

Water Sensitive Urban Design

CONCEPTS AND TERMINOLOGY

Purpose of this fact sheet:

This fact sheet provides definitions of the technical terms used in the Water Sensitive Urban Design Guidelines for the Coastal Dry Tropics.

Adsorption	Bonding of metals and nutrients onto the surfaces of suspended particles or biofilms, by way of physical, chemical and biological processes.
Aerobic or Oxic Zone	An environment in which there is oxygen present (in dissolved or gaseous form).
Anaerobic or Anoxic Zone	An environment in which there is no or very little oxygen present (in dissolved or gaseous form).
Aquatic macrophyte	A plant adapted to living in water or periodically inundated habitats
Aquifer Storage & Recovery	Injection of recycled water into aquifers for storage, which may be recovered later to meet water demands.
Bathymetry	The topography or the shape of the land below the water surface.
Biodiversity	The number and variety of living organisms; includes genetic diversity, species diversity, and ecological diversity (same as biological diversity).
Biofilm	A growth of microscopic organisms (i.e. bacteria and algae) living on any available surfaces (e.g. plant, rock, sediment) in the water body.
Bioretention Basin	Vegetated depressions engineered to collect, store, and treat stormwater runoff at downstream locations within the catchment. Bioretention basins can vary in shape and size. They treat stormwater runoff via filtration through densely planted surface vegetation and infiltration into a prescribed filter media. Pollutants are primarily removed by adsorption and biological transformation within the filter media. Treated stormwater is then collected in a perforated under-drain system and discharged.
Bioretention Swale	Bioretention swales provide both stormwater treatment and conveyance functions, combining a bioretention system installed in the base of a swale that is designed to convey stormwater as part of a minor and/ or major drainage system. Bioretention swales filter stormwater runoff through densely planted surface vegetation and through a prescribed filter media which commonly flows to a perforated under-drain system. Commonly employed along roadways.
Buffer Strip	An area of vegetation through which stormwater runoff passes while travelling to a downstream receiving water or discharge point. In association with vegetated swales, buffer strips can slow runoff and provide water quality benefits. They reduce sediment loads by passing a shallow depth of flow through vegetation and rely upon well distributed sheet flow. Vegetation tends to slow velocities and coarse sediments are retained.
Catchment	An area of land bounded by topographic features such as hills, from which drainage flows to a common point, usually ending in a river or creek and eventually the sea.
Constructed Wetland	An aquatic environment that supports a range of aquatic vegetation across the majority of the waterbody area. Constructed wetland systems remove pollutants from stormwater runoff through enhanced sedimentation, fine filtration and biological uptake.
Denitrification	Conversion of biologically available nitrogen to biologically unavailable nitrogen gas, by specialised bacteria
Deposition	Settling of particles on the sediment bed.

Detention time	The time it takes for a 'parcel' of water to flow from the inlet of a wetland system to the outlet.
Ephemeral	A short-lived, transitory event or occurrence often used to describe the life cycle of plants and animals. When used to describe wetlands, ephemeral refers to habitats that are intermittently inundated, and goes through periods of wetting and drying conditions.
Environmental Value (EV)	Particular values or uses of the environment that are important for a healthy ecosystem or for public benefit, welfare, safety or health and that require protection from the effects of contaminants, waste discharges and deposits. Several environmental values may be designated for a specific waterbody.
Extended detention	Temporary ponding of water on the surface of the bioretention basin or constructed wetland.
Flow attenuation	The reduction in peak flow resulting from temporary water storage.
Gross Pollutant Trap (GPT)	A trap designed to intercept coarse particulate material (by sedimentation) and trash and debris (by screens or booms). Gross pollutant traps may be incorporated into inlet pits, collector drains or main drains.
Groundwater	Water in the saturated zone beneath the land surface.
Hydraulics	The science of the conveyance of water through a natural or artificial structure (e.g. wetland, pipe, channel).
Hydraulic efficiency	Describes the extent to which uniform flow conditions occur at any wetland cross section.
Hydraulic roughness	Surface roughness of any medium that influences the velocity distribution of flow.
Hydrodynamics	The fluctuation or changes in flow behaviour (depth, direction, etc.) within a waterbody resulting from the interaction of hydrologic and hydraulic attributes of the system and surrounding environment.
Hydrologic effectiveness	Describes the interaction between runoff capture, detention time and detention volume within a wetland system. Hydrologic effectiveness is a measure of the mean annual volume of stormwater runoff captured and treated within the wetland and is expressed as a percentage of the mean annual runoff volume generated from the contributing catchment.
Hydrologic regime	Describes the long-term spatial variation in the water depths and period of inundation within a wetland system.
Hydrology	The science of the natural occurrence, distribution and movement of water.
Impervious Area	A hard surface area (e.g., parking lot or rooftop) that prevents or retards the entry of water into the soil, thus causing water to run off the surface in greater quantities and at an increased rate of flow.
Infiltration	The downward movement of water from the land surface into the soil.
Natural Water Cycle	The cycle of water movement through the environment including rain, overland and groundwater flow, evaporation, and evapotranspiration of water back into the atmosphere.
Nitrogen	A nutrient which is essential to all biota, including plants, animals and bacteria; needed to form proteins and genetic material.
Nutrient Load	An estimate of the total amount of a nutrient (nitrogen or phosphorus) entering a waterway over a particular time interval (units of N or P per year).

Permanent pool	The part of the wetland retained below the lowest outlet structure that is design to act as a refugial pool for aquatic wildlife during the dry spells.
Phosphorus	A nutrient which is essential to all biota, including plants, animals and bacteria, found in energy molecules and membranes of cells.
Plug flow	Flow conditions where all “parcels” of inflow have the same detention time.
Pollutant	A substance which may naturally occur but is present at harmful levels (e.g. sediment or nutrients in a water body) or which may be unnatural in the environment and capable of producing environmental harm (e.g. chlorinated pesticides).
Receiving Water	A water body that may receive runoff from the catchment, and generally has some environmental value or beneficial use. Natural wetlands are included in the definition of receiving waters, but constructed wetlands that have been built primarily for the purpose of stormwater treatment, are not.
Runoff Coefficient	The runoff coefficient measures permeability and determines the portion of rainfall that will run off the watershed. The runoff coefficient value, expressed as ‘C’, can vary from close to zero to as high as 1.0. A low ‘C’ value indicates that most of the water is retained for a time at the site, by soaking into the ground or forming puddles, whereas a high ‘C’ value means that the majority of the rain is runoff.
Sand Filter	Stormwater passes through and is treated by a filter media (typically sand) absent of vegetation. Sand filters do not incorporate vegetation because the filter media does not retain enough moisture to support plant growth and they are often installed underground. Sand filters require pre-treatment to remove litter, debris and coarse sediments.
Scouring	Severe erosion caused by water.
Sediment	Particulate matter, such as sand or mud, that is generally derived from the land and can be suspended and transported by fluid flow.
Sedimentation Basin	A small pond or basin created to retain runoff long enough to allow coarse sediment and debris to settle out.
Soil Erosion and Sediment Control	Soil erosion and sediment control is an important requirement when constructing WSUD measures as it protects systems from clogging while development of the contributing catchment occurs. More information on soil erosion and sediment control can be found in the Townsville City Council Development Guidelines.
Stormwater	Surface water runoff following a rain event (including piped flows) from urban surfaces (roads, pavements, rooftops, car parks and vegetated open space).
Stormwater Harvesting	The capture of stormwater run-off for reuse.
Swale	Swales (or vegetated swales) are used to convey stormwater and to provide removal of coarse and medium sediments. They are commonly combined with buffer strips and bioretention systems (refer Chapter 3 – Bioretention Swales). Swales utilise overland flow and mild slopes to convey water slowly downstream.
Total Suspended Solids (TSS)	A measure of the mass of solid material (organic and inorganic) suspended in water (commonly mg/L)

Total Water Cycle Management (TWCM)	Total water cycle management recognises the finite limits to a region's water resources and assumes greater importance as the level of demand approaches those limits. It is a holistic approach to balancing the competing demands placed on water resources, so as to meet defined water quantity and quality objectives, including those relating to the role of water in the environment. The key principles of total water cycle management include: recognising all potential sources of water, including wastewater and stormwater; using all water sources sustainably; allocating and using water equitably; and integrating water use and natural water processes, including maintaining environmental flows and water quality.
Urban Development	Non-rural forms of development including rural residential, suburban and dense urban (including residential, commercial; and non-rural industrial). Urban development forms could comprise greenfield, redevelopment, infill and retrofit of urban built infrastructure.
Water Cycle	The cycle of water through the environment including rain, flow over and under the land and transpiration back into the atmosphere.
Water Quality	Physical, chemical and biological characteristics of the water column, including nutrients, sediment and chlorophyll a.
Water Quality Modelling	A technique used to make predictions about the quality of water in waterways. Water quality modelling encompasses pollutant export modelling via models such as MUSIC and AQUALM, which predicts the pollutant loads being discharged from a given area.
Water Quality Objectives (WQOs)	Measurable goals for the quality of receiving waters to ensure the Environmental Values are protected.
Water Sensitive Urban Design (WSUD)	A holistic approach to the planning, design, construction and retrofitting of urban development that aims to minimise negative impacts on the natural water cycle and protect the health of aquatic ecosystems. It promotes the integration of stormwater, water supply and sewage management within a development precinct.

References:

Australian Guidelines for Urban Stormwater Management in National Water Quality Management Strategy, No. 10. Agriculture and Resource Management Council of Australia and New Zealand and Australian and New Zealand Environment and Conservation Council, 2000.

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Draft Queensland Water Recycling Strategy. Queensland, Department of Natural Resources, 2001.

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