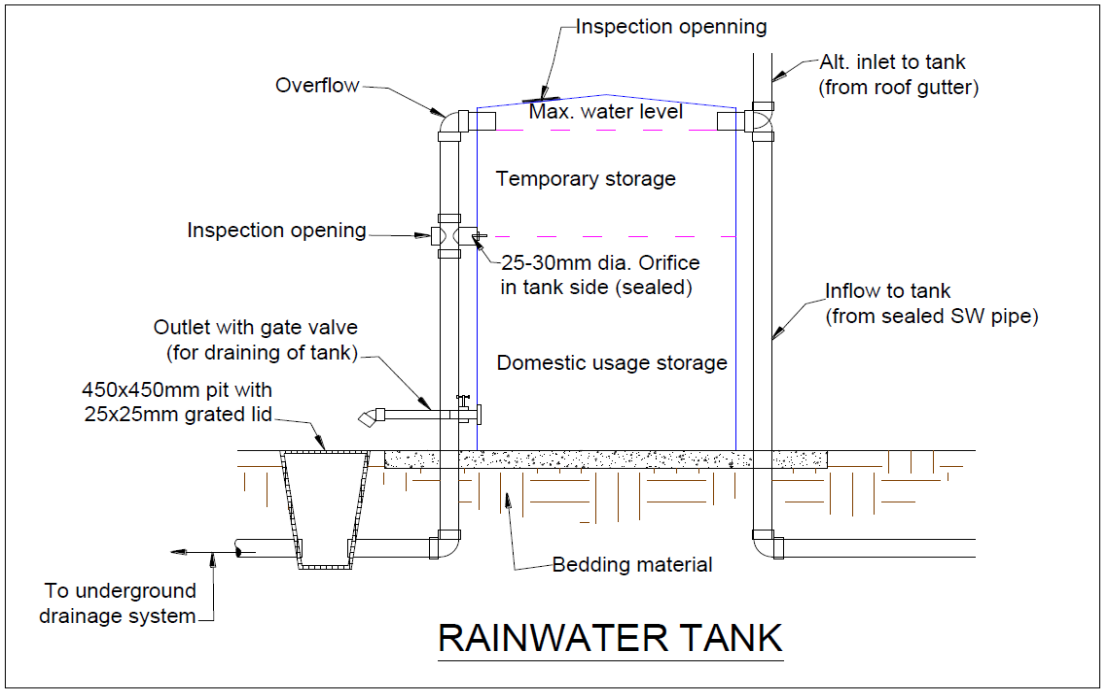

Figure 2 – Rainwater tank detail

3.3.3 Surface Storage System

Surface storage systems can only be used by dispensation at the discretion of Council where underground and above-ground storage systems cannot meet the on-site stormwater detention requirements.

In such exceptional cases, the following storage water depth will apply:

- Paved and landscaped areas: 100mm maximum depth

Other considerations:

- The surface storage system must be well clear of habitable buildings and positioned near the lowest point of the site.
- An additional 20% storage volume shall be provided to allow for future unintentional reduction in storage.

3.3.4 Pump-out System

Pump-out systems for roof and surface water are not permitted as an OSD system and any design plans incorporating such systems for disposal of stormwater shall be rejected.

Council may, at its discretion, accept basement level pump-out systems for disposal of seepage water and runoff generated from access ramps to the basement associated with multi-storey buildings. However, this requires a comprehensive design to justify how the 1%AEP event shall be catered for.

3.4 Flow Control Outlet

The flow control outlet must be designed such that the flow directed into the Council drainage system is limited to the PSD when the storage is at the OSD volume (Vs).

Acceptable flow control outlet types are listed below:

- Orifice system
- Multi-cell system

3.4.1 Orifice System

The size of the orifice must be designed using the orifice formula:

$PSD = CAV$

Where: $V^2 = 2gh$

$A = \pi d^2/4$

C = orifice coefficient

Deriving the diameter of the orifice leads to:

$d = 21.9 \times [PSD / (h^{0.5})]^{0.5}$

Where:

h is the water head of the orifice (i.e., height between the centreline of the orifice pipe and the maximum level of the temporary site storage) in metres.

PSD is the Permissible Site Discharge in litres per second.

d is the diameter of the orifice in millimetres.

The minimum size of the orifice that Council will accept is 50mm. It requires the provision of a 20mm x 20mm trash grate over the orifice inlet when the orifice diameter is less than 100mm.

Figure 3 below shows the orifice pit design inclusive of the baffle wall. A grated pit cover must be used over the detention chamber of the orifice pit to enable visual inspection and a solid pit cover must be used over the outfall chamber to avoid uncontrolled water bypassing the system.

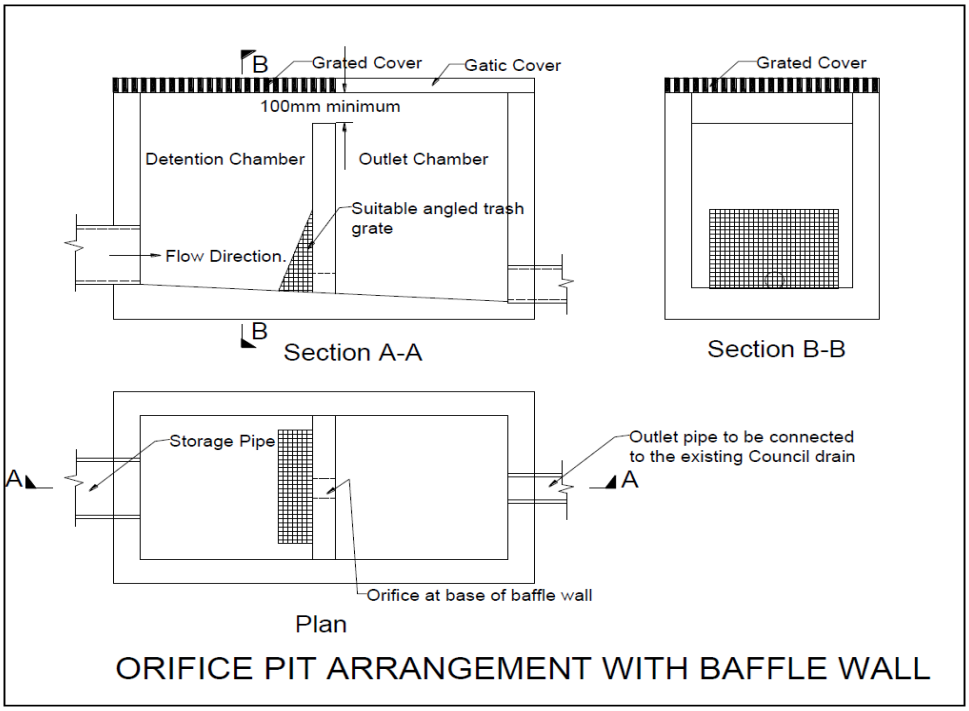

Figure 3 – Orifice Pit detail

Note, the highest point of the underground storage system must not be higher than the top of the baffle wall within the orifice pit.

Figure 4 shows typical cross-section of the orifice plate.

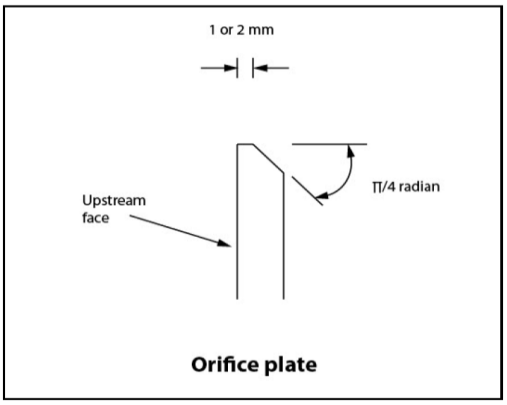

Figure 4 – Orifice plate detail

3.4.2 Multi-cell System

Below is a sample layout arrangement of the multi-cells for the below ground storage system.

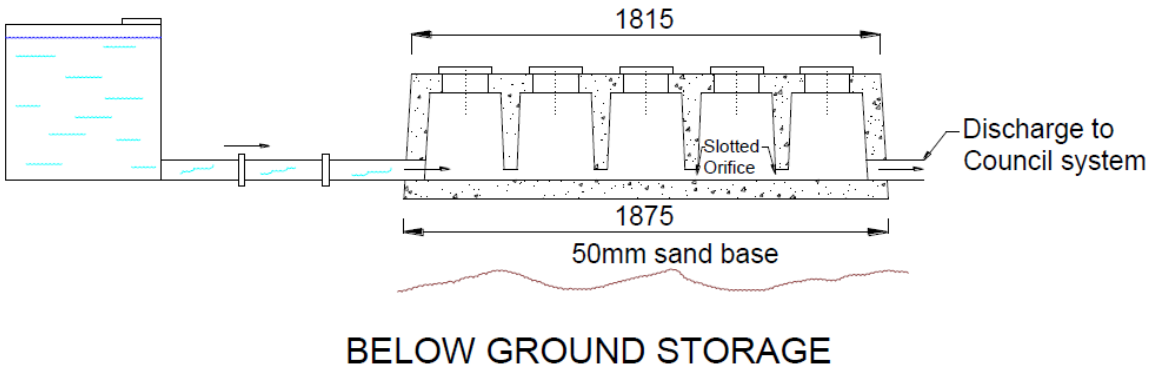

Figure 5 – Below ground multi-cell system

Council will only assess a multi cell system if the relevant charts justifying the model of the proposed multi cell system is provided.

Figure 6 shows a sample chart that is used to select the type of multi-cell system according to the inlet head.

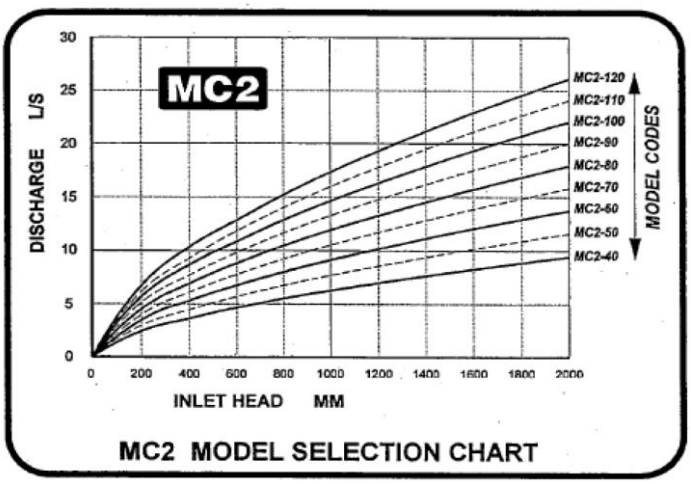

Figure 6 – Example of a multi-cell chart

3.5 On-site Storage Detention Calculations

It is Council's preference to calculate the On-site Stormwater Detention requirement using the OSD4 software. However, other software solutions can be used based upon the Swinburne method provided which aligns with the OSD4 design output.

3.5.1 Calculations using the OSD4 software

If the stormwater discharge needs to be controlled, then the Permissible Site Discharge (PSD) for the site will be specified on the Planning Permit. The PSD shall be used as the "Nominated PSD" in the OSD4 software solution.

To derive the on-site stormwater detention requirement using the OSD4 software, the following information must be obtained from Council's Engineering Development team:

- Tc – Time of concentration of the catchment
- Tso – Travel time from the discharge point to the catchment outlet
- Weighted coefficient of stormwater run-off from the original estate drainage design

The rainfall zone must be taken as "Melton" in the OSD4 program and the ARI's specified in Section 3.1 must be adopted.

4.0 Information Required for OSD Submissions

The following information needs to be submitted to Council for assessment prior to approval:

4.1 Initial Submissions

- Pdf submissions must be submitted to the following email address:

  InfrastructurePlan@melton.vic.gov.au

- The submission must include:

  - All relevant information, including but not limited to, the Planning Permit number, the Permissible Site Discharge and design summary.
  - An electronic set of drainage plans showing, amongst other things, details of the OSD system and levels to prove that the design flows to the Legal Point of Discharge under gravity.
  - Detailed calculation sheet
  - A copy of the Property Information Form (PIF) showing the Legal Point of Discharge provided by Council.

4.1.1 Information Required on OSD Plans

- The OSD plan must include:

  - Drawing scale
  - North direction
  - Street names abutting the relevant property
  - Property address
  - TBM
  - Title boundary
  - Legal Point of Discharge (LPOD) and adjacent Council drains
  - Drainage easements, where applicable
  - Building footprint, including driveways and impervious areas
  - Finished floor levels of building, including habitable dwelling and garage.
  - Internal drainage system, including pipe diameter and pipe type
  - Drainage from driveways
  - OSD system, including dimensions and levels to enable calculation of storage volume.
  - Longitudinal section of temporary site storage area including LPOD
  - Pits schedule, including top and invert levels
  - Detailed drawing of the flow control device
  - Notes:
    - All works within a Council Road Reserve or easement, including a pipe connection into Council's drains, must be supervised by one of Council's Construction Supervisor.

      Email: Construction@melton.vic.gov.au

    - Relevant permits, including but not limited to a variation to a crossover, build over an easement and/or consent to work within road reserve must be obtained from Council prior to commencing any work, where applicable.

      Online forms available on Melton Council website under Engineering Applications:

      Engineering applications Melton City Council

    - All structures within a Council drainage easement and road reserve must be constructed according to Council's standards.

    - All other relevant technical notes

4.1.2 Supporting Calculations

- The OSD plan must be supported by calculation sheets that include the following information:

  - ❖ Calculations of the impervious area at the post developed stage
  - ❖ Design parameters and OSD calculations
  - ❖ Calculations of the storage provided in each OSD element
  - ❖ Calculations of the site discharge

  - ❖ If the orifice system is used, then the following must be provided:

    - ➢ Calculation of the orifice diameter
    - ➢ Effective water head at the orifice

  - ❖ If the Multi Cell system is used, then the following must be provided:

    - ➢ Calculate the effective water head
    - ➢ Relevant graphs justifying the selected multi-cell model

4.1.3 Final Submission

- Once Council is satisfied with the design and OSD plans, it must be submitted in pdf for endorsement to:

  Email: InfrastructurePlan@melton.vic.gov.au

4.1.4 Construction Phase

- A suitably qualified plumber must construct and install the OSD system.

- Prior to covering of the underground OSD system, or just after the installation of the aboveground OSD system, an application for an inspection from one of Council's Construction Supervisor must be made to Email: Construction@melton.vic.gov.au

- The construction works must comply with the Council endorsed OSD plans.

4.1.5 Post Development Documents

- A Plumber's Certificate detailing that the works were undertaken in accordance with the endorsed OSD plans (Relevant Plan numbers must be referenced in the certificate)

- Photos of the OSD system during and post construction.

- The post development documents must be submitted to Council via email: InfrastructurePlan@melton.vic.gov.au

Appendix

1. Submission Checklist

☐ Cover letter

- Planning permit number
- Site address
- Site discharge
- Design summary

☐ OSD Plan

- Drawing scale
- North direction
- Street names abutting site
- Property address
- TBM
- Title boundary
- LPOD and adjacent Council drains
- Easements, where applicable
- Internal drainage system including pipe diameter and type
- Driveway drainage
- Storage system
- Site storage area
- Pit schedule including top and invert levels
- Detail of flow control device

☐ Calculation Sheets

- Impervious area at the post development stage
- Design parameters and OSD calculations
- Storage in each OSD element
- Site discharge calculations
- Orifice or multi-cell calculations

2. Glossary

- ARI - Average Recurrence Interval
- LPOD - Legal Point of Discharge
- OSD - On-site Storm Water Detention
- PSD - Permissible Site Discharge
- TBM - Temporary Bench Mark
- Vs - On-site Storm Water Detention storage volume
- PIF - Property Information Form

3. References

- OSD Workshop Documents of Swinburne University of Technology
- OSD Policy of Liverpool City Council
- OSD Policy of Warringah Council
- OSD Policy of Holroyd City Council
- OSD Policy of Manningham City Council
- OSD Policy of Ballarat City Council