STORMWATER ATTENUATION
DESIGN GUIDE

NOVEMBER 2019

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Why is Stormwater Management Required for New Development?

Council is required to ensure that the impact of new development on flood risks for existing properties are minimised and where possible effectively mitigated. On-going residential intensification and infill development is resulting in greater impervious surface coverage and increased total and peak stormwater runoff. Without mitigation the increase in total and peak stormwater runoff will increase the risk of flooding for some properties in some parts of the city.

PNCC are currently developing a comprehensive Stormwater Management Framework that will set out catchment priorities and provide guidance in respect of design standards and approved solutions for stormwater runoff management to mitigate flood effects as well as stormwater treatment. The framework will include standard procedures / guidelines for stormwater management as well as methods for assessing the effects of development. The *Engineering Standards for Land Development* will be updated to reference the framework document. However, the framework has been formally adopted, this Stormwater Attenuation Draft Design Guide is provided to assist developers and their representatives determine the acceptable solution in combination with PNCC's *Engineering Standards for Land Development*.

Purpose of Stormwater Attenuation

The purpose of stormwater attenuation is to mitigate any increase in peak stormwater runoff and prevent where possible any increase in flooding risks within the receiving network. Council expects stormwater management solutions to be evaluated on an individual property and site-specific basis taking into account the risk of flooding in the downstream catchment and the existing level of service. In general, any increase in impervious area and peak stormwater runoff may need to be mitigated to prevent adverse effects on the downstream catchment, however this requirement will need to be confirmed for each catchment.

Stormwater mitigation can usually be achieved by means of an on-site tank or storage device. During and following a rainfall event stormwater from the roof will rapidly fill the tank while at the same time being slowly discharged at a pre-determined rate. The tank storage reduces the peak stormwater flow by limited the release of captured stormwater to a slower rate (typically set at the pre-development flow rate) over a longer time period. The reduced discharge can be achieved either by pumping the water out at a set rate, or by limiting the discharge through limiting the outlet diameter, such that all the stored stormwater is released over a period not exceeding 24 hours. The actual duration of discharge will depend on the size of the outlet, the volume of the tank, and the level of mitigation required.

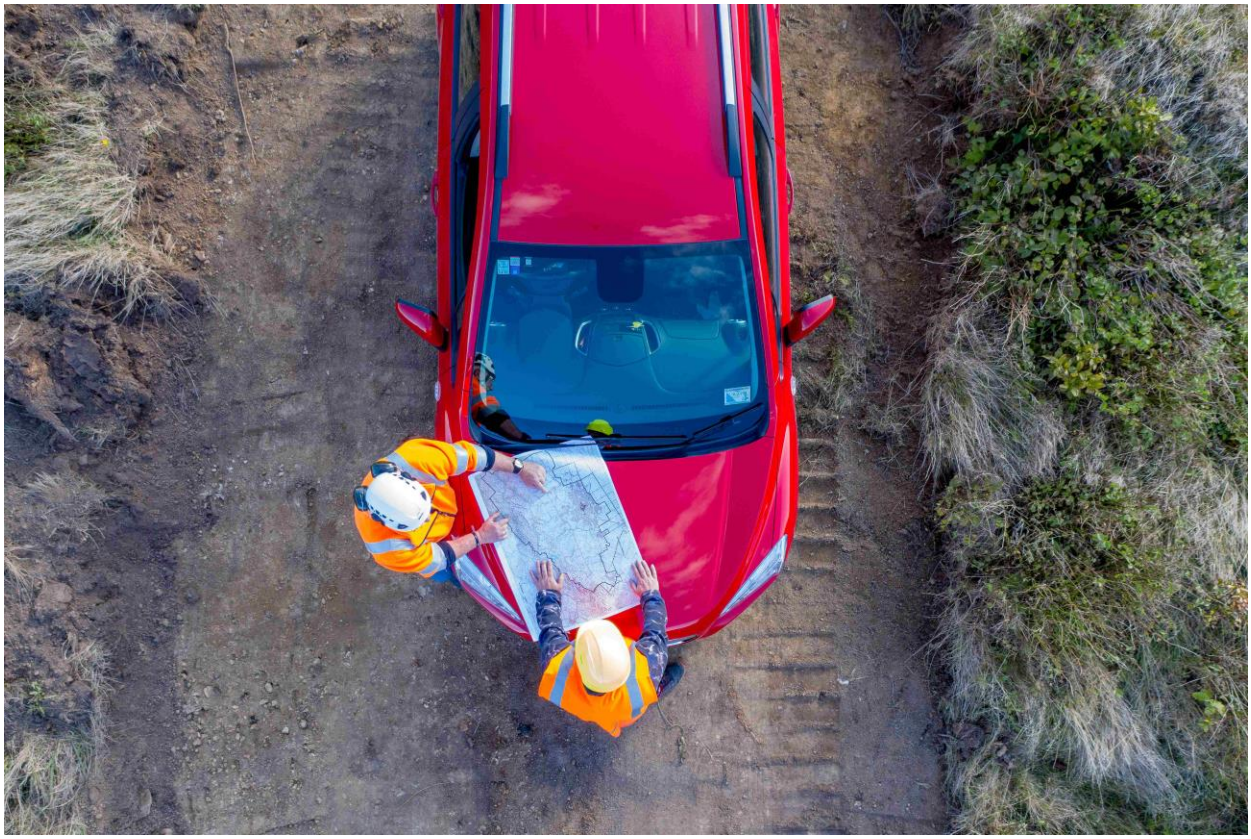
The design guide includes reference to a range of provides a list of possible options, to assist the design process. Alternative designs can be submitted to PNCC for assessment. To assist the designer with detailing specific attenuation solutions some additional guidance has been provided under the following four areas:

1. Key Requirements for Stormwater Attenuation Tanks
2. Specific Requirements for Building Consents
3. Links to Further Resources
4. Soak Holes and Rain Gardens
5. A simple worked example

1. Key requirements for Stormwater Attenuation Tanks

- The tank must provide the required stormwater storage which empties following the rain event
- A tank of a size larger than the required stormwater storage volume can be installed provided the volume above any outlet meet the stormwater volume requirement
- Alternatively a second tank can be utilised for capture of rainwater for other purposes.
- The tank must automatically drain via a low level, controlled gravity outlet to the kerb or network stormwater main.
- An overflow must be provided that drains to an approved stormwater outfall (i.e., stormwater network or kerb and channel). The overflow must be sized so that it is at least the same size as the inlet to the tank.
- If the situation requires an inground tank, where a gravity discharge cannot be achieved a pump may need to be installed
- The tanks must only retain water temporarily, i.e. not more than 24 hours.
- The supply and installation of the tanks and associated pipework is the responsibility of the developer.
- The maintenance of the tanks and associated pipework is the responsibility of the property owner.
- If the rainwater tank is decommissioned in the future, the owner must provide attenuation of equal or greater volume.
- The tank details must be included in the building plans submitted as part of the building consent process, the installation will be inspected, the work must be carried out by a licensed drainlayer.
- Devices for removing debris from the stormwater runoff prior to entry to the tank must be incorporated into the system. Routine maintenance of the screening devices must be undertaken to prevent any direct overflow/spill that will increase overland flow to the network or to neighbouring properties.
- Provision must be made for a flushing or cleaning system for the tank
- Stormwater attenuation may be achieved with a combination of measures, e.g. tanks and soak hole where the overall attenuation requirement is met.

Additional requirements in respect of above-ground rainwater tanks are outlined in Section 6.7.1.5 of the *Engineering Standards for Land Development*.



2. Specific requirements for Building Consent

It is the responsibility of the building consent applicant to provide design details for the stormwater system, within the scope of the consent notice, and the design guidance provided.

2.1 Above Ground Installation

- Provide the tank manufacturer's specifications.
- Provide details of how the tank will be restrained for seismic and wind loads. This must be considered before the building is constructed. Posts and fixing restraints may be required and fixing to brick veneer will not be acceptable. Detailing seismic restraint may require an engineering assessment and PS1.
- Detail the location of the tank and all plumbing/drainage details including the orifice drain diameter.
- Detail the construction requirements for stormwater pipework layout for the tank
- Provide PS1 producer statement for the design of the tank.
- Provide details of the tank durability.
- Confirm that the tank is set back at least 1 meter off neighbouring boundaries (or other distance if detailed in the resource consent).
- Allow for the tank footprint in the calculation of total site coverage

2.2 Below Ground Installation

- Ensure the tank overflow wherever possible drains via gravity to the network. However if the tank is too deep, site too low, or fall inadequate for a gravity discharge then PNCC will consider a pumped discharge.
- Provide the tank manufacturers specifications.
- Provide the location of the tank and all plumbing/drainage details including the pump specifications and high-level alarm for the event of pump failure (if required).
- Ensure if a pumped discharge is approved then the rate shall be as approved by PNCC.
- Provide PS1 producer statement for the design of the tank.
- Provide details that the tank durability will be suitable for an in-ground installation.
- Provide details of any hold down. This can be in the form of straps and anchor blocks. If a concrete tank is provided a corbel footing may be used.
- Provide confirmation that uplift forces are provided for as these can lift driveways and cause significant damage if not properly considered
- If the tank is to be installed under areas where vehicle loading may occur, the tank must be designed appropriately (noted on the PS1). Engineering of the surface above the tank may also be needed with supporting documentation.
- Confirm the tank is set back at least 1 meter off neighbouring boundaries or other distance if detailed in the resource consent
- Confirm distance of the tank from building footings is determined in relation to the tank depth. Typically, the tank may be no closer to the building than the depth of the excavation. If the tank is to be closer than this then specific engineering of the building foundation will be required.

- **Indicative Tank Installations**

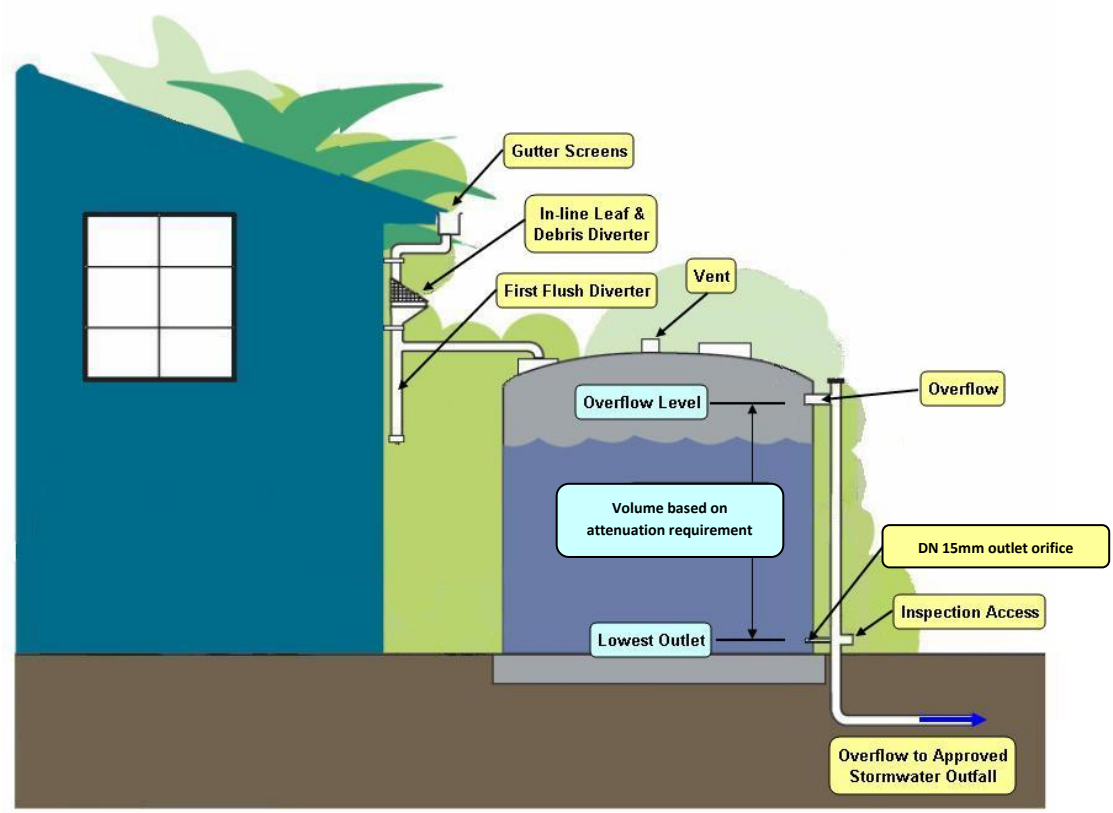


Figure 1: Above-ground detention tank – typical components (adapted to PNCC specific requirements from: *Three Waters Management Practice Note - HCC 06: Detention Tank*, Hamilton City Council)

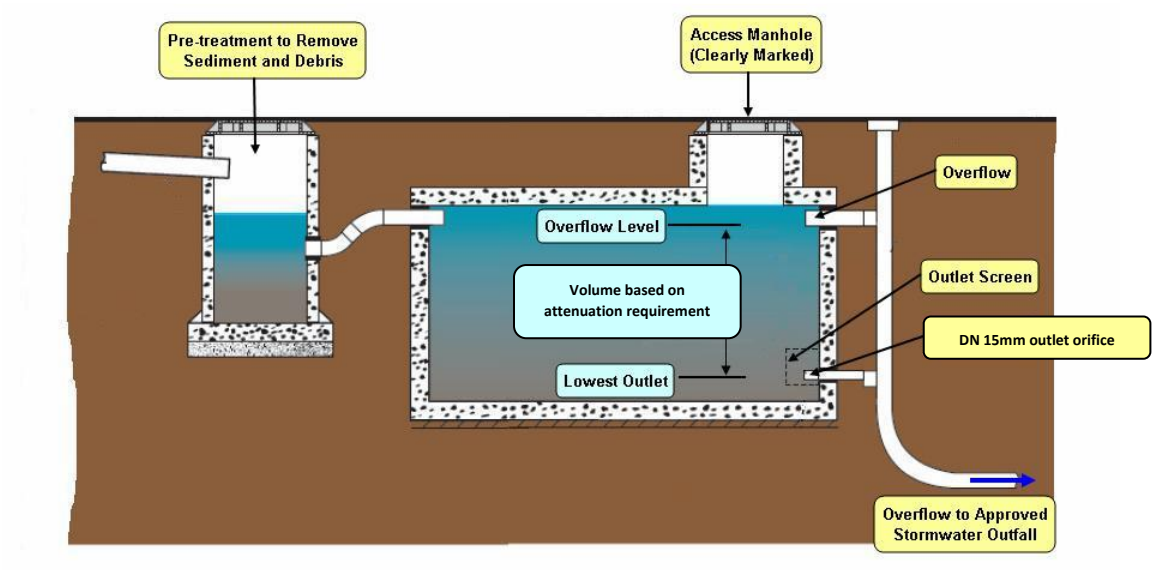


Figure 2: Below-ground detention tank – typical components (adapted to PNCC specific requirements from: *Three Waters Management Practice Note - HCC 06: Detention Tank*, Hamilton City Council)

3. Soak Holes and Rain Gardens

Soak Holes may be suitable for attenuation of stormwater, however not all soil types or locations around the Palmerston North City Council area are likely to be appropriate for soak holes. Testing must be carried out prior to construction and PNCC reserves the right to be present during this testing. Note: a building consent is required for Soak Holes.

Calculations for rates of soakage must be in accordance with the Verification method under E1/VM1 and the requirements set forth in Section 6.7.1.6 of the *Engineering Standards for Land Development*. The Stormwater Management Plan must detail the soakage rate using the approved method and must demonstrate the volume of attenuation is achieved, and that soakage rates are appropriate. All calculations will be peer reviewed by a member of the Infrastructure team.

Rain Gardens may be appropriate for larger (commercial) sites. Stormwater calculations, garden sizing, site stormwater controls and rain garden designs must be supplied to PNCC for approval as part of the Building consent/Resource consent process. Additional design considerations relating to rain gardens is provided in Section 6.7.1.3 and 6.7.1.4 of the *Engineering Standards for Land Development*.

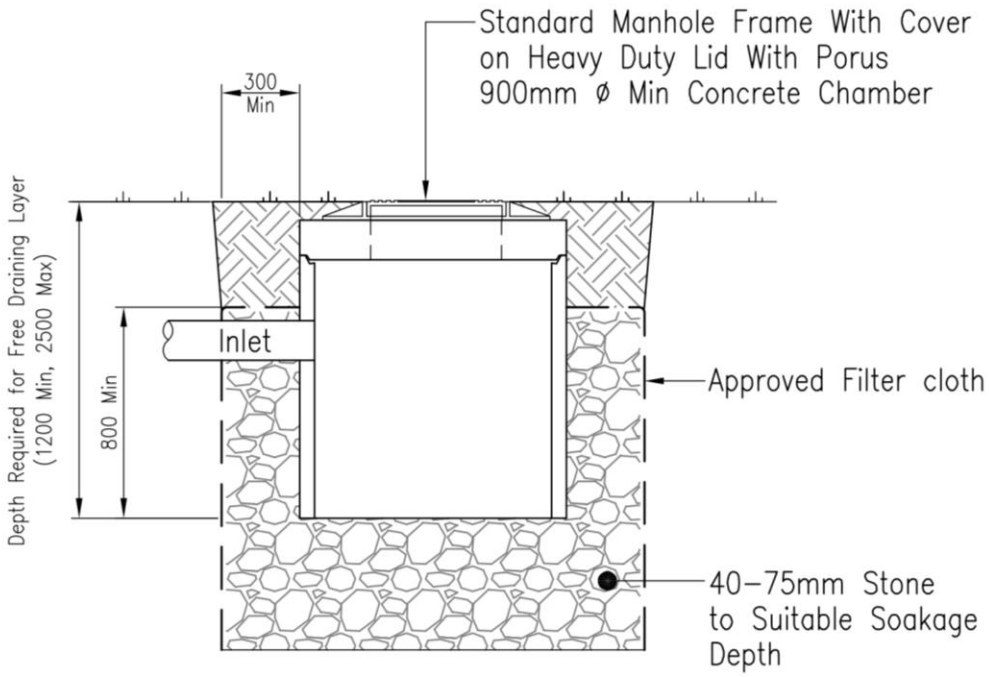


Figure 3: PNCC approved *standard soak pit detail*

4. Worked example

Example Consent notice (generic)

Pursuant to Section 221 of the Act a consent notice condition must be imposed requiring the following:

(a) Future development on all lots must be hydraulically neutral. Any future development resulting in additional impervious areas will need to be hydraulically neutral. In lieu of a stormwater management plan (SMP), PNCC will accept rainwater tanks as a mitigation measure to achieve hydraulic neutrality. The tanks must temporarily store rainwater run-off and comply with the following requirements:

i. The tank is reserved for stormwater runoff and water cannot be used to store rainwater for purposes other than attenuating stormwater runoff during rainfall events.
ii. The tank must automatically drain via a low level, DN 15 controlled gravity outlet to the kerb. A high level overflow to the same kerb connection is also permitted.
iii. The tanks must only store water temporarily, and must not store water for more than 24 hours.
iv. This temporary storage is sized so that for any increase over the allowable impervious area, the storage requirement is at a rate of 30 litres storage for every additional 1 m² impervious area.
v. Impervious area includes, but is not limited to roofs, patios, driveways and parking areas

Roof area of new dwelling		158m^2
New carport		23m^2
New driveway area		82m^2
New outdoor patio and side pathway		65m^2
Existing garage on site removed (as per subdivision)		- 36m^2
Total impervious area		**292m^2**
Attenuation required:	30L x 292m^2 =	**8760 L**

Therefore select 3x3000L slimline tanks

The worked example is using the prescribed method in lieu of a site-specific Stormwater Management Plan (SMP). An SMP may be able to reduce the attenuation volume requirements through calculations considering the site-specific time of concentration or storage duration requirements. Calculations and a design must be submitted to PNCC for assessment and approval.

PALMERSTON NORTH CITY COUNCIL

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