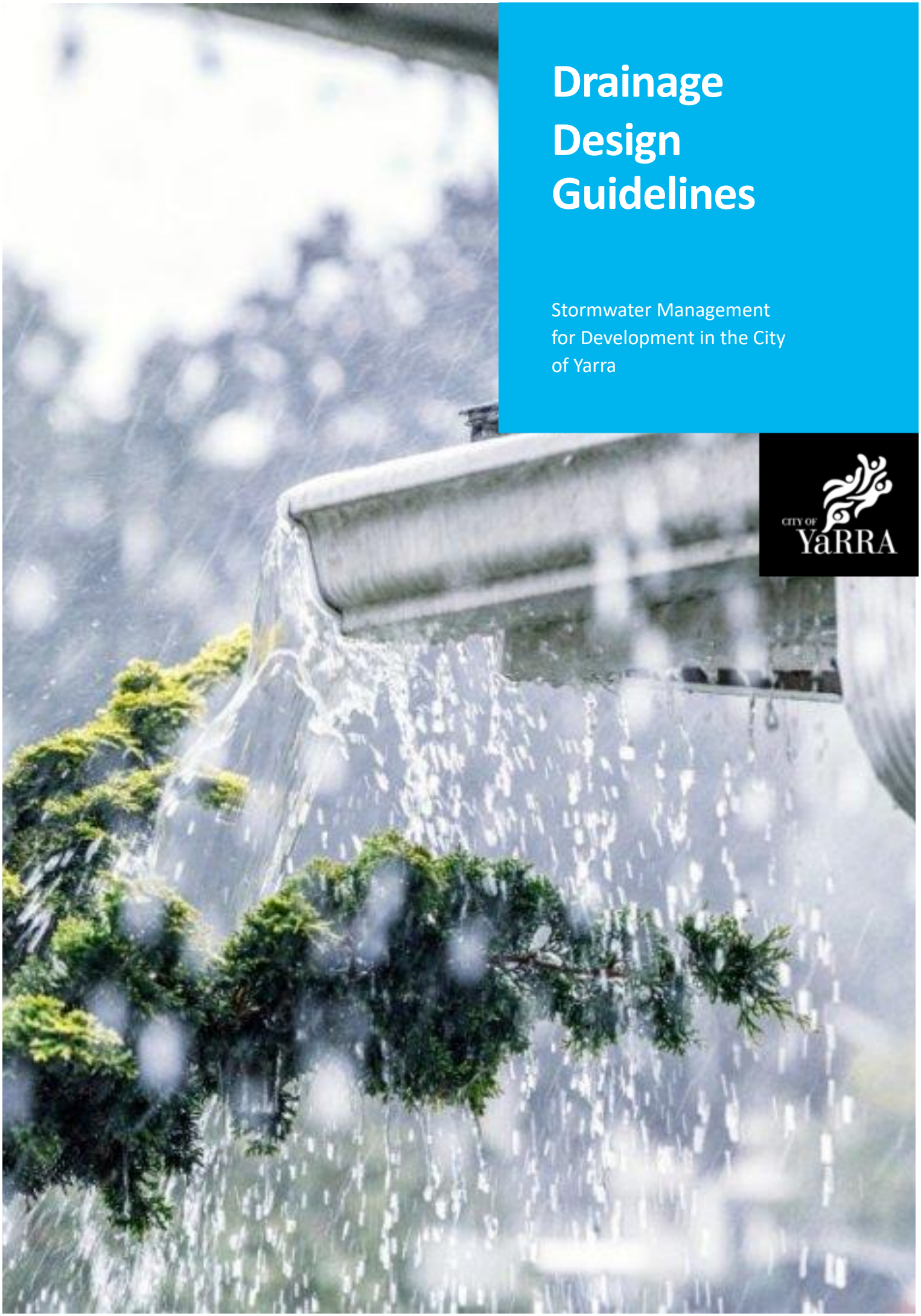
Drainage Design Guidelines

Stormwater Management for Development in the City of Yarra



Yarra City Council acknowledges the Wurundjeri Woi Wurrung people as the Traditional Owners and true sovereigns of the land now known as Yarra. We also acknowledge the significant contributions made by other Aboriginal and Torres Strait Islander people to life in Yarra. We pay our respects to Elders from all nations and to their Elders past, present and future.

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1. Purpose of the Guidelines

The purpose of this Guidelines is to outline the design requirements for stormwater drainage systems within private development sites located in the City of Yarra. These include, single dwelling, multi-unit Development, apartment, infill re-development, industrial and commercial type developments.

The guidelines include requirements for calculating stormwater conveyance, detention, and treatment.

These Guidelines form part of the response to City of Yarra's," Integrated Water Management (IWM)" policy and both State and Local Planning Provisions.

This document is to be read in conjunction with Council's relevant strategies, policies, guidelines, requirements, and standards as they relate to the management of urban stormwater in the city landscape.

2. Stormwater System Design Requirements

Following the issue of the planning permit, the Design Stage focusses on the detailed design response for the development, as per permit conditions and this Drainage Design guideline. The stormwater management system designed for the development, must be undertaken in accordance with Council's design standards and guidelines, and to the satisfaction of council and/or relevant other authorities (where applicable).

Detailed design documentation should include design plans and cross sections at a level suitable for tendering and construction, with supporting computations and investigations provided. Depending on the nature of the proposed development (type) the required documentation detail is outlined in Appendix C.

The documentation submitted should also include a completed Checklist (refer Appendix A) accompanied by a signed cover letter with applicant details and planning permit reference.

2.1 Minor and Major flow management

Minor stormwater flows are produced during typical (smaller) storm events and are conveyed through the underground pipe drainage network. The minor stormwater system must be designed to capture events with the following Annual Exceedance Probabilities (AEP), based on the type of development proposed. Table 1 below shows the minimum design capacity requirements for the minor drainage system.

Table 1 - Minor flows – stormwater system design capacity

Development type	Design capacity (AEP)	Design capacity (ARI)
Residential	20% AEP	1 in 5 ARI
Industrial	5% AEP	1 in 20 ARI

Commercial	10% AEP	1 in 10 ARI
Major commercial	5% AEP	1 in 20 ARI

Major stormwater flows occur when rainfall events exceed the capacity of the underground drainage system. During these larger storm events, excess stormwater is conveyed overland via roads, open channels, reserves, easements, and other designated overland flow paths.

The major overland flow path must be designed to safely discharge stormwater during major rainfall events without posing unacceptable risks to public safety, property, buildings, or critical infrastructure. Overland flow paths must direct stormwater to a confirmed point of discharge while minimising adverse impacts on adjoining properties and the surrounding environment.

Unless otherwise approved by Council, the major drainage system must be designed for the 1% AEP (1 in 100 ARI) storm event. Consideration must also be given to the potential impacts of blockage, surcharge, and climate change where applicable.

Finished surface levels and building floor levels must be designed to provide appropriate freeboard above the applicable major flood level in accordance with Council and relevant authority requirements.

3. Legal Point of Discharge (LPD)

A Legal Point of Discharge (LPD) is nominated by Council as the site's point of connection from the property boundary (private land) to discharge stormwater runoff to the local stormwater network (public land). This stormwater connection may be to a Council, Melbourne Water or VicRoads stormwater asset. Generally, the LPD is located towards the lowest side of the property. However, due to the topography of the site, Council will allocate the most appropriate (convenient, closest) stormwater asset to the development site.

The applicant is responsible for complying with all relevant authority requirements, including any applicable conditions and design standards for these connections.

The LPD advised for the development, may be connection to:

- a Council underground pit or pipe asset
- the street kerb and channel to the front of the property subject to additional requirements and fees
- a drainage easement or asset in the rear of the property
- direct discharge to / over a laneway surface
- a table drain, open earthen channel, vegetated or grassed swale, or treatment biofiltration system
- a Melbourne Water pit, pipe, channel, drain, or waterway (subject to Melbourne Water conditions, refer to section 3.3.9)
- a VicRoads pit, pipe, channel, drain, or other stormwater asset (subject to VicRoads conditions, refer to section 3.3.10).

3.1 Drainage Levy

Where an appropriate connection to an accessible and appropriate stormwater asset is not possible, and the discharge is over a surface (e.g., kerb and channel, or laneway surface), Council will notify the applicant of the contributing fee to be charged, for connection to a Council asset. The fee represents the development's contribution to the future upgrading of the stormwater network in that local area. The fee is calculated based on the contributing surface area of the property as per Councils existing Drainage Contribution Policy.

Depending on the development type (and complexity), minimum requirements on existing / proposed property details may need to be accompanied with more site-specific details. Additional information may be requested by Council to complement (support) the LPD application.

For instance, a geotechnical investigation report may be required if underground structures are proposed and/or significant excavation is planned; or a soil contamination report is required due to concerns of former land use history/past known activity; or high risk of groundwater intrusion or shallow water table at the location.

The LPD section of the Checklist provided in these Guidelines must be completed, signed, and submitted with the LPD application, to confirm that the relevant (additional) data requested, has been supplied.

3.2 LPD Application process

The application process for Legal Point of Discharge (LPD) is undertaken through Council's Engineering Services or Building Services Units in accordance with Section 610 of the Building Regulations, 2006. Council's website has further Information on stormwater and legal point of discharge, and how to apply.

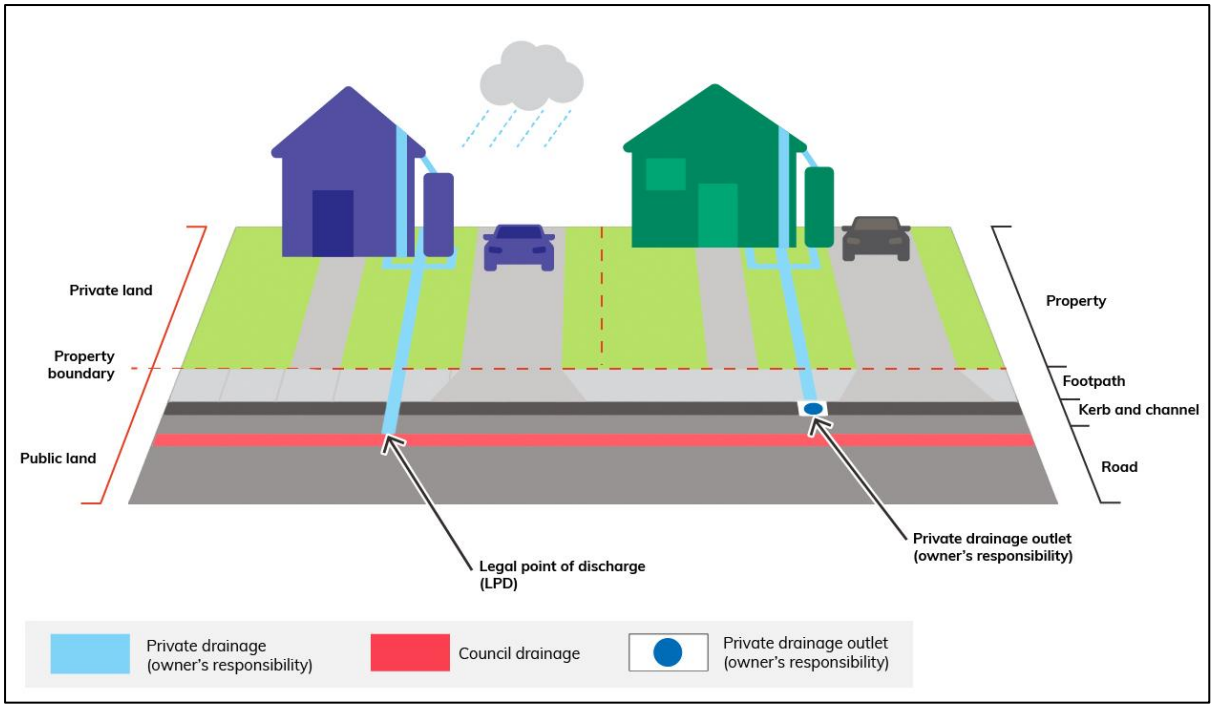
Council will nominate the legal point of discharge and specify any requirements to be included in the design of the internal (private) stormwater management system. The requirements include, but are not limited to, the following:

- LPD connection point
- Permissible Site Discharge (PSD)
- Onsite Detention (OSD) parameters
- Flood and overland flow
- Groundwater control
- the sustainable measures

Council will issue a LPD letter response to the applicant including the above information. The applicant is required to submit the detailed design of the internal drainage system for assessment and approval prior to commencement of works onsite, complying with all requirements outlined in the LPD letter.

Figure 1 below illustrates a typical drainage layout, including asset ownership and responsibility boundaries. The following sections provide design guidance for the various types of LPD connections

Figure 1 – Typical drainage layout and delineation of responsibility



3.3 Connection options to LPD

Depending on the location of the planned development in relation to the Council (or others') stormwater network, the nominated LPD may vary by type of connection at point of discharge, along with specific requirements to accommodate the type of connection.

Connections must be undertaken in accordance with required standards and ensure connections are sound, secure, and free flowing otherwise will not be accepted by Council. Poor connections of inlet pipes extending into the receiving (council) pit or pipe will not be approved/accepted and will require applicant to rectify.

3.3.1 LPD for single dwellings and extensions

If the proposed extensions and single dwelling developments covers less than 70% of the land, the development do not require a separate application for the assessment of detailed design plans. The applicant can directly submit the detailed design plans when submitting the LPD application form.

The allocated point of discharge must be designed in accordance with these Guidelines and can be assumed to be one of the following:

- to the existing internal system, given that it's been proved on site to be in good working condition by a licensed plumber
- to the current LPD location, given that it's been proved on site to be in good working condition
- to an additional connection discharging overland to kerb or laneway.

If the submission is compliant, the LPD application response will outline the allocated discharge location for the development (assumed prior to submission) and provide approval for the submitted drainage plan.

3.3.2 Pipe connection (existing)

Connection can be made directly to a Council stormwater pipe where:

- Council's pipe diameter is three (3) times larger than the incoming pipe. For example, a private stormwater pipe of 100mm diameter can only connect to a minimum 300mm diameter authority pipe
- Council's pipe is located within a road reserve, the pipe diameter must be a minimum of 300mm
- Council's pipe is located under the road pavement, the pipe diameter must be a minimum of 375mm
- Council's pipe must be in good condition (sound and clear) following connection. Council reserves the right to request a CCTV inspection of the receiving (Council) pipe, as necessary to inform its decision.

The connection must be made in accordance with Council's Standard Drawings and to the satisfaction of Council.

Council does not permit direct pipe connections to existing brick drains or other pipe materials of similar fragility (as determined by Council).

3.3.3 Pit connection (existing)

Connection can be made to an existing Council stormwater pit in accordance with Council's Standard Drawings and to the satisfaction of Council. The Council pit must be a minimum of 600 x 900mm in dimension and be in good condition.

If the existing pit is less than 600 x 900mm or in poor condition, it must be reconstructed to Council standards and satisfaction. Evidence of the pit condition must be submitted to Council for assessment, prior to approval of the connection.

3.3.4 New pit connection

Connection can be made by constructing a new Council stormwater pit over an existing Council stormwater pipe. The construction of a new pit must be in accordance with Council's Standard Drawings and the satisfaction of Council.

3.3.5 Kerb and channel connection

Connection can be made to the kerb and channel. However, it must be located adjacent to the property, unless otherwise directed by Council. Consideration must be given to the overall design to ensure that there is appropriate fall to the kerb and channel and no pipes or pits hold water. If this cannot be reasonably achieved, a new outfall drain may be required to be constructed, within the road reserve or easement.

A surcharge pit must be installed within the property boundary prior to the LPD pipe exiting the property and connecting to the network. The pit must be positioned to allow stormwater to surcharge towards the road reserve, unimpeded.

Connections to kerb and channel are not to be made within a vehicle crossing. The connection must be positioned at a minimum 200mm outside of the splay of the crossing/crossover, unless otherwise directed by Council.

The connection must be made in general accordance with Council's Standard Drawings and to the satisfaction of Council. However, Council may issue specific requirements, dependant on the material type of the receiving kerb (concrete, pitchers, sawn bluestone, dressed bluestone, etc). Table 2 outlines the requirements for the LPD discharge pipe connecting to the kerb and channel.

Table 2 - Pipe class/grade and cover details for private assets located withing the road reserve

Type	LPD connection type	Minimum cover (mm)	Minimum pipe size (mm)	Preferred pipe material	Pipe class/grade
Private	To kerb	50	ø100	Galvanised Steel (CHS) UPVC	250 Steel grade SN6, SN8 or SN10
		50	150 x 100	Galvanised Steel (RHS)	250 Steel grade
	Direct to pipe / pit	500	ø150	UPVC Reinforced Concrete Pipe (RCP)	SN8 or SN10 Class 4 or 6

Note 1: Minimum pipe grade of 1 in 100 for 100 mm diameter pipes, and 1 in 80 for 150 mm diameter pipes.

Note 2: Minimum velocities of 0.75 m/s for pipe running half full or greater, and 1.00 m/s for pipe running less than half full.

3.3.6 Laneway surface direct discharge

Connection can be made to a Council laneway by discharging directly over the surface of the laneway pavement. The discharge pipe must finish flush with the property boundary. The pipe invert must be positioned 150mm above the finished (surrounding) surface level of the laneway pavement at the property boundary.

3.3.7 Existing LPD within a property

Connection can be made to an existing LPD connection within the property, however a stormwater report including CCTV footage and findings, must be provided by a suitably qualified plumber who can verify the existing property is connected to an appropriate Council asset that is in good serviceable condition, to Council's satisfaction.

If the condition of the existing system is not to the satisfaction of Council, Council reserves the right to request rectification by the applicant in order to gain final approval for the connection. An inspection opening (IO) should be installed at the connection of the new pipe to the existing stormwater pipe.

3.3.8 Construction of an outfall drain

In the absence of an appropriate LPD, the construction of a new outfall pipe by the applicant, within an easement or road reserve, may be required and directed by Council. Council has a number of mandatory requirements for constructing a new Council stormwater asset, including:

- Preparation and submission of a drainage design plan to Council's satisfaction
- Payment of plan checking and supervision fees and lodgement of a works maintenance bond
- Hold point inspections
- CCTV footage and report
- As-Constructed Survey – D-SPEC and .dwg format
- As constructed plans.

In accordance with the *Subdivision Act 1988*, an estimated cost for the outfall works must be submitted to Council to allow appropriate calculation of fees to be applied, where the constructed asset is intended to be handed over to Council following a defects liability period. Under the Act, a three (3) month defects liability period applies to the outfall stormwater works.

The construction of assets that become Council's responsibility at handover, incur a:

- plan checking fee of 0.75% of the value of the works
- supervision fee of 2.5% of the value of the works
- works maintenance bond lodgement, to the value of 5% of the actual cost of the stormwater works.

During construction of the new Council asset, Council is required to inspect the works at various hold points, including:

- Prepared stormwater pipe bedding
- Prepared bedding for stormwater pits
- Formwork and reinforcement (where needed) for pit walls
- Connection of existing or new subsoil (aggie) pipes into new stormwater pit (e.g., for works behind kerb and channel)
- Compacted stormwater pipe haunching
- Compacted backfill.

Following construction (and prior to commencement of the defects liability period) and in accord with the Water Services Association of Australia (WSA) 05-2008 2.2 Code of Practice:

- CCTV footage and report findings for all new Council stormwater assets must be provided to Council for review
- the constructed Council assets must be surveyed in line with D-SPEC specifications with the report and electronic information submitted to Council for assessment and approval
- As-constructed engineering plans showing the location, type, depth and dimensions of the new Council stormwater drains and pits must be provided to Council standards.

- The as-constructed assets must also be surveyed and submitted as digital data in accordance with D-SPEC.

The works maintenance bond will be returned to the payee at the end of the defect's liability period provided that the works/assets have been maintained, and all defects are rectified to the satisfaction of Council. Table 3 outlines the design requirements for the outfall drain.

Table 3 - Pipe class/grade and cover details for public assets

Type	Location	Minimum cover (mm)	Minimum pipe diameter (mm)	Preferred pipe material	Pipe class /grade
Public	Behind kerb	500	375	Reinforced Concrete Pipe (RCP)	Class 4 or 6
	Under road pavement	500	375	Reinforced Concrete Pipe (RCP)	Class 4 or 6

Note 1: Minimum pipe grade of 1 in 100 for 100 mm diameter pipes, and 1 in 80 for 150 mm diameter pipes.

Note 2: Minimum velocities of 0.75 m/s for pipe running half full or greater, and 1.00 m/s for pipe running less than half full.

3.3.9 Connection to Melbourne Water assets

Council will identify if stormwater is required to connect to a Melbourne Water asset, at the Pre-Planning Stage (e.g., Stormwater Information Report, SIR) or at the Planning Stage (e.g., at Step/stage 1 of LPD two-step application process).

The applicant (developer) is required to apply to Melbourne Water for approval of any new or modified stormwater connection to a Melbourne Water asset. The applicant must submit the complete (internal system and LPD) detailed design documentation to Melbourne Water for assessment and approval. The design must comply with Melbourne Water requirements and include all Council requirements as stipulated in the Stage 1 LPD application process.

The applicant (developer) must provide written confirmation that Melbourne Water has approved the connection in accordance with the stormwater design documentation submitted to Council. Once the written confirmation is received, Council will commence the assessment and approval of the stormwater design plans in accordance with Step/Stage 2 of the LPD process.

3.3.10 Connection to VicRoads assets

Council will identify if stormwater is required to connect to a VicRoads asset (if connection to a Council or Melbourne Water asset is not feasible) at the Pre-Planning Stage (Stormwater Information Report request) and/or Stage 1 of the LPD two-step application process.

The applicant (developer) is required to apply to VicRoads for approval of any new or modified stormwater connection to a VicRoads asset. The applicant must submit the complete (internal system

and LPD) detailed design documentation to VicRoads for assessment and approval. The design must comply with VicRoads requirements and include all Council requirements as stipulated in the Step/Stage 1 LPD process.

The applicant must provide written confirmation that VicRoads has approved the connection in accordance with the stormwater design documentation submitted to Council. Once the written confirmation is received, Council will commence the assessment and approval of the stormwater design plans in accordance with Step/Stage 2 of the LPD process.

4. On-Site detention System (OSD)

The primary purpose of on-site stormwater detention within the City of Yarra is to limit the rate of discharge from a site to the downstream stormwater network, freeing up network capacity to reduce the risk / impact of flooding during more extreme rainfall events. This is achieved by controlling post development flow rates to a pre-determined level and temporarily storing excess runoff in storage tanks (or pipes) within a site boundary.

The On-Site Detention System must be designed in accordance with the following general requirements:

- Detention systems must be readily accessed for inspections and maintenance
- OSD must not be constructed under buildings, concrete slabs (i.e., inaccessible for maintenance)
- Where an existing dwelling/building is to remain, it must be connected to the OSD system
- OSD must be positioned in private land only, ideally in common property for multi-units
- Installation should remain outside Tree Protection Zones (TPZ). If unavoidable, non-destructive methods to be utilised and a qualified arborist to be consulted (any reports should form part of the submission of planning documentation).

The primary elements of an On-Site Detention System are:

- A runoff **collection system** consisting of gutters, downpipes, pits and pipes.
- A runoff **storage area** (Detention Pipes, Tank, or similar etc.)
- A **flow control device** (MultiCell, Orifice Pit) to allow discharge to the Legal Point of Stormwater Discharge at the Permissible Site Discharge rate.

The key calculations for the design of the On-Site Detention system are:

- Permissible Site Discharge (PSD) for 20% Annual Exceedance Probability (AEP) event
- Site Storage Requirement (SSR) for 10% AEP event

Please Note: No OSD requirement for an Extension of existing structure/ New Single Dwellings if proposed impervious area is less than 70% of the total site area.

4.1 Permissible Site Discharge (PSD)

The Permissible Site Discharge (PSD) is the peak flow rate allowed to be discharged from the proposed development to the nominated LPD (stormwater network). The PSD must be limited to:

- A 20% AEP flow rate (1 in 5 ARI)
- The equivalent of a 70% impervious site coverage, or the pre-developed discharge rate if it is less than 70% impervious site coverage.

The Permissible Site Discharge (PSD) is calculated using the Rational Method:

$$Q = \frac{C\ A\ I_{20}}{3600}$$

Where:

Q = Permissible Site Discharge (L/S)

I_{20} = Rainfall Intensity for 20% AEP event for a duration equivalent to associated Time of Concentration (mm/h)

A = Development site Area (m^2)

As a guide, the time of concentration (mins), can be determined from Table 1 and the rainfall intensity can be determined from BOM latest rainfall data Home | ARR Data Hub.

Table 4 - Time of concentration based on lot size

Land Use (Total lot Size)	Time of Concentration TC (mins)
≥4000 m^2	12
≥750 m^2	9
≥500 m^2	8
≥350 m^2	7
<350 m^2	6
Multi-Storey Development	5

4.2 Site Storage requirement (SSR)

All developments that require on-site detention must detain, at a minimum, the 10% AEP storm event. However, for cases where a safe overland flow path cannot be provided or where flows exceeding pipe capacity may impact the development or adjacent, upstream, or downstream properties, the requirement will be to detain the 1% AEP storm event.

Council will only accept detention calculation using the Swinburne OSD Method. A computer program such as InSite Water (or equivalent package) must be used to calculate detention storage, if it applies the Swinburne OSD Method.

The OSD modelling assumptions and outputs must be submitted with the design documentation to justify the detention volume proposed.

If separate detention systems are proposed at the development site, then the storage and discharge for each system needs to be directly proportional to the catchment area contributing to each system. This must be reflected in the catchment layout plan and computations submitted for assessment approval.

In circumstances where a portion of the development's impervious runoff cannot be captured into the detention system (i.e., uncontrolled runoff) the discharge rate from the detention system must be reduced by the calculated uncontrolled runoff flow rate. That is, the PSD (adjusted) = PSD (original) – Q (flow rate of uncaptured area).

4.3 Flow control outlet (orifice)

The outlet shall be designed such that the flow going into the Council drainage system is limited to the Permissible Site Discharge (PSD) when the storage is at the OSD storage volume. For piped outlet, the following method should be used to size the orifice.

$$A = \frac{Q}{C_d\sqrt{2gh}}$$

Where:

A	=	Area of orifice (m^2)
Q	=	Permissible Site Discharge (m^3/s)
C_d	=	0.6 (coefficient of round shaped pipe)
g	=	9.81 m/s^2 (gravity)
h	=	water head for the orifice (height between centreline of the orifice pipe and maximum level of the temporary site storage) in metres

The diameter of the orifice can be calculated from the area using the equation below.

$$\text{Diameter} = 2 \times \sqrt{\frac{A}{\pi}}$$

Refer to Appendix B for the baffle pit details.

5. Water Sensitive Urban Design (WSUD) – Retention and Treatment

Stormwater treatment is required to minimise risks to human health and to protect receiving waterways and the broader environment from the impacts of stormwater runoff generated by urban development. These requirements align with the EPA Victoria Urban Stormwater Management Guidance and support Council's broader objectives for integrated water cycle management. Stormwater retention also contributes to reducing reliance on potable water supplies, consistent with the City of Yarra's commitments under the WSUD Policy, Environment Strategy, Climate Emergency Plan, and Ecologically Sustainable Development (ESD) Policy.

The City of Yarra has established stormwater management objectives through Planning Scheme Clauses 22.16, 53.18, 55.03, 57.05, 58.03, all of which ensures alignment with:

- The EPA Urban Stormwater Management Guidance (2021), and
- Clause 56.07-4 of the Victorian Planning Provisions (Clause 56), where applicable.

Together, these frameworks ensure that new developments achieve best-practice stormwater treatment and retention outcomes consistent with state and local policy objectives.

5.1 WSUD Requirements

All new developments are required to demonstrate compliance with the applicable WSUD treatment objectives, supported by relevant reporting and calculations submitted with the development application.

5.1.1 Blue Factor Assessment Tool

Blue Factor is the primary stormwater assessment tool adopted by the City of Yarra for demonstrating compliance with WSUD objectives. The tool has been developed by DEECA in partnership with Microburst Software and replaces the former STORM tool, which has now been retired. STORM was originally developed in 2006 and is no longer considered fit for purpose.

Blue Factor provides a standardised, outcome-based assessment of stormwater management performance **and is only accepted for small to medium projects on sites no larger than 1 hectare / 10,000 sqm, and no proposals that include public roads**. Results from Blue Factor are required to be submitted to the City of Yarra as part of the development application,

together with supporting documentation demonstrating compliance with Council and EPA objectives.

The selection and implementation of WSUD measures should be undertaken in accordance with the Melbourne Water WSUD Guidelines and other relevant state guidance. Options for treating stormwater | Melbourne Water

5.1.2 MUSIC Modelling

For any development larger than 1ha or any proposal containing public road work, MUSIC (Model for Urban Stormwater Improvement Conceptualisation) may be required to provide a more detailed assessment of stormwater treatment performance. MUSIC enables the design and analysis of WSUD assets to demonstrate achievement of best-practice stormwater treatment objectives.

Where MUSIC modelling is undertaken, performance results and supporting documentation must be submitted to the City of Yarra with the development application to demonstrate compliance with the relevant objectives and policy requirements.

6. Managing Groundwater (subsurface design)

Groundwater encountered during the demolition and excavation phases of construction must be captured, removed from site, and relocated to a suitable location in accordance with EPA guidelines and requirements. Management of groundwater must be included in the Construction Management Plan (CMP) for the site, which must be submitted and approved by Council prior to the commencement of works.

The following requirements must be met for situations where development structures e.g., basements have interactions with groundwater:

- Groundwater management shall not adversely impact adjacent, upstream, or downstream properties, receiving waters and groundwater dependent ecosystems (GDEs)
- Provision must be made for groundwater flows in the design of perimeter or through drainage system
- Construction techniques, where possible, shall eliminate the need for ongoing management and disposal of groundwater or seepage flows e.g., a tanked construction designed by a suitably qualified Civil Engineer

- Records of all water discharges and monitoring results are to be documented and kept on site. Copies of all records shall be provided to the appropriate regulatory authority upon request.

7. Design requirements for Basement Construction

Increasing development activity and demands on limited space within the City of Yarra, has seen the demand for basement constructions within private development increase significantly in recent years.

- If sub-surface structures are proposed as part of the development, the applicant must provide a geotechnical report prepared by a qualified Engineer indicating the expected groundwater level.
- If groundwater is encountered within 2 metres of any sub-surface structure, the portion of the structure within the 2 metres and below must be water-proofed to the satisfaction of Council.

The applicant (developer) is to submit detailed civil drawings of the sub-surface structure designed by a qualified engineer with supporting geotechnical report prepared by a qualified geotechnical engineer. This detail must form part of the overall internal stormwater system detailed design.

Please note: Council does not accept the collection and transfer (i.e., pump systems) of groundwater to any of Council's public stormwater network and/or sewerage infrastructure. Any interacted groundwater must be kept from penetrating the sub-surface structures, including the agricultural drains at the interface of the ground and the structure.

8. Appendices

8.1 Appendix A: Drainage Design Checklist

Drainage Design Checklist for Single and Other Type Developments					
		PLAN REQUIREMENTS			
1		Shown North Point, Revision Table on the Plan	☐Y	☐ N	☐ NA
2		One set of A1 PDF_ size plans on a preferred scale of 1:100	☐Y	☐ N	☐ NA
3		Provided a Summary table showing, PSD, SSR and Total Storage Volume	☐Y	☐ N	☐ NA
4		Provided a Summary table showing Total Area, Pre-development impervious, and Post- Development Impervious Area	☐Y	☐ N	☐ NA
5		Provided a Pit Schedule and relevant details	☐Y	☐ N	☐ NA
6		Indicated that the backfill under paved areas is to consist of 20mm nominal size class 2 fine crushed rock in 150mm layers to 95% modified compaction in accordance with AS1289-5.2.1	☐Y	☐ N	☐ NA
7		**Legal Point of Discharge (LPOD)**			☐ NA
	a	Depth for the existing pits and pipes has been provided	☐Y	☐ N	☐ NA
	b	Investigation of existing drainage has been completed, and information has been provided for review (including CCTV, pipe inspection, etc).	☐Y	☐ N	☐ NA
	c	Design of outlet pipe is done in accordance with Council's requirements i.e. minimum 100mm diameter pipe @ 1:80 slope (not applicable to Kerb Openings)	☐Y	☐ N	☐ NA
	d	For underground connection- If vertical clearance from the surface to top of the LPD pipe is <600mm then Galvanised Steel Pipe required.	☐Y	☐ N	☐ NA
	e	Provide notation on the plans based on the Yarra Standard Drawings, refer attached- Yarra standard drawings | Yarra City Council	☐Y	☐ N	☐ NA
	f	Existing LPD has been identified and indicated on the plans / utilised as the connection type	☐Y	☐ N	☐ NA

	g	Provided longitudinal section drawing of the proposed connection to LPD with exact cover levels, invert level, vertical and horizontal offsets from existing service conduits, depth to surface and conduit size. If adequate clearance is not available written dispensation is required from relevant service authority.	☐Y	☐ N	☐ NA
	h	Plan notation added which states: "Minor drainage pipe (up to 150 mm diameter) excavation to be dug by handheld shovel under the canopy of any existing tree to be retained. Tree roots >30 mm diameter must not be severed"; For any further questions, contact Development and Civil Engineering team (03 9205 5555)	☐Y	☐ N	☐ NA
	J	Provided a detail of the pump pit in accordance with Section 9 of AS3500.3	☐Y	☐ N	☐ NA
8		**On Site Detention (OSD) Requirements** <u>Please Note:</u> No OSD requirement for an Extension of existing structure/ New Single Dwellings if proposed impervious area is less than 70% of the total site area New Single Dwellings, Multi Unit Developments and any development with proposed impervious area greater than 70% of the total site area must have an OSD and follow the guidelines below			☐ NA
	a	Calculations Provided of OSD using Swinburne Method (using 2016 IFDs values from BOM) - InSite report is preferred	☐Y	☐ N	☐ NA
	b	PSD calculated as per Section 3.1	☐Y	☐ N	☐ NA
	c	SSR value provided	☐Y	☐ N	☐ NA
	d	Orifice size calculated as per Section 3.3	☐Y	☐ N	☐ NA
	e	Baffle Pit Designed as per Appendix B	☐Y	☐ N	☐ NA
	f	Storage pipes to be nominated with either Reinforced Concrete Pipes (RCP) or Fibre Reinforced Concrete (FRC) Class 2 minimum. For UPVC pipes, a minimum of SN8 Sewer Grade (AS1260) to be used, for example StormPro, BlackMax, Enviro or equivalent If the storage pipes are located under trafficable area or loading, the pipe class and grade must be suitable for the imposed loads which should be certified by the suitable engineer	☐Y	☐ N	☐ NA
	g	Correctly indicated pipe length, invert level and grade	□Y	□ N	□ NA
	h	Pipe lengths to match manufacturer's pipe lengths, to avoid small pipe sections adjacent to pit	☐Y	☐ N	☐ NA

	i	Provided drainage cross sections plans of pipes, pits, utility crossings	☐Y	☐ N	☐ NA
	j	Minimum 10mm nominal fall through detention pit shown	☐Y	☐ N	☐ NA
9		**Multi-cell:**			☐ NA
	a	Type to be clearly nominated on plans	☐Y	☐ N	☐ NA
	b	Location and details of flow control outlet, including size and invert levels (inlet and outlet) of multi-cell (plus inclusion of risers on all inspection openings of the multi-cell unit.	☐Y	☐ N	☐ NA
	c	If IOs in driveway, the 200X200 Jenco steel covers to match finished surface of the driveway	☐Y	☐ N	☐ NA
	d	Pit covers or grated covers must be higher than the top of the baffle wall to avoid surcharge	☐Y	☐ N	☐ NA
10		**WSUD Requirements**			☐ NA
	a	Provided relevant stormwater treatment requirements with all supporting calculations including Blue Factor Report, MUSIC;	☐Y	☐ N	☐ NA
	b	Roof catchment plan/WSUD plan outlining the areas contributing to each stormwater management asset to be shaded and labelled in sqm	☐Y	☐ N	☐ NA
11		**Flooding and Overland Flows**			☐ NA
	a	Checked if the property is affected by overland flows online using this link Yarra flood mapping: year 2100 scenario	☐Y	☐ N	☐ NA
	b	Applied directly to Melbourne Water to obtain information on whether the property is subject to flooding (if above condition is satisfied)	☐Y	☐ N	☐ NA
12		**Basement Construction**			☐ NA
	a	Provided an Engineering design for basement construction to manage groundwater if applicable	☐Y	☐ N	☐ NA
	b	Submitted a Geotech Report with Ground Water Table. Basements within 2m of groundwater must be tanked and no groundwater to discharge to LPD. Please note: Council does not accept the collection and transfer (i.e., pump systems) of groundwater to any of Council's public stormwater network. Any interacted groundwater must be kept from penetrating the sub-surface structures, including the agricultural drains at the interface of the ground and the structure.	☐Y	☐ N	☐ NA
13		Received a Build over Easement (BoE) Consent letter from responsible authorities if applicable	☐Y	☐ N	☐ NA

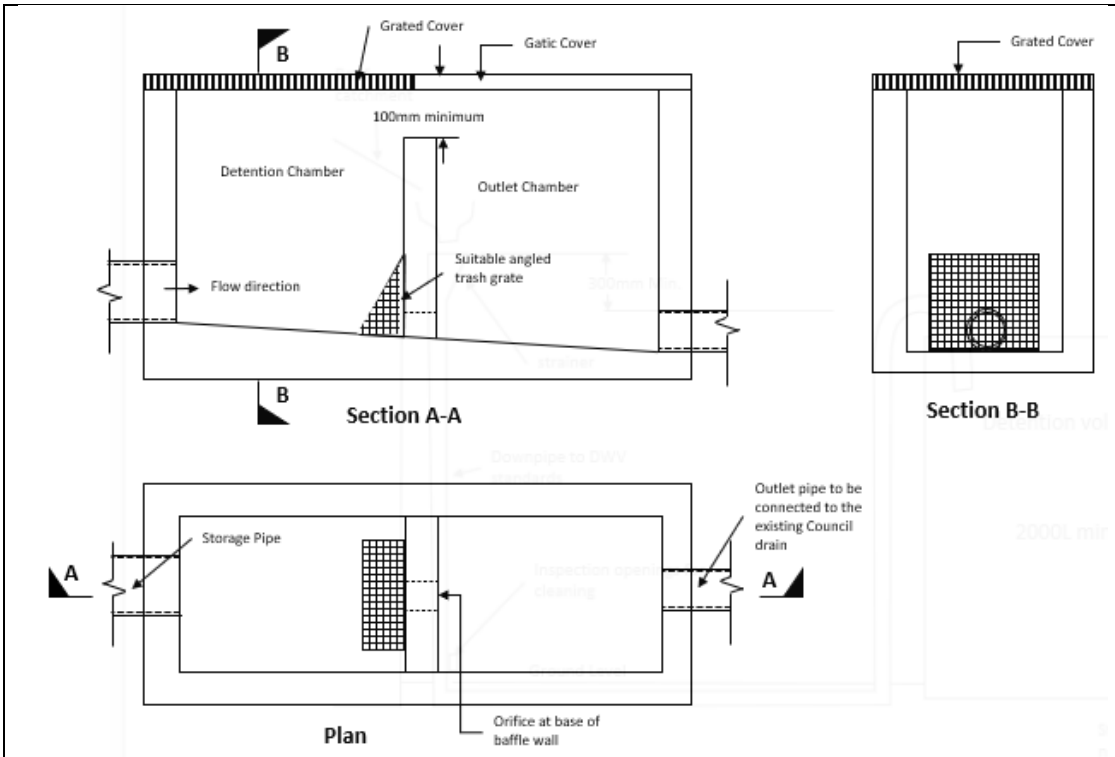
14		**Rainwater Tanks (RWTs)**			☐ NA
	a	As per Victorian Building Authority (VBA) guidelines, a minimum of 2000L RWT for reuse has been provided and dedicated to toilet flushing and irrigation when using rainwater.	☐Y	☐ N	☐ NA
	b	Added a plan notation stating: "All plumbing for re-use to comply with AS/NZS3500 Part 2	☐Y	☐ N	☐ NA
	c	Indicated the roof area connected into each tank from each unit with plan notation (in m^2) and shading.	☐Y	☐ N	☐ NA
	d	If the below ground tank is subject to traffic loading, a Certificate of Compliance (design) must be provided for the appropriate traffic loading, and to the satisfaction of Council	☐Y	☐ N	☐ NA
	e	Show section details of tank if being used for detention to highlight levels for detention overflow and orifice arrangement- refer to Victorian Building Authority (VBA) for example, including levels and off takes	☐Y	☐ N	☐ NA
15		**Pipes and Pit Lids**			
	a	Provided grated pit lids within paved areas and concrete lids within grassed/landscaped areas;	☐Y	☐ N	☐ NA
	b	Provided Class C pit lids within crossovers, Class B lids within driveways/front yard and Class A in rear yard as a minimum;	☐Y	☐ N	☐ NA
16		**Trees** Showed all existing trees to be retained on the plans, including neighbouring properties and road reserve;	☐Y	☐ N	☐ NA

I,……(**full name and position title**) ……
……(**Name of Applicant**) as the designer of this drainage sy stem, am a qualified and experienced civil engineering professional with delegation to sign this Desig n Checklist and I take
responsibility for ensuring compliance with the preparation of the Drainage system.

Signature …… Date …….

8.2 Appendix B: OSD Control Pit and Detention Pipe Details

Control Pit/Baffle Pit



Notes:

1. The weir wall must be a minimum 100mm thick concrete with the slow-release orifice cast into the wall for up to 900mm wall depth, min 150mm thick for 900- 1200mm wall depth and min 200mm thick for 1200- 1500mm wall depth
2. Steel plates, as a weir wall, are not recommended due to the potential for tampering. In circumstances where a two-chambered pit cannot be constructed, a steel plate with slow-release orifice must be fixed with tamper proof dyna bolts chem-set into the pit wall.
3. A minimum 100mm high overflow, over the weir wall, must be provided for the full width of the weir
4. A minimum 10mm nominal fall through detention pit must be provided
5. A solid pit lid, above the outlet chamber of the baffle pit, must be provided
6. A grated pit lid, above the inlet chamber of the baffle pit, must be provided
7. A 25mm Galvanized Grid Mesh Fully (commonly known as trash grate) framed by 25X25X3 mm Galvanized Angle, must be provided to protect the orifice from blocking and located in the inlet chamber of the baffle pit.
8. Each chamber of the baffle pit must meet minimum internal dimensions required by Australian Standard AS3500.3:2015, Clause 7.5.2.1
9. Minimum detention pipe size to be 225mm.
10. Top of baffle wall must be min 400mm below the Finished Floor Level of all habitable areas and min 200mm below the Finished Floor Level of all garage areas.
11. Minimum baffle pit orifice size is 40mm
12. The length and slope of detention pipe must be notated on the plan.
    - Minimum 300mm cover for stormwater detention pipes to be provided. Additional reinforcement required under driveway if less than 300mm cover or a higher pipe class to be utilised.
13. Minimum 200mm horizontal gap between parallel detention pipes must be provided.

Detention Pipe Details

Preferred detention pipe material is SN8 UPVC StormPro, BlackMax, Enviro or equivalent or either Reinforced Concrete Pipes (RCP) or Fibre Reinforced Concrete (FRC) Class 2 minimum.

Pipe diameter (mm)	**Minimum grade**
225 Ø	1 in 150
225 – 450 Ø	1 in 200
525 Ø or greater	1 in 250

Notes:

1. If there are Dual pipes – minimum 200mm gap, measured externally, between parallel pipes for pipe sizes up to 600mm diameter. (Note: for pipe sizes greater than 600mm diameter, consult Council Engineers)
2. Pipe Bedding – show typical trench bedding and backfill details as per Council standard (max compaction and depth)
3. The length and slope of detention pipe must be notated on the plan.
    - Provide a minimum 450mm cover to the detention pipe or follow the offset/clearance policy of the relevant service authority.

8.3 Appendix C: Detailed design documentation – requirements for submission

Development type	Stormwater System		On-site Stormwater detention	Stormwater retention	Stormwater treatment (WSUD Requirements)	Managing groundwater intrusion
	Minor flows^	Overland flows^^				
Extension or alteration to a single dwelling (< 50 m^2)	Note 1	Note 1				
Extension or alteration to a single dwelling= (> 50 m^2)	Note 1	Note 1				
Single dwelling construction						Note 1
Multi-dwelling development				Note 2		Note 1
Apartment development				Note 2		
Mixed-use development				Note 2		
Major development				Note 2		
Industrial development				Note 2		
Commercial development				Note 2		

Highlighted sections in Table 1 in "blue" are to be considered in conjunction with the notes where applicable

^ Minor flows refer to stormwater runoff associated with the 20% AEP storm event or less that is typically conveyed in the underground piped drainage system.

^^ Overland flow refers to surface flows once the capacity of the minor drainage system is exceeded.

Note 1: Council reserves the right to use discretion to set design requirements

Note 2: Stormwater retention to meet both potable water use reduction and stormwater runoff (volume) reduction targets.