Medium to high-density residential buildings and works

Stormwater requirements for urban developments: development scenario





Acknowledgment

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We are committed to genuinely partner, and meaningfully engage, with Victoria's Traditional Owners and Aboriginal communities to support the protection of Country, the maintenance of spiritual and cultural practices and their broader aspirations in the 21st century and beyond.



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Introduction

This development scenario is a support tool for those complying with stormwater planning requirements. The intended audience is both design practitioners submitting applications, as well as council planners assessing development applications.

A checklist indicates the minimum information that should be included in a stormwater report lodged with the planning application. This worked example for an apartment building and works development demonstrates how a development application should be designed to satisfy the objectives and standards of the relevant clauses. The right column of the example (green boxes) indicate which sections of the report respond to which checklist items. The call out text boxes (blue boxes) offer resources and links for both designers and assessors.

Planning requirements

The development in this example is for buildings and works associated with an apartment, irrespective of whether the building is subdivided. The required provisions for the works are at Clauses: 55.07-5 (Integrated water and stormwater management objectives) where the development is less than five storeys in a residential zone, and 58.03-8 (Integrated water and stormwater management objectives) where the development is five storeys or greater within a residential zone (or any height within particular commercial/activity/special zones). Note, the requirements of these clauses are identical, and the clause applied is dependent on the number of storeys of the development. In this example, the development is 48 storeys, so Clause 58.03 applies. The clause objectives and required standard are outlined below.

This example can be used for apartment complexes and potentially similar built form proposals, depending on the occupancy and resultant water demand within the building and site (i.e. medium density apartments, office buildings, etc). In this example, the application consists of two apartment buildings with basement car parking below. The example can be adapted for similar developments with these features.

A buildings and works application for apartment or mixed-uses will need to meet all planning scheme requirements for the land and the development type. This may include local controls. Applicants are encouraged to check with their local council if they are not sure which planning scheme provisions apply and complete a site layout plan before commencing the stormwater report.



* The Permeability and Stormwater Management objectives in these clauses are identical – the applicable clause is dependent on the zoning and number of storeys in the development.

** Clause 65.01 specifies decision guidelines which list matters the responsible authority must consider, as appropriate, before deciding on an application or approval of a plan. This includes consideration of whether a proposed development is designed to maintain or improve the quality of stormwater within and exiting the site. They do not apply to VicSmart permits.

Objectives of Clause 58.03-8

58.03-8 Integrated water and stormwater management objectives

- To encourage the use of alternative water sources such as rainwater, stormwater and recycled water.
- To facilitate stormwater collection, utilisation and infiltration within the development.
- To encourage development that reduces the impact of stormwater run-off on the drainage system and filters sediment and waste from stormwater prior to discharge from the site.

Standards

The requirements for Standard D13 are listed below.

	Clause	Standards
For apartment buildings 5 stories or more excluding the basement	58.03-8	 Buildings should be designed to collect rainwater for non-drinking purposes such as flushing toilets, laundry appliances and garden use.
		 Buildings should be connected to a non-potable dual pipe reticulated water supply, where available from the water authority.
		 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).
		 Designed to maximise infiltration of stormwater, water and drainage of residual flows into permeable surfaces, tree pits and treatment areas.

All applications must be accompanied by details of the proposed stormwater management system, including drainage works and retention, detention and discharges of stormwater to the drainage system.

Worked example

The stormwater report presented by the applicant should provide all the information listed in the checklist.

This example is a conceptual level development and aims to focus on the information required within Clause 58.03-8. Some local councils may require more detail for aspects of the design than presented here. The schematic is not intended as an accurate representation of all other planning requirements for a development of this nature.

A: Proposed development description

The development site has an area of 8,850 m². The application proposes two 48-storey mixed-use buildings, comprising of six podium levels and two 42-storey residential apartment towers above, with associated access and landscaping. The development has commercial/retail enterprises in the podium levels below the towers, such as restaurants, cafes, cinemas and other recreational venues as well as car parking. There is approximately 4,075m² of combined building roof area and 1,829m² of pervious grounds for residents.

The residential towers include 550 studio apartments and 360 two-bedroom apartments, with an estimated occupancy rate of 1,270 people (based on each studio having one occupant and each two-bedroom apartment having two occupants).

The Water Sensitive Urban Design (WSUD) response includes the following:

- The whole roof area of both towers draining to rainwater harvesting tanks to supply internal toilet flushing demand, with overflows directed to the street drainage.
- 80% of the podium roof draining to a rainwater harvesting tank for irrigating the vegetation on both the podium and the ground level gardens (an estimated demand of 36kL/year). Any overflows are discharged to the street drainage.
- Runoff from the carparks, driveway and walkway are directed to a series of tree pit bioretention swales 80m² in area. The tree
 pit bioretention is 80m long by 1m wide, running along the entrance driveway. In-ground tree pit raingardens have been
 chosen to maximise greening to the site. They provide passive irrigation to trees via a linear bioretention basin to which
 surrounding hard surfaces are drained.
- Trees and native tussock grasses to be planted in the bioretention basin, contributing towards cooling and providing an attractive and enjoyable entrance way to the complex.

A: Pi	roposed development
desc	ription
	A1: Describe the proposed development e.g. describe the land use, anticipated tenancy, buildings and works, number of car parking spaces, expected number of occupants, etc.

Legal point of discharge Tower 1 Levels 7-48 Roof to tank Roof to tank Podium Levels 0-6 Road and walkwayto Irrigation raingarden Tower 2 Levels 7-48 Roof to tank LEGEND: C Site boundary 3 Grassed area Vegetation **Building Roof** Catchment area Access road Walkway/ground Rainwater Tank Raingarden level Water flow direction

B: Site layout plan and WSUD treatment systems

Figure 1: Site layout plan

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Table 1: Catchment type or WSUD asset surface area

Catchment type	Area (m²)	Area treated by	Demands
Roof tower 1 (100%)	805	Tank (15kL) to toilet flushing	510 pp @ 20L/day: 10.2kL/d
Roof tower 2 (100%)	903	Tank (15kL) to toilet flushing	760 pp @ 20L/day: 15.2kL/d
Roof podium (80%)	1,894	Tank (3kL) to irrigation	36kL/year - seasonally distributed
Roof podium (20%)	473	No treatment	-
Driveway and walkway	2,866	Raingarden (80m²)	-
Garden	1,829	-	-
Raingarden	80	-	-
Total area (m ²)	8,850	-	-
Total impervious (m ²)	6,941	-	-
Fraction impervious	78%	-	-



To meet the best practice stormwater management objectives of Clause 58.03-8, the development WSUD response will include:

- Tower roof areas (100%) to harvest and supply toilet flushing (demand well exceeds supply so yield % is very high).
- Podium roof area (80%) to harvest rainwater for irrigation re-use.
- Driveway and walkway surfaces to be treated by a raingarden.

The litter generated from the site will be drained to raingardens, which are a highly effective gross litter trap. In order to maintain the aesthetic and function of the raingarden, the litter will need to be removed at regular intervals (approximately monthly, as required).

Figure 2 shows the WSUD assets and their catchments and required drainage connections. Please refer to concept design drawings for further details of each WSUD asset.



 \Box

B7: If relevant to development type, identification of potential toxicants generated by the business to be located on the premises requiring structural isolation from the runoff draining to a WSUD treatment system or stormwater drain.

Figure 2: Required drainage connections for assets and their catchments

B: Site layout plan, catchment areas and WSUD treatment systems

Relevant links

- Urban Stormwater Best Practice Environmental Management Guidelines (Victorian Stormwater Committee): <u>http://www.publish.csiro.au/book/2190</u>
- Options for treating stormwater using WSUD (Melbourne Water): https://www.melbournewater.com.au/planning-and-building/stormwater-management/options-treating-stormwater
- WSUD Engineering Procedures Stormwater (Melbourne Water): <u>https://www.publish.csiro.au/book/4974/#contents</u>
- Infrastructure Design Manual (IDM) (Local Government Infrastructure Design Association): <u>https://www.designmanual.com.au/download-idm</u>
- Designing for a cool city Guidelines for passively irrigated landscapes (CRC for Water Sensitive Cities): https://watersensitivecities.org.au/content/designing-for-a-cool-city-guidelines-for-passively-irrigated-landscapes/

C: Modelling and compliance

The raingardens/tree pits and irrigated rooftop gardens contribute to achieving water quality benefits as well as providing the combined benefits of cooling and adding enjoyable aesthetics for inhabitants and visitors to the complex. There are no toxicants or chemicals generated on-site.

MUSIC software was used to model the treatment performance of the proposed site design as shown in the model schematic in **Figure 3**. The modelling details are summarised in **Table 2** and **Table 3**.

The climate data was chosen according to the recommended pluvio-data for the Melbourne city region (10 years of data with mean annual rainfall between 650 and 750mm/year).

Table 2: MUSIC modelling parameters

MUSIC Model Inputs	
Site location	Melbourne regional
Rainfall data used	086071 MELBOURNE (1952-1961)
Modelling timestep	6 mins
PET data	Melbourne Average Monthly PET
Pollutant characteristics	Defined according to surface types as per Table 3 in Melbourne Water MUSIC Guidelines 2018

Table 3: Raingarden parameters

Raingarden	
Combined area	80m ²
Extended detention depth (EDD)	150mm
Tree media depth	700mm
Tree media hydraulic conductivity	50mm/hr
Saturated zone	200mm







Figure 3: MUSIC model schematic

The effectiveness of the treatment systems is summarised in **Table 4** demonstrating compliance with water quality improvement requirements outlined in Best Practice Environmental Management Guidelines (minimum 80% reduction in total suspended solids, 45% reduction in total phosphorus, 45% reduction in total nitrogen and 70% reduction in litter). Gross pollutants are effectively removed from the stormwater by the raingardens.

Table 4: MUSIC modelling compliance results

	Sources	Residual load	% Reduction
Flow (ML/year)	4.32	3.26	24.5
Total suspended solids (kg/year)	682	95.9	85.9
Total phosphorus (kg/year)	1.43	0.569	60.1
Total nitrogen (kg/year)	10.3	5.57	46.1
Gross pollutants (kg/year)	149	12.7	91.5

Relevant links

- MUSIC software (eWater): https://ewater.org.au/products/music/
- MUSIC Guidelines (Melbourne Water): <u>https://www.melbournewater.com.au/sites/default/files/2018-02/Music-tool-guidelines-2018.pdf</u>

As part of the assessment of the planning application the assessor should review the MUSIC file submitted.

• The MUSIC Auditor tool can be accessed at: https://www.musicauditor.com.au/ /

In order to use the MUSIC Auditor tool:

- Register as a user or login at https://www.musicauditor.com.au/user/register
- Create a summary report from your MUSIC model find help on how to do this at https://musicauditor.com.au/FAQ
- Upload your summary report file by using the 'Choose File' radio button and press 'Submit'.
- Download the pdf report to review.

D: Functional design considerations

Note: This section may be required for inclusion with the planning application, or else the information may be required as a condition of permit. Check with your council for advice on which applies.

Note: Under Clause 53.18 all applications must be accompanied by details of the proposed stormwater management system, including drainage works and retention, detention and discharges of stormwater to the drainage system

Rainwater tank



D: Functional design considerations D1: Plan from Checklist item B or amended plan required by permit. D2: Sectional view of each WSUD treatment showing indicative levels. D3: Size of treatment elements, e.g. tank volume, raingarden width and length, extended detention depth, etc. D4: Details of pipe connections between any rainwater tank and end uses, e.g. toilet/s, laundry, hot/cold water and irrigation, as applicable.

Figure 4: Rainwater tank concept design plan

Tree pit raingarden



Figure 5: Tree pit raingarden cross section - for all raingardens

Table 5: Plant species preferences

Recommendations for plant types*	
Tree type	Lophostemon confertus (Brush Box Tree)
Vegetation for raingarden	Ficinia nodosa (Knobby Club Rush)

*These are only two of many species which could be used. For purposes of aesthetics other species may also be used to add variety – refer to the resources below. For a development of this size a density of 6-10 plants/m² is proposed.

Notes to applicants:

- If you are unable to connect to the legal point of discharge on your site from a ground level raingarden, consider the use of planter box raingardens. This is explained in Example 3 – Townhouse development building and works.
- When using permeable paving or other infiltration measures adjacent to any building or structure, there must be an impervious apron (0.5m setback) between the building and the infiltration system.
- Consider the site constraints when siting WSUD elements. These considerations must be clearly documented in the application.

Relevant links

- WSUD Engineering Procedures Stormwater (Melbourne Water): <u>https://www.publish.csiro.au/book/4974/#contents</u>
- Adoption Guidelines for Stormwater Biofiltration Systems (CRC for Water Sensitive Cities): <u>https://watersensitivecities.org.au/content/stormwater-biofilter-design/</u>
- Infrastructure Design Manual (IDM) (Local Government Infrastructure Design Association): <u>https://www.designmanual.com.au/download-idm</u>
- Trees for Cooler and Greener Streetscapes Guidelines for Streetscape Planning and Design (DELWP)
 <u>https://www.planning.vic.gov.au/policy-and-strategy/planning-for-melbourne/plan-melbourne/cooling-greening-melbourne/trees-for-cooler-and-greener-streetscapes
 </u>

A useful reference for suitable streetscape WSUD plant species is Moreland City Council's WSUD streetscape raingarden and tree pit design package (refer to Planting Palette Extract) located at:

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https://www.moreland.vic.gov.au/environment-bins/environment/water/wsud-design-package/

E: Site management plan

Many Victorian councils require a site management plan to be submitted and approved before site works begin, so check with council on specific requirements. Site management plans help you record the way you manage risk and may help with your planning. If a pollution incident happens, they may also help demonstrate to Environment Protection Authority (EPA) Victoria what steps you have taken to meet your <u>general environmental duty (GED)</u> (from 1 July 2021) by reducing or eliminating the risk of harm to human health and the environment.

The following site management plan (refer to **Figure 6**) outlines the consideration and measures taken to contain sediment and litter from construction on-site and to protect the receiving drain and downstream waterways. The measures include such things as covering stockpiles, designated wash-down areas, stabilised gravel entrance and protection to all receiving drains.

The EPA Victoria website also provides information about following a risk-based approach to preventing and minimising impacts from erosion and sedimentation.

E: Site management plan

E1: Statement outlining the environmental protection measures to protect the stormwater system during construction (e.g.. sediment, dust, waste, chemicals management).



E: Site management plan
E2: Site management
measures shown on a plan.

Figure 6: Proposed site management plan

Note: Where the access way slopes down toward the road, a diversion hump should be installed across the stabilised access to direct stormwater runoff to the side where it can be filtered by the silt fence.

Relevant links

For larger scale developments (10 or more dwellings or over 1000m²), consider developing a site management plan that addresses environmental risk, or an Environmental Management Plan (EMP) – guidelines are available at:

 Environmental Management Plan Guidelines (Commonwealth of Australia): <u>https://www.environment.gov.au/system/files/resources/21b0925f-ea74-4b9e-942e-a097391a77fd/files/environmental-management-plan-guidelines.pdf</u>

Other useful resources include:

- Site Environmental Management Plan kit (Melbourne Water): https://www.melbournewater.com.au/planning-and-building/developer-guides-and-resources/standards-andspecifications/develop-site
- Guidance on reducing erosion and sedimentation risk (EPA Victoria): https://www.epa.vic.gov.au/for-business/find-a-topic/erosion-and-sediment/advice-for-businesses
- Assessing and controlling risk: A guide for business EPA publication 1695 (EPA Victoria): <u>https://www.epa.vic.gov.au/about-epa/publications/1695-1</u> This guide is also available in languages other than English.
- Construction techniques for sediment pollution control EPA publication 275 (EPA Victoria): https://www.epa.vic.gov.au/about-epa/publications/275
- Construction Guide to preventing harm to people and the environment EPA publication 1820 (EPA Victoria):

https://www.epa.vic.gov.au/about-epa/publications/1820

Outlines how to manage risks in construction, provides an outline of your legal obligations, what actions you can take to comply with the new laws, and contains a list of common hazards and information about how to manage waste. The guide does not tell you about the controls to put in place to suit your circumstances.

• Civil construction, building and demolition guide – EPA publication 1834 (EPA Victoria):

https://www.epa.vic.gov.au/about-epa/publications/1834

Supports industry to eliminate or reduce the risk of harm to human health and the environment through good environmental practice. It provides an overview of the duties under the new laws, outlines a risk based approach for assessing and managing risks, and includes information on controls that you can put in place to manage your risks.

F: Asset maintenance program

Note: This section may be required by your council. Check with your council for further advice on what is required. A suggested list is provided in the checklist.

Although an asset maintenance program is not a requirement under this standard, some councils may require maintenance schedule detailing, including inspection of WSUD assets, schedule of maintenance, and responsibilities (i.e. future tenant, owner, body corporate, etc).

In order to protect our waterways and enhance the function, aesthetics and amenity associated with WSUD, it is important that these assets are maintained so they continue to operate as designed.

In this case, in order to maintain the aesthetic and function of the raingarden, the litter will need to be removed at regular intervals (approximately monthly, as required). The management of the raingardens and tanks will be the responsibility of the landowner.

Note: It is suggested that councils recommend to property owners that they record the location and details of their buried on-site stormwater devices and attach it to property title documents. Councils should also consider recording information about the location of buried stormwater infrastructure on private land where required as part of a planning permit, to support future asset management and/or enforcement.

Relevant links

- WSUD Maintenance Guidelines (Melbourne Water): https://www.melbournewater.com.au/media/636/download
- WSUD Audit Guidelines (Stormwater Victoria): https://www.musicauditor.com.au/node/36
- WSUD Maintenance Manuals (City of Port Phillip):
- Rainwater tanks: https://manualzz.com/doc/7441220/rainwater-tanks---city-of-port-phillip
- Raingardens: <u>https://www.portphillip.vic.gov.au/media/dd1n33yv/maintenance_manual_raingarden.pdf</u>