DESIGN RIGHT

Hydraulic neutrality

With urban densification putting a strain on infrastructure services, some councils now require stormwater to be dealt with in situ, easing the strain on public systems.

BY ALIDE ELKINK,
FREELANCE TECHNICAL WRITER, WELLINGTON

FOR ANY BUILDING or development site, the area of ground able to absorb rainfall is reduced by the roofs of buildings and hard surface areas such as driveways and paving. The soil type also influences how much and how quickly water can be absorbed.

This means that water previously absorbed on an undeveloped site is typically discharged into a council stormwater system instead. The increasing density of urban and suburban development has significantly increased the stormwater load on public utilities.

Move to hydraulic neutrality

To address this and potentially reduce the need for costly stormwater system upgrades, several councils have adopted the principle of hydraulic neutrality, also known as stormwater neutrality or hydrological neutrality. With this approach, any rainfall on a site must be retained and disposed of on that site. No stormwater is to be discharged into the public stormwater system, either piped or by street drainage.

The aim is that no additional demand is placed on existing stormwater systems from new developments so that the risk of stormwater flooding in heavy rain events is reduced. A side benefit is the recharging of aquifers and the maintenance of groundwater levels.

Stormwater flood management varies

The Resource Management Act (RMA) is the primary legislation for the sustainable management of natural and physical resources. It assigns key roles and responsibilities for resource management to regional councils and territorial authorities, who in turn set out policies and rules for stormwater management.

Although the RMA covers flooding as a natural hazard, flooding as a result of extreme stormwater flows is not specifically covered in the Act. This has led to inconsistencies in how stormwater is dealt with nationally. For example, some councils reference New Zealand Building Code clause E1 *Surface water* for dealing with flooding, while others reference NZS 4404:2010 *Land development and subdivision infrastructure* for specific flood protection design requirements.

What causes stormwater flooding?

Stormwater flooding can occur after extreme rainfall events as a result of:

- rainwater that has not soaked into the soil accumulating on lower-lying areas
- drainage of stormwater being restricted by high tides or river and creek levels
- backflow up water courses during a high tide or river flood
- floodwater that has spilled over banks of streams and rivers as a result of too much stormwater draining into the waterways.

Managing stormwater run-off

The level of ground infiltration or absorption is affected by the amount of impermeable surface area. Urban development typically results in an increase in the amount of hard surfaces, so run-off must be managed on each site to ensure that the post-development peak water run-off is no greater than the pre-development peak water run-off.

Generally, this means dealing with water on site. Methods that can be implemented to achieve hydraulic neutrality include:

- improving soil infiltration or the ability of the ground to absorb water
- water flow attenuation or reducing the rate at which the water can flow away from an area so that the permeable ground is able to absorb the moisture, albeit at a slower rate
- on-site storage and disposal of all rainwater incidents on the site from roofs and paving, for example.

Gravelly and sandy soils readily absorb water so hydraulic neutrality can often be achieved by ensuring that stormwater is disposed of by infiltration on site.

Peat, clay or silty soils cannot absorb large quantities of water, so on-site storage in ponds or holding tanks – together with an on-site soakage or drainage system – may be required to achieve hydraulic neutrality.

Kāpiti Coast case study

Hydraulic neutrality is required for all new residential projects on the Kāpiti Coast. A driver for this has been that much of the residential areas are low lying and located inland of elevated dunes, which makes the area vulnerable to flooding from poor stormwater drainage.