

INTRODUCTION TO STORMWATER ISSUES

8. Glossary

This Glossary has been provided for general guidance and direction. It should not be construed as providing legal or statutory definitions in any way. Please refer to the appropriate Act, Plan, or consent for further information.

Abrasion Superficial damage either to the skin, generally not deeper than the epidermis, or the mechanical scraping of a rock surface by friction between rocks and moving particles during their transport in wind, glacier, waves, gravity or running water.

Accretion The accumulation of material, for example within a flood plain or estuary.

AEE Assessment of Environmental Effects. A document that evaluates potential and actual adverse environmental effects of an activity, and the means of avoiding, remedying, or mitigating those effects. The requirements of an AEE are defined within the Fourth Schedule of the Resource Management Act, 1991.

AEP The annual exceedance probability is the probability (as a percentage) that a flood of a given magnitude will be equalled or exceeded in any one year as follows:

- 1% AEP = 1 in 100 year storm;
- 10% AEP = 1 in 10 year storm;
- 20% AEP = 1 in 5 year storm;
- 50% AEP = 1 in 2 year storm.

Note that the rainfall (storm size) and the flood level (i.e. runoff effect) may have different AEPs depending on antecedent or pre-existing conditions.



Alignment The structural extent of a road or carriageway. A road alignment may not be the same as a designation, where this exists.

Aquaculture The farming of freshwater and saltwater organisms under controlled conditions.



Aquifer An underground water-bearing layer from which groundwater can be usefully extracted. The surface of saturated material in an aquifer is known as the water table.


ARI The average recurrence interval is the average return frequency of rainfall, flood, or flow rate. Refer to AEP.

Arterial An arterial road is a moderate or high capacity local road which is immediately below a State highway in terms of its level of service.

Attenuation device See detention storage.

Austroads standards	<i>APR – 232: Guidelines for Treatment of Stormwater Runoff from the Road Infrastructure.</i> Austroads, 2003
Average particle size	Average size of suspended solids entrained (whether actually or potentially) in stormwater.
Backwater	Water upstream of an obstruction (e.g. weir) which is deeper than it would otherwise be without the obstruction. Backwater effects may also be experienced when storm flows exceed the capacity of the conveyance system or encounter other barriers (e.g. high tides and / or storm surges).
Baffle	A device to deflect, slow, or regulate flow. Baffles may also be used to trap pollutants that either float (e.g. litter, hydrocarbons), or accumulate on the bed or a stream or device (e.g. sediment).
Barrier	A weir, dam, perched culvert, or a particularly long and / or steep culvert that prevents the migration or movement of fish. Fish ladders may also act as a barrier in some instances where predators have the opportunity to ‘fish’ along a ladder or at its entry and exit points.
BAT	Best available technology. See also BPO.
Batter	A structure or embankment of earth, gravel, or similar material which forms a pond bank or foundation for a road.
Berm	A strip of ‘flat’ land of given width that is immediately adjacent to a road carriageway and slopes towards the stormwater drainage collection system.
Biodiversity	Biodiversity is the variation of life forms within a given ecosystem, and is often used as a measure of the health of biological systems.
BMPs	Best management practices used to control stormwater issues at source with the aim of meeting sustainable water quantity and quality objectives. This may include managing the extent of impervious area (quantity related) or methods to manage the generation of contaminants at source (e.g. road sweeping).
BOD₅	Biological oxygen demand. See also COD.
BPO	Best practicable option. The BPO has a defined meaning under the RMA. The BPO does not necessarily mean the adoption of the BAT.
By-pass	A means by which flood flows or spills may be diverted around a treatment device.

Buffer	An area that provides a transition between two areas, often with different risk profiles or needs. Buffers may be adjacent to and a part of a steep slope, to attenuate surface water flows, between a road and a stream or community, or an area adjacent to or a part of a stream or wetland that is an integral part of the stream or wetland ecosystem.
Catchment	Any area draining to a defined point (e.g. within a drainage network) or to a receiving environment such as a large stream, river, lake, or coastal waters.
Catchpit/ sump	Kerbside opening that collects rainwater from roads. Runoff drains into a small chamber that incorporates a sediment trap and serves as an entry point to a reticulated stormwater system.
Cesspit insert	A device installed underneath a cesspit inlet to treat stormwater through filtration, settling, absorption, adsorption, or a combination of these mechanisms.
Channel	A long, narrow excavation or surface feature that conveys surface water and is open to the air.
Cleanfill	Material that has no potential to produce harmful effects on the environment. This material is generally a natural material such as clay, soil, and rock, and such other materials as concrete, brick, or demolition products that are free of combustible or organic materials and are therefore not subject to biological or chemical breakdown. Sediment accumulated within long term or permanent stormwater treatment devices is rarely able to be defined as cleanfill.
CMA	Coastal marine area. The area of foreshore and seabed below mean high water springs.
CMP	A catchment management plan addresses stormwater runoff generated or received into a catchment typically to meet specified water quantity and quality objectives.
COD	Chemical oxygen demand.
Cohort	A group with a common characteristic (typically age).
Colloidal	Particles with a diameter between approximately 5 and 200 nanometers that when dispersed are largely affected by surface chemistry.
Contaminant	<p>The Resource management Act (1991) defines a contaminants as:</p> <p><i>“any substance (including gases, odorous compounds, liquids, solids, and micro-organisms) or energy (excluding noise) or heat, that either by itself or in combination with the same, similar, or other substances, energy, or heat—</i></p> <p><i>(a) When discharged into water, changes or is likely to change the physical, chemical, or biological condition of water; or</i></p> <p><i>(b) When discharged onto or into land or into air, changes or is likely to change the physical, chemical, or biological condition of the land or air onto or into which it is discharged.”</i></p>
(Resource) Consent	An authorisation under the Resource Management Act, 1991.

Conveyance	The process of water moving from one place to another.
CSO	Combined sewer overflow.
Culvert	Pipe or concrete box structure that conveys stormwater under a roadway or embankment typically with no cesspits or manholes along its length.
Dead storage	The volume below any conveyance system or pathway, or below the outlet invert.
Debris barrier	A rack or other device for trapping litter. This may be a floating boom or a baffle arrangement (amongst others).
Degree of imperviousness	The specific portion of a catchment, drainage area, or site that is covered with an impervious surface and therefore does not allow stormwater to infiltrate, usually expressed as a percentage.
Deposition	The placement or addition of material within an environment or landform.
Depression storage	The amount of rainfall that is trapped in depressions on the ground surface.
Design efficiency	The specified treatment efficiency of a treatment device. The subsequent operating efficiency may be affected by construction and the maintenance of the device resulting in the operational efficiency differing from the design efficiency.
Design storm	<p>The specified maximum storm size to be treated by a device or withstood by a structure. Within treatment systems, smaller storms may not be fully attenuated within the system and larger storms would typically be by-passed at least in part around the main treatment system to reduce effects such as scour and the resuspension of entrained sediment. For structures, storms exceeding the design storm may result in partial or complete failure of the structure.</p> <div data-bbox="1123 1010 1567 1366" data-label="Image">  <p>Kiwitea Stream flood damage Source: Manawatu District Council.</p> </div>
Designation	The area designated for use as an arterial route or other such public work within a district plan.
Detention storage / Dry Pond	A vegetated natural or manmade depression or facility that collects water from developed areas and releases it at a slower rate than it enters. The excess of inflow over outflow is temporarily stored to be released over a few hours or a few days.
Diadromous	Describing fish that travel between fresh and salt water.
Discharge	The volume of water (and suspended sediment if surface water) that passes a given location within a given period of time.
Dry spell	Period between rain events.
Ditch	Drainage channel, commonly used in farmland. Ditches often have steep sides and are devoid of vegetation (compare with swale).

DO	Dissolved oxygen. The relative measure of oxygen dissolved (and available) in water.
DoC	Department of Conservation.
Drainage	The collection, conveyance, containment, and/or discharge of surface and storm water runoff.
Earthworks	The disturbance of unstabilised and / or sediment bearing surfaces during construction.
Emulsion	The dispersion of a substance (eg oil) with another (eg water). The stability of an emulsion may vary and depend on environmental parameters, substances mixed, and stabilising factors. An oil / water emulsion may render conventional oil separator and treatment systems less efficient.
Ephemeral	A temporarily flowing stream that may include standing pools or ponds, but which flows only during storm events.
Erosion	When land is worn away due to wind, water, or ice. Erosion occurs naturally but can be intensified by land clearing activities such as farming, development, and road-building.
ESC	Erosion and Sediment Control.
ESCP(s)	Erosion and Sediment Control Plan(s).
Eutrophic	A condition of a water body in which excess nutrients, particularly phosphorous, stimulates the growth of aquatic plant life usually resulting in the depletion of dissolved oxygen. Thus, less dissolved oxygen is available to other aquatic life.
Fauna	Collective term for animals.
First Flush	Contaminants mobilised during the first rainfall event after a long intervening dry spell.
Flood prone area	Usually defined by defined levels of 'acceptable' flooding within a district plan. Usually relating to the 1:50 or 1:100 year event.
Flooding	A natural occurrence that can cause nuisance and pose risks to human health if inappropriate development and / or stormwater management occurs. Flooding can be exacerbated by changes in a catchments hydrology affecting the flooding frequency, size, duration, and volume.
Geotextile	A fabric of a given strength and pore size used to control either sediment or water movement.
Groundwater	Water under the ground surface that is stored and / or moving below the soil layer.
Gutter/ channel	The edge of a road or other pavement below the kerb that drains runoff, typically into catchpits.




Clive River in flood, 1974
Source: Hastings District Council.

Habitat	The specific area or environment in which a particular type of plant or animal lives and grows.
Heavy metals	Metals such as copper and zinc which are commonly found in stormwater run off.
HIRDS	NIWAs High Intensity Rainfall Design System.
HRT	Hydraulic residence time.
Hydraulic improvement	Changes to a drainage channel to improve the flow of water usually away from a piece of infrastructure or community. In the case of a natural watercourse, hydraulic improvement typically means concrete lining and straightening.
Hydraulic neutrality	Neutralising the effect of increased impervious surfaces on the hydrograph to pre-development levels.
Hydrocarbons	Petroleum hydrocarbons contained in fuels such as petrol and diesel, and lube oils.
Impermeable layer	A cemented or compacted and often clay-like layer of soil that forms an impenetrable barrier to liquids within the soil profile and / or roots.
Impervious surface	A hard surface area which either prevents or slows the entry of water into the soil, and / or a hard surface area which causes run off in greater quantities or at an increased rate of flow compared with predevelopment conditions.
Infiltration trench	<p>Typically a long, narrow trench filled with rock or other granular material (however other media such as fly ash and compost have been trialed). Depending on the underlying geology, some infiltration trenches may not have a stormwater out let; others may be designed to include under drainage to assist with the removal of excess runoff particularly in more cohesive soils. Infiltration trenches may be combined with planting to form biofiltration systems, and work best with some form of pretreatment (such as vegetated buffer strips or swales) to reduce the clogging or binding of the surface materials.</p>
Innominate activity	Under the Resource Management Act, an innominate activity is an activity for which there are no corresponding rules. The default statutory 'tests' are therefore as for a discretionary activity, and consent must be sought.
Intermittent stream	A temporarily flowing stream that may include standing pools or ponds, but which flows only for part of the year.
Invert	The inside bottom of a pipe.
Kerb / gutter	The edges of a road where the road abuts a footpath, median, or shoulder. The kerb separates motorists from adjacent areas and acts as a gutter to assist the drainage of the carriageway.



Infiltration trench
Source: Washington Cathedral Stormwater Management and Ravine Restoration Programme.

Litter	Materials unlawfully, incorrectly, or inappropriately disposed of. Often litter is floatable materials such as bottles and plastic, which are a nuisance within stormwater. Other litter common in stormwater includes cigarette butts, and wrappers. Leaf litter, vegetation, and other natural debris can also become a nuisance, despite being natural, as it can clog drains and cause surface flooding.
LID	Low impact design is an approach for site development that protects and incorporates natural site features into erosion and sediment control and stormwater management plans.
LTMA	Land Transport Management Act, 2003.
Mangal	Mangrove forest, or stand of mangroves.
Mauri	The life force, spirit, or life supporting capacity. Waters with no mauri are waimate and may compromise or pollute those that they mix with.
Median	The central strip between lanes of opposing traffic.
MEP	Maximum extent practicable.
MfE	Ministry for the Environment.
MHWS	Mean high water spring tides.
NIWA	National Institute of Water and Atmospheric Research.
Non-point source pollution	The broad term referring to the type of pollution that is caused by non-specific sources, including human-made and natural pollutants. Runoff from roads has in the past been considered to be non-point source pollution. However improved asset management and information allowing road assets to be accurately located diminishes this argument. By contrast, the direct dumping of chemicals into a water body by a factory would be a specific source of pollution.
Non-structural BMP	A preventative action to protect receiving water quality that does not require construction. Non-structural best management practices (BMPs) rely predominantly on behavioural changes in order to be effective. Major categories of non-structural BMPs include education, recycling, maintenance practices and source controls.
NOR	A notice of requirements to a territorial authority pursuant to s168 or s181 RMA for land to be designated.
Nutrients	Typically chemical nutrients include compounds containing nitrogen or phosphorus. These may give rise to an increase in an ecosystem's primary productivity (excessive plant growth and decay), in turn resulting in further effects including lack of oxygen and severe reductions in water quality, fish, and other animal populations.
O&M	Operations and maintenance.
Oil separator	A device designed to separate gross amounts of oil and suspended solids.
Organic content	That part of soil or sediments which is produced by organisms (whether animal or plant sourced).


Orifice	A hole or opening of a specified size designed to discharge flow at a pre-determined rate.
Outfall	The point where stormwater discharges from a pipe, ditch, or other conveyance to a receiving body of water.
Overland flow	Surface runoff caused by means such as excess infiltration or saturation, or exceedance of the capacity of a reticulated system. Overland flow is sheet flow typically before it has concentrated into a channel.
Overland flow path	Route taken by runoff not able to be contained in the reticulated or natural stormwater conveyance system.
PAHs	Polynucleic aromatic hydrocarbons (e.g. benzo (a) pyrene, fluoranthene, chrysene).
Performance standards	The specified discharge standard for a stormwater treatment device.
Periphyton	A mixture of plants, microbes, and detritus that is attached to submerged surfaces in aquatic ecosystems. Periphyton is an important food source and can be an indicator of water quality.
Phytoplankton	Microscopic plants of the plankton such as diatoms and flagellates, which float or drift passively in water.
PNA	Protected natural area.
Point discharge	The release of stormwater from a pipe, culvert, or channel.
Pollution / pollutant	See contamination.
Pollutant Loading	The total quantity of pollutants in stormwater.
Quality	Relates to the concentration of contaminants within stormwater and / or the effect that stormwater discharges may have upon a receiving environment.
Quantity	Relates to the volume of stormwater discharged.
Rain garden	<div> <div>Bioretention and infiltration structure for the treatment of stormwater.</div> <div>  <p>Rain Garden. Source: Landcare Research.</p> </div> </div>
RCA	Road controlling authority as defined in the LTMA, 2003.
Reach	A length of channel with uniform characteristics.
Receiving environment	Bodies of water or surface water systems receiving water from upstream man-made or natural systems.


Recharge	The flow to groundwater from the infiltration stormwater.
Refuge	An area where an animal may rest or escape to to avoid detection or predation.
Required Efficiency	Suspended solids removal efficiency target.
Retention	The process of collecting and holding stormwater with no outflow.
Retrofit	The modification of an existing development with or without an existing stormwater management system through the construction and / or enhancement of a stormwater quality improvement device.
Riparian	The banks of rivers and streams, wetlands, and lakes.
Riprap	A facing layer or protective mound of stones placed to manage erosion associated with a structure or embankment due to the flow of stormwater.
RMA	Resource Management Act, 1991.
Road	Road means the whole of any land laid out by a council for a road or street or vested in a council for the purpose of a road intended for public use as shown on a deposited survey plan or vested in the council as a road by any other enactment (refer s.315 Local Government Act 1974).
Runoff	Drainage or flood discharge that leaves an area as surface flow or as pipeline flow.
Runoff Coefficient	The percentage of rainfall volume that will become runoff.
Saline intrusion	Saltwater intrusion arises when salt water (from the sea) flows inland to meet freshwater (streams, rivers, aquifers). The saltwater intrusion forms a wedge which is caused by the relative densities of the merging waters (sea water has a higher density than freshwater).
Sand filter	<p>Sand filters are structural stormwater controls that capture and temporarily store stormwater before using gravity to pass it through a filter bed of sand (either alone or mixed with other media such as zeolite, compost, or activated carbon) to flocculate and filter contaminants.. Sand filters typically comprise two chambers. The first chamber is usually a sediment forebay or sedimentation chamber, which removes floatables and coarse sediments. The second is the main filtration chamber, which removes additional pollutants by filtering the runoff through a sand bed.</p>



Sand filter

Source: University of Iowa.

Scour	Specific erosion usually associated with the discharge from a culvert, or at bridge piers, or from the transition from a hard / manmade finish to natural surfaces. Also see erosion.	 <p>Riverbank slip, Wanganui Source: Wanganui District Council (2000).</p>
Sediment	Eroded material that can include adsorbed contaminants.	
Sediment forebay	Small pond designed to capture coarse sediment.	
Sediment generation	The amount of sediment that is eroded off any given piece of land or earthworks area. The amount of sediment generation can be reduced by erosion controls practices.	
Sediment yield	The amount of sediment finally lost from any given piece of land or earthworks. The amount of sediment yield can be reduced by sediment control devices.	
Sheet flow	The portion of precipitation that moves initially as overland flow in very shallow depths before eventually reaching a stream channel.	
Smothering	The burial (or partial burial) by sediment of a stream bed, fauna, flora, or effect on their functional performance (e.g. clogging of gills or coating of leaves).	
Soffit	The inside top of a pipe, or under side of a structure.	
Source control	Action to prevent pollution where it originates. See non-structural BMP.	
SQID	Stormwater quality improvement device.	
SSWI	Site of specific wildlife interest.	
Stabilised	The rendering of site resistant to erosion by the application of compacted basecourse, hydroseeding (i.e. the sprayed application of grass or other seed), mulch, polythene, jute, or similar, or works within low sediment bearing surfaces such as rock.	
Storm size	See AEP.	
Stormwater	Runoff water resulting from rainfall. See FAQ Series 1.	
Stormwater management device	Devices that control the discharge of stormwater and that remove contaminants. Stormwater management devices include attenuation / detention devices (ponds, tanks, and infiltration systems), stormwater quality improvement devices (wetlands, rain gardens, swales, and sand filters), and conveyance systems (ditches, watertable drains, and pipes). A SQID may be online (whereby all the runoff from a contributing catchment area flows through a stormwater device), or offline (whereby only run-off up to a nominated maximum flow rate passes through the device and flows in excess of the nominated maximum flow rate are bypassed).	
Stormwater network	A system of underground pipes and open channels.	

Structural BMP	See stormwater management device.
Substrate	Ground or other solid object on which plants grow, animals move across or are attached to.
SUDS	Sustainable urban drainage system
Surface Water	Water that remains on the surface of the ground.
SVOCs	Semi-volatile organic compounds.
Swale	<p>A long, gently sloped, vegetated, and shallow drainage conveyance with relatively gentle side slopes. Most commonly grassed, but wetland vegetation can be used either in part (e.g. at outlets), or along the entire swale length. Compatible with 'gradual slope change ditches' as defined in road design and safety manuals.</p> <div data-bbox="863 573 1573 853" data-label="Image">  <p>Swale at North Harbour Stadium. Source: NZWERF.</p> </div>
TA	Territorial Authority means a city council or a district council (named in Part 2 of Schedule 2 of the Local Government Act 2002).
TCLPs	Toxicity characteristic leaching procedure. Test sometimes required by controlled landfills prior to accepting intractable wastes such as sediments accumulated within stormwater quality improvement devices.
Temperature	The discharge of stormwater from paved surfaces can affect the temperature of natural receiving environments especially during hot spells. Changes in temperature are defined as a contaminant under the Resource Management Act, 1991.
Time of concentration	The time it takes water falling at the head of a catchment to reach a given point of interest or discharge point. The time of concentration of storm flows usually decreases with development and the advent of impervious surfaces.
Toxic	Poisonous, carcinogenic, or otherwise directly harmful to life.
TP10	Auckland Regional Council Technical Publication No. 10: Stormwater Treatment Devices Design Guideline Manual, 2003. (Now Auckland Council Guidance Notes)
TP90	Auckland Regional Council Technical Publication No. 90: Erosion and Sediment Control Guidelines for Land Disturbing Activities, 1999. (Now Auckland Council Guidance Notes)
TPH	Total petroleum hydrocarbons.
TSS	Total suspended solids.
USLE	Universal Soil Loss Equation. Can be used in the estimation of sediment generation from earthworking activities.

Viscosity	A fluid's internal resistance to flow, or its thickness (a measure of fluid friction).
VOCs	Volatile organic substances (e.g. benzene, toluene, xylenes).
Water quality criteria	Specific levels of water quality that, if achieved, are expected to render a body of water suitable for its intended use and / or for the protection of the environment.
Water sensitive urban design	Low impact design (see LID) with particular emphasis on sustainable vegetation practices and low-level of water usage.
Water table drain	See ditch.
Waterbody	<p>The Resource Management Act, 1991, defines a waterbody as:</p> <p><i>“Freshwater or geothermal water in a river, lake, stream, pond, wetland, or aquifer, or any part thereof, that is not located within the coastal marine area.”</i></p>
Watercourse	Natural or artificial channel which conveys runoff.
Weir	<p>A barrier across a flow path, drain, stream or waterbody for the purpose of:</p> <ul style="list-style-type: none"> ▪ Controlling and/or measuring low flows; ▪ Decreasing water velocity; ▪ Minimising channel erosion; ▪ Promoting sediment deposition; ▪ Promoting infiltration; ▪ Raising the water level upstream in a controlled manner.
Wetpond	Drainage facilities for water quality treatment that contain a permanent pool of water.
WSUD	Water sensitive urban design.