

# Non-residential buildings and works (such as commercial & retail)

Stormwater planning requirements development scenario



## Acknowledgment

We acknowledge and respect Victorian Traditional Owners as the original custodians of Victoria's land and waters, their unique ability to care for Country and deep spiritual connection to it. We honour Elders past and present whose knowledge and wisdom has ensured the continuation of culture and traditional practices.

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.

The generic 'building and works' checklist is referred to throughout the example. The checklist is a handy reference guide to be used in conjunction with the detailed worked example and indicates the minimum information that should be included in a stormwater report lodged with the planning application. This worked example 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 non-residential buildings and works, such as offices or industrial warehouses. The stormwater management response is required to comply with Clause 53.18-5 (Stormwater management objectives for buildings and works) and 53.18-6 (Site management objectives) under the Victoria Planning Provisions (VPP). The requirements discussed apply irrespective of the site being subdivided in the future.

This example can be used for other proposals, such as a large commercial retailer, a supermarket, or for multiple commercial tenancies under one roof. In this example the site is large enough to provide on-site car parking and utility areas associated with the development. It can be adapted for smaller commercial developments with these features.

The application 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 starting the stormwater report.

Zone	Development Type	IWM/Stormwater clause	Site Management clause
RESIDENTIAL	Subdivisions	<u>56.07</u>	<u>56.08</u>
	Apartments (buildings & works)	<u>55.07-5 B39</u> <u>58.03-8 D13*</u>	At responsible authority's discretion ( <u>65.01</u> )**
	Multi-dwelling (buildings & works)	<u>55.03-4 B9</u>	At responsible authority's discretion ( <u>65.01</u> )**
NON-RESIDENTIAL	Subdivisions	<u>53.18-4 W1</u>	<u>53.18-6 W3</u>
	Buildings & Works	<u>53.18-5 W2</u>	<u>53.18-6 W3</u>

\* 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 53.18

### 53.18-5 Stormwater management objectives for buildings and works

- To encourage stormwater management that maximises the retention and reuse of stormwater.
- To encourage development that reduces the impact of stormwater on the drainage system and filters sediment and waste from stormwater prior to discharge from the site.
- To encourage stormwater management that contributes to cooling, local habitat improvements and provision of attractive and enjoyable spaces.
- To ensure that industrial and commercial chemical pollutants and other toxicants do not enter the stormwater system.

### 53.18-6 Site management objectives

- To protect drainage infrastructure and receiving waters from sedimentation and contamination.
- To protect the site and surrounding area from environmental degradation prior to and during construction of subdivision works.

## Standards

The requirements for Standard W2 and W3 are listed in the table below.

**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.**

	Clause	Standards
For new building >50 m <sup>2</sup>	53.18-5	<b>Standard W2:</b> The stormwater management system should be designed to: <ul style="list-style-type: none"><li>• 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).</li><li>• Minimise the impact of chemical pollutants and other toxicants including by, but not limited to, bunding and covering or roofing of storage, loading and work areas.</li><li>• Contribute to cooling, improving local habitat and providing attractive and enjoyable spaces.</li></ul>

Clause	Standards
53.18-6	<p><b>Standard W3:</b></p> <p>An application should describe how the site will be managed prior to and during the construction period and may set out requirements for managing:</p> <ul style="list-style-type: none"><li>• Erosion and sediment.</li><li>• Stormwater.</li><li>• Litter, concrete and other construction wastes.</li><li>• Chemical contamination.</li></ul>

## Worked example

The stormwater report presented by the applicant should provide all the information listed in the checklist. This example is conceptual level and focuses on the elements required to satisfy the relevant criteria of Clause 53.18-5 and 53.18-6 (standards W2 and W3) only. Certain 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 site is an existing 6000m<sup>2</sup> commercial block, to be developed into a proposed new 'large restricted retail' premises with car parking. The store has 4225m<sup>2</sup> impervious building area and 612m<sup>2</sup> impervious parking area for customers, plus an additional 250m<sup>2</sup> paved driveway and 104m<sup>2</sup> paved walkway. The building services 30 staff members on average each day. The site is located in a Commercial 2 Zone.

- 30% of the total roof area is drained to a rainwater tank, with overflows directed to the street drainage. The harvested roof runoff is supplied to toilets.
- 50% of the roof drains to a tree pit raingarden (45m<sup>2</sup>) located adjacent to the building.
- 20% of the roof area remains untreated and discharged to the street drainage.

Runoff from the carparks, driveway and walkway are directed to a series of tree pit raingardens 80m<sup>2</sup> in area. Tree pit raingardens have been chosen to maximise greening to the site. They provide passive irrigation to trees via biofiltration basins, to which surrounding hard surfaces are drained. Trees and native tussock grasses are planted in the raingardens contributing towards cooling and providing attractive and enjoyable spaces.

#### A: Proposed development description

- A1: Describe the proposed development i.e. describe the land use, anticipated tenancy, buildings and works, number of car parking spaces, expected number of occupants, etc.

## B: Stormwater site layout plan, catchment areas and WSUD treatment systems

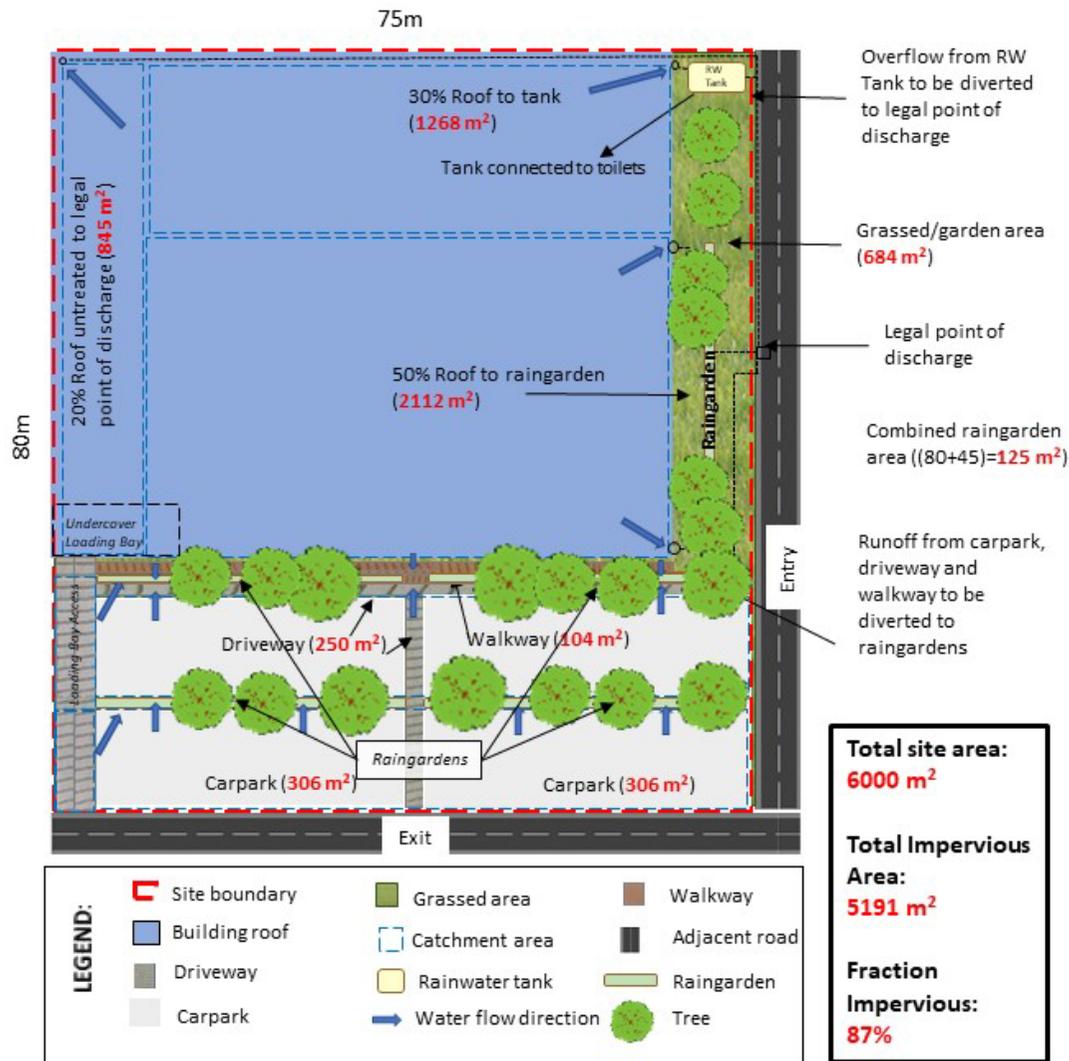


Figure 1: Site layout plan with stormwater treatment

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

- B1:** Provide a site layout plan showing all building roofs and covered areas, pervious (unsealed) surface areas and impervious (sealed) surface areas with dimensions. These details must be consistent with the plans and other documents lodged with the planning application.
- B2:** Show the site boundary, dimensions, and total site area on the site layout plan.
- B3:** Show the legal point of discharge (see checklist for further description).
- B4:** Specify the area draining to each downpipe, treatment and legal point of discharge – includes both impervious and pervious areas (see checklist for further description)

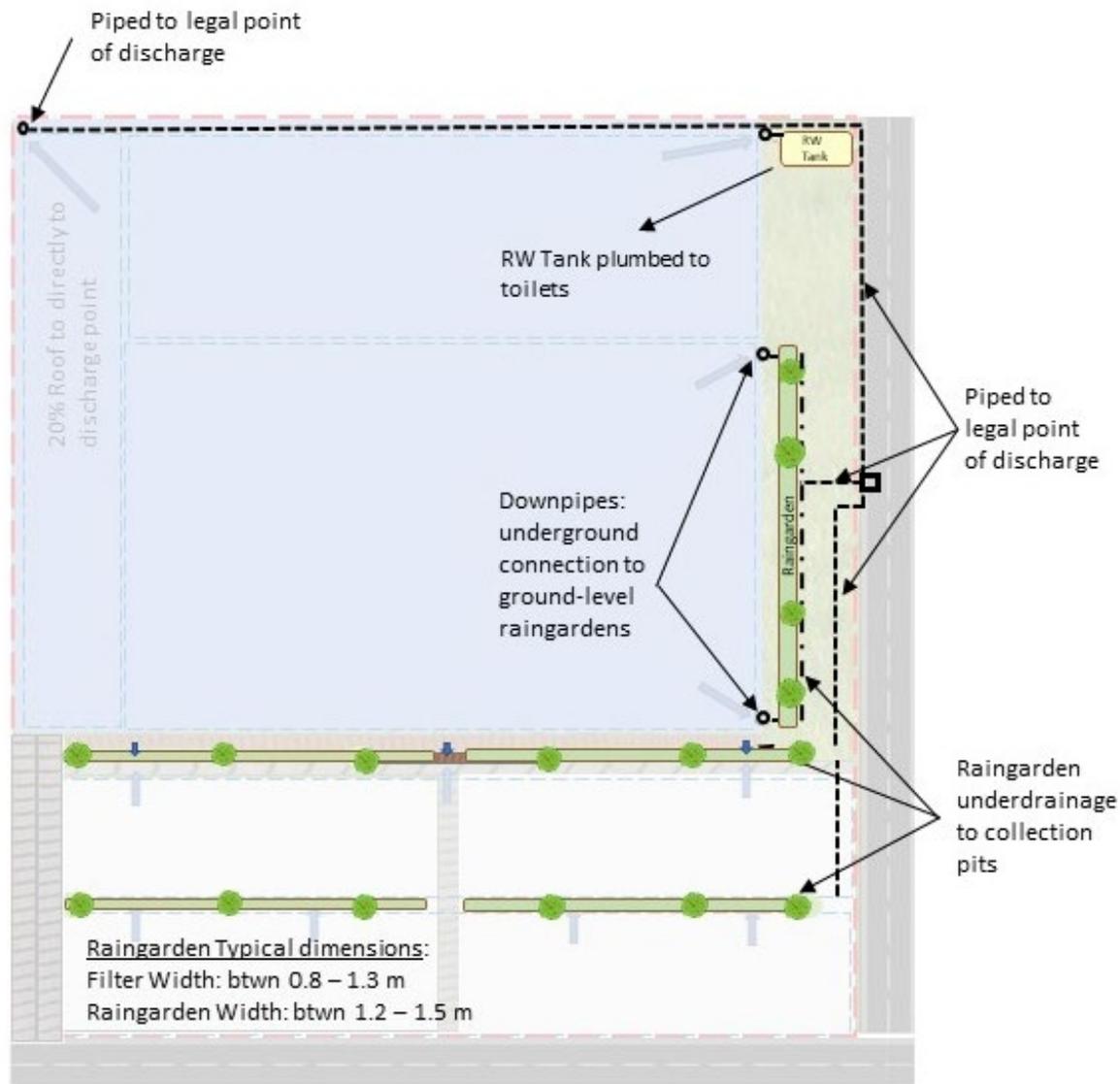


Figure 2: Drainage plan for design solution

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

- B5:** Show the location, type and surface area (m<sup>2</sup>) of the proposed WSUD treatment systems on a plan, including how each internal catchment area to be treated will be connected to a WSUD element (e.g. roof to rainwater tank, driveway to raingarden). Show how piped connections will be made within the site and to the LPOD and clearly annotate any impervious areas not being treated by a WSUD element.
- B8:** Describe how the stormwater management design contributes to local cooling, improving local habitat outcomes and providing attractive/enjoyable spaces.

The Water Sensitive Urban Design (WSUD) solutions to meet best practice water quality and cooling/amenity objectives of Clause 53.18 Standard W2 are:

- Roof area (30%) harvested and supplied for toilet flushing demand for 30 staff.
- Roof area (50%) treated by raingarden.
- Carpark, driveway and walkway surfaces treated by raingarden.

**Table 1: Catchment type or WSUD asset surface area**

Catchment area	Area (m <sup>2</sup> )	Area as a per cent of site area	Area treated by	Treatment size
50% roof	2,112m <sup>2</sup>	35.2%	Raingarden	45.0m <sup>2</sup>
30% roof	1,268m <sup>2</sup>	21.1%	Rainwater tank for 30 staff toilet flushing (20L/pp/day =0.6kL/day)	15,000 Litres (15kL)
20% roof	845m <sup>2</sup>	14.1%	No treatment	-
Carpark + driveways	862m <sup>2</sup>	14.4%	Multiple raingardens	80.0m <sup>2</sup>
Walkway	104m <sup>2</sup>	1.7%	Raingarden (included in above)	-
Garden	684m <sup>2</sup>	11.4%	-	-
Raingarden	189m <sup>2</sup>	2.1%	-	-
<b>Total</b>	<b>6,000m<sup>2</sup></b>	<b>100.0%</b>	-	-

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

**B6:** Indicate the expected volume of on-site stormwater reuse and how this has been calculated.

**B9:** Table summarising the internal drainage catchment areas shown on the site layout plan, the size of the catchment area, the percentage of the site this represents and information about the corresponding WSUD treatment system. The table should equal 100% of total site area. The information should correspond to the information shown on the site layout plan.

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

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). This is discussed further at the end of the example and your local council should be consulted for specific requirements at planning stage.

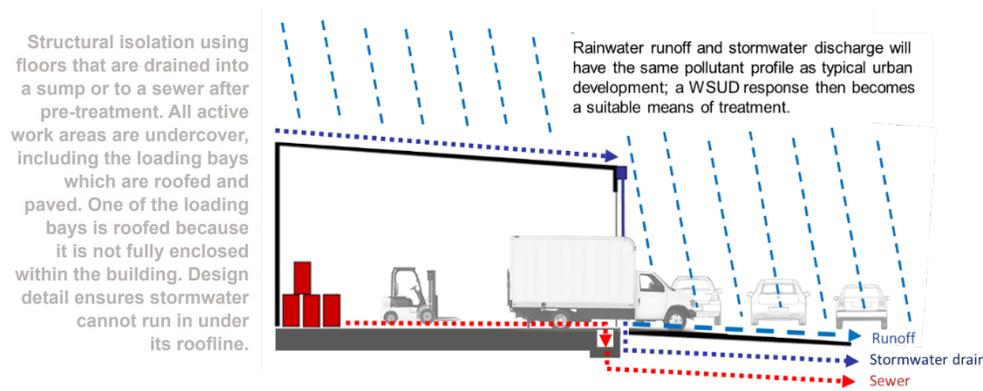
### Relevant links

- Urban Stormwater Best Practice Environmental Management Guidelines (Victorian Stormwater Committee): <http://www.publish.csiro.au/book/2190>
- 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): <https://www.publish.csiro.au/book/4974/#contents>
- Infrastructure Design Manual (IDM) (Local Government Infrastructure Design Association): <https://www.designmanual.com.au/download-idm>

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

- **B7:** If relevant to the development type, identify potential toxicants generated by the business, where they will be located on the premises and what structural isolation is required to prevent the runoff draining to a WSUD treatment system or stormwater drain.

Standard W2 requires measures to minimise the impact of chemical pollutants and other toxicants. The detailed response for the management of toxicants generated from the building is to be included in the detailed design. Risk of toxicants to the stormwater system will also be partly managed through the new general duty to prevent harm, as part of the new Environment Protection Act in mid-2021. All toxicants are to be isolated from interaction with runoff through the use of roofing, bunding, capture and disposal – as per the following diagram:



**Figure 3: Structural isolation design for management of industrial toxicants**

## C: Modelling and compliance

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.

The raingardens and tree pits also provide the combined benefits of cooling and adding enjoyable aesthetics for inhabitants and visitors to the complex. The building is designed to effectively manage any pollutants or chemicals generated on-site by avoiding interaction with stormwater runoff.

MUSIC software was used to model the treatment performance of the proposed site design as shown in the model schematic in **Figure 4**. The modelling details are summarised in **Table 2** and **Table 3**. Other modelling software (e.g. STORM, InSite Water) may be used instead, as appropriate and acceptable to Council - an example STORM output is shown in **Table 5** at the end of this section.

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

### C: Modelling and compliance

- C1:** Compliance summary with objectives outlined in Clause 53.18.
- C2:** STORM report with a minimum 100% rating or MUSIC (or other acceptable modelling) results that meets best practice performance for stormwater pollutant load reductions: TSS 80%; TP 45%; TN 45%; Litter 70%.
- Summary of model input parameters, including each WSUD treatment system.
- Screen print of model analysis (e.g. STORM report) or a schematic of the model (e.g. for MUSIC).
- If MUSIC: Check MUSIC file using the MUSIC auditor (<https://www.musicauditor.com.au/>).
- The applicant should submit a copy of the MUSIC file (.sqz) used to generate treatment performance.

**Table 3: WSUD asset parameters**

Rainwater tank		Raingarden	
Size	15kL	Combined area	125m <sup>2</sup>
Demand (30 staff @20L/day toilet flushing demand)	600L/day	Extended detention depth (EDD)	150mm
		Tree media depth	700mm
		Tree media hydraulic conductivity	50mm/hr
		Saturated zone	300mm
		Orthophosphate content of filter media	30mg/kg

In order to reach the performance target within the limitations of the site, car park raingardens are somewhat oversized for the catchment at 80m<sup>2</sup> (9.2% of catchment). This has the benefit of increasing greening benefits for the site, however consideration needed to be given to certain aspects of design. The submerged zone is increased to 300mm in the car park raingardens to aid water retention. This affected the phosphorus treatment performance. In order to meet the total phosphorus reduction target, a filter media with low orthophosphate content is required to be used. This type of detail requires special consideration at the design specification and especially construction phase. Note that the tree media hydraulic conductivity is lower than the typical recommended range for a biofiltration raingarden, however has been justified in the passive irrigation design used in this example.

**C: Modelling and compliance**



**C3:** Minimises impact of chemical pollutants and other toxicants, as relevant.

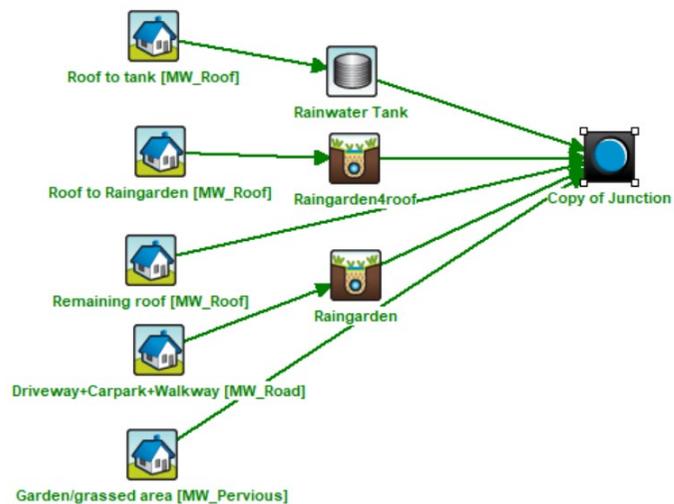


Figure 4: MUSIC model schematic

Table 4: MUSIC modelling compliance results

	Sources	Residual load	% Reduction
Flow (ML/year)	3.11	2.68	13.8
Total suspended solids (kg/year)	269	33.3	87.7
Total phosphorus (kg/year)	0.717	0.297	58.5
Total nitrogen (kg/year)	7.16	3.78	47.2
Gross pollutants (kg/year)	110	18.2	83.4

Compliance rating using STORM = 106%

*Note: For a commercial building it is fair to assume that the number of occupants in the building is equal to the number of bedrooms in STORM, if toilet flushing demand is the only demand used. If there are more than 100 occupants, then the tank will need to be split, and occupants' usage spread across multiple tanks in STORM – checking that the total tank volume is not greater than the actual tank.*

**Table 5: STORM modelling compliance results**

Development type: Commercial/Retail

Allotment site (m<sup>2</sup>): 6,000.00

STORM rating %: 106

Description	Impervious area (m <sup>2</sup> )	Treatment type	Treatment area / volume (m <sup>2</sup> or L)	Occupants / number of bedrooms	Treatment %	Tank water supply reliability (%)
Roof_1_to raingarden	2,112.00	Raingarden 100mm	45.00	0	128.70	0.00
Roof_1_to tank	1268.00	Rainwater tank	15,000.00	30	48.60	94.00
Walkways carpark	966.00	Raingarden 100mm	80.00	0	133.35	0.00

### Relevant links

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

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

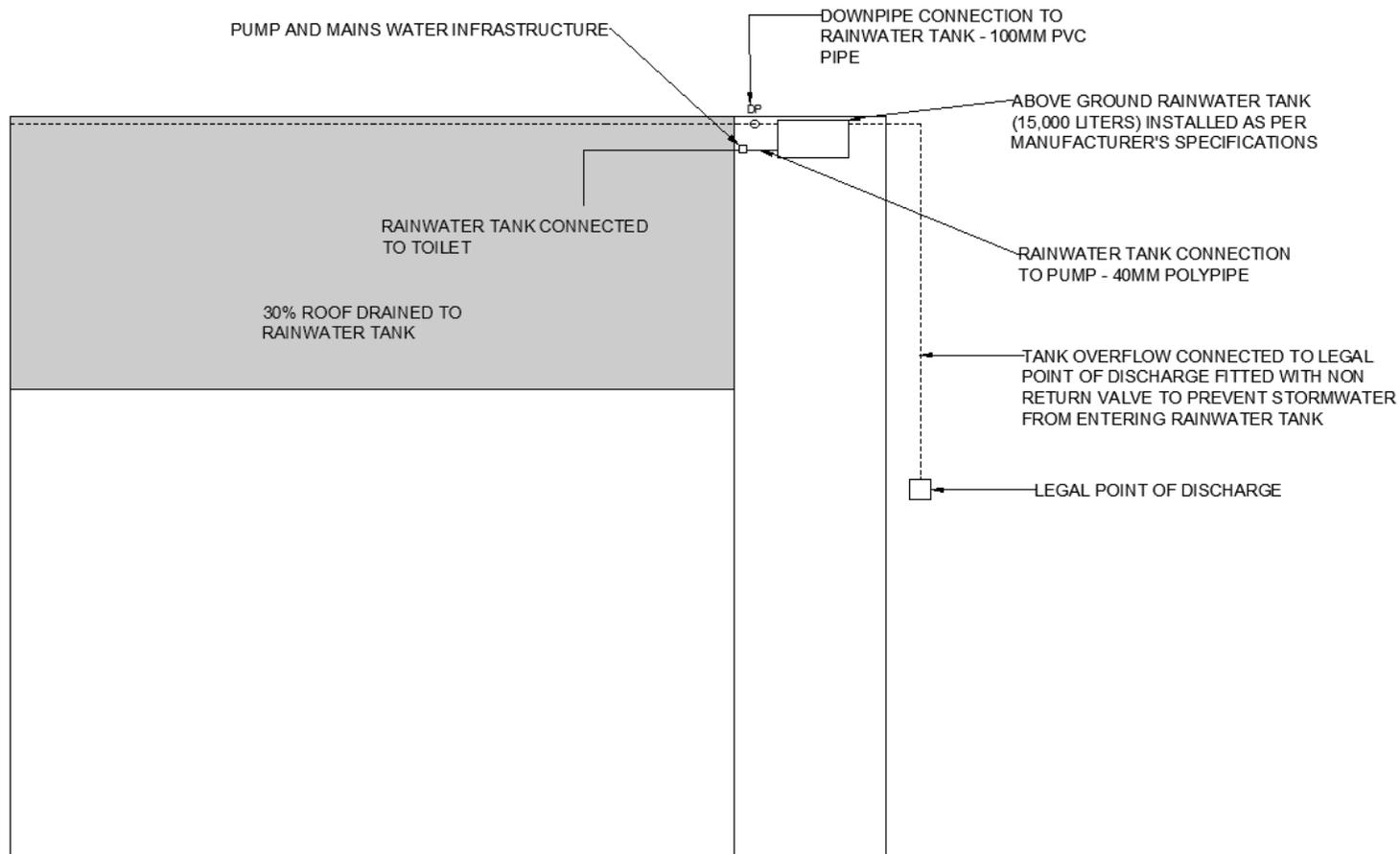


Figure 5: Rainwater tank concept design plan

### 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.

## Tree pit raingarden

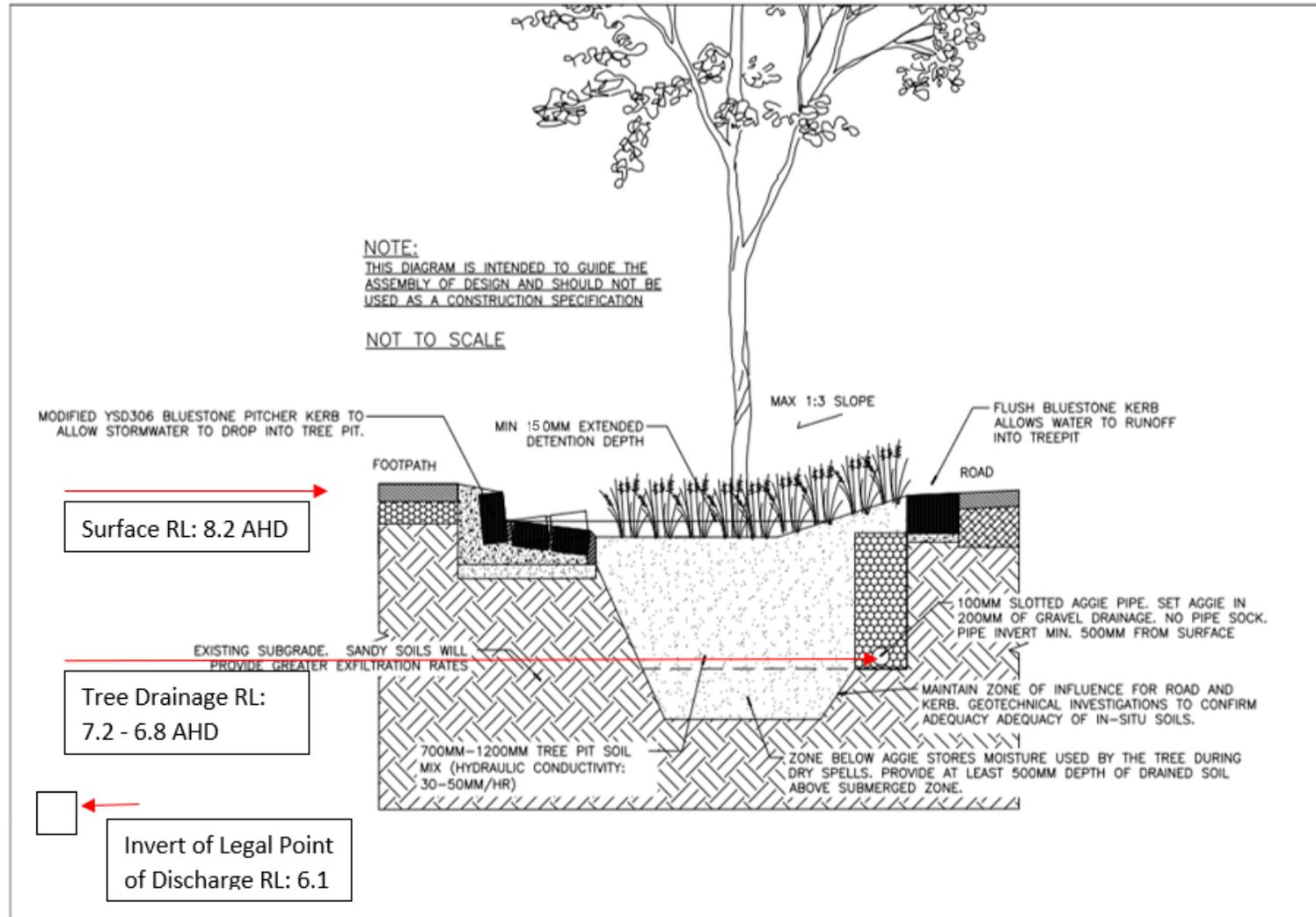


Figure 6: Tree pit raingarden cross section – for all raingardens

### D: Functional design considerations

- D5:** Levels for each WSUD treatment including surface level, extended detention depth, filter layers and depth, under drain system, legal point of discharge.
- D6:** Plant species and planting densities to be used in any vegetated treatment systems. Refer to checklist.
- D7:** For vegetated treatment systems, management of the interface between the WSUD treatment and immediately surrounding areas, e.g. car parking spaces, walkways, lawns, so that the WSUD elements and public safety are protected.

Table 6: Plant species preferences

Recommendations for plant types*	
Tree type	<i>Lophostemon confertus</i> (Brush Box Tree)
Vegetation for raingarden	<i>Ficinia nodosa</i> (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/m<sup>2</sup> 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 buildings 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):  
<https://www.publish.csiro.au/book/4974/#contents>
- Adoption Guidelines for Stormwater Biofiltration Systems (CRC for Water Sensitive Cities):  
<https://watersensitivecities.org.au/content/stormwater-biofilter-design/>
- Infrastructure Design Manual (IDM) (Local Government Infrastructure Design Association):  
<https://www.designmanual.com.au/download-idm>
- Trees for Cooler and Greener Streetscapes - Guidelines for Streetscape Planning and Design (DELWP)  
<https://www.planning.vic.gov.au/policy-and-strategy/planning-for-melbourne/plan-melbourne/cooling-greening-melbourne/trees-for-cooler-and-greener-streetscapes>

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:

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

## E: Site management plan

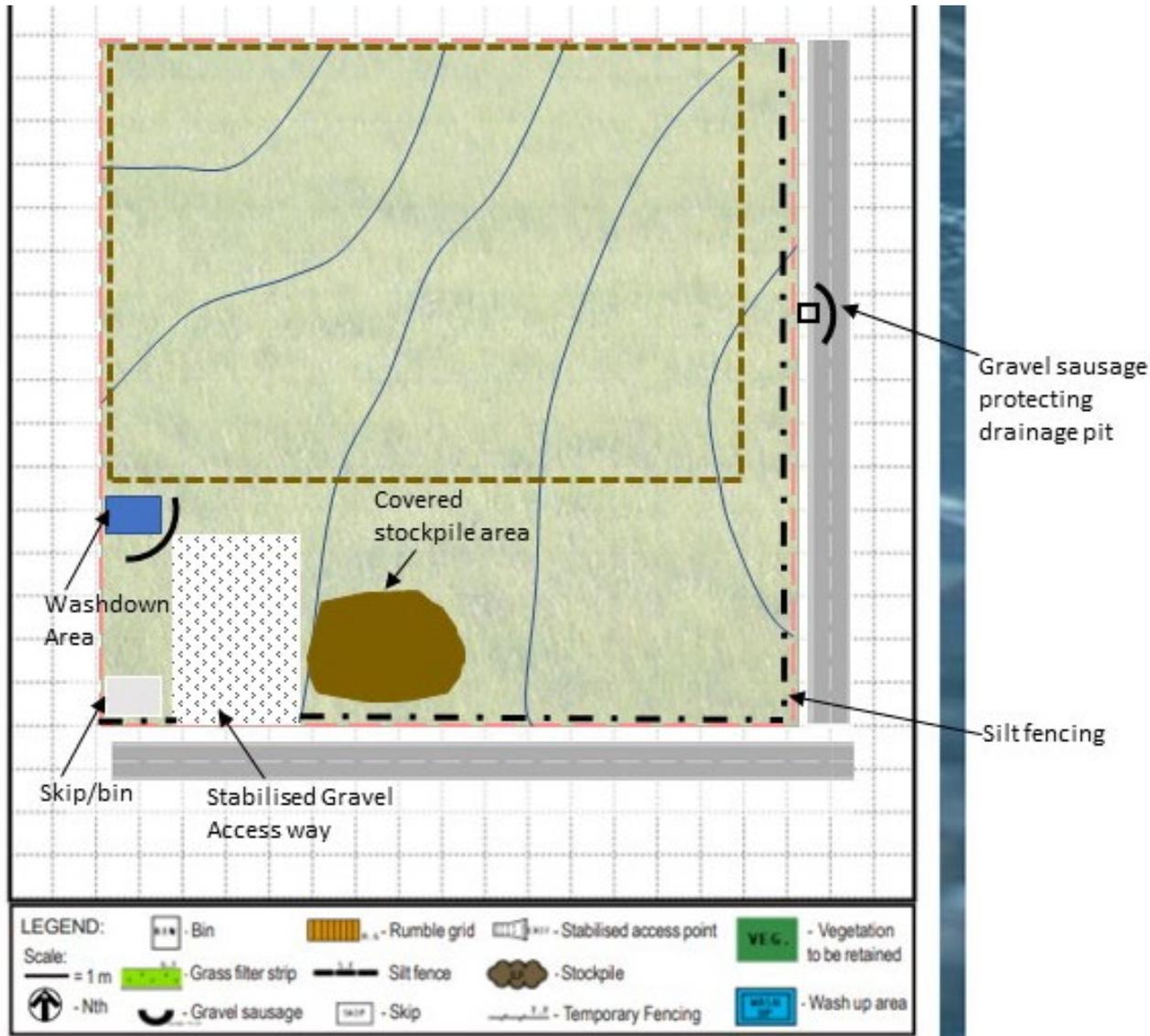
Many Victorian councils require a site management plan to be submitted and approved before site works begin, so check with council on specific requirements. Site management plans help you record the way you manage risk and may help with your planning. If a pollution incident happens, they may also help demonstrate to Environment Protection Authority (EPA) Victoria what steps you have taken to meet your general environmental duty (GED) (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 7**) outlines the consideration and measures taken to contain sediment and litter from construction on-site and to protect the receiving drain and downstream waterways. Such measures include 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 7: 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 1000m<sup>2</sup>), 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):  
<https://www.environment.gov.au/system/files/resources/21b0925f-ea74-4b9e-942e-a097391a77fd/files/environmental-management-plan-guidelines.pdf>

Other useful resources include:

- Site Environmental Management Plan kit (Melbourne Water):  
<https://www.melbournewater.com.au/planning-and-building/developer-guides-and-resources/standards-and-specifications/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):  
<https://www.epa.vic.gov.au/about-epa/publications/1695-1>  
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: [https://www.portphillip.vic.gov.au/media/dd1n33yv/maintenance\\_manual\\_raingarden.pdf](https://www.portphillip.vic.gov.au/media/dd1n33yv/maintenance_manual_raingarden.pdf)

