STORMWATER

Credit 25
Points available: 2

AIM OF CREDIT

To reward projects that minimise peak storm water outflows from the site and reduce pollutants entering the public sewer infrastructure or other water bodies.

CREDIT CRITERIA

25.1	**Stormwater Peak Discharge**	**1 point** is available where the post-development peak Average Recurrence Interval (ARI) event discharge from the site does not exceed the pre-development peak ARI event discharge.
25.2	**Stormwater Pollution Targets**	**1 additional point** is available, where the first point has been achieved and all stormwater discharged from site meets specified pollution reduction targets.

COMPLIANCE REQUIREMENTS

25.1 STORMWATER PEAK DISCHARGE

One (1) point is awarded where project teams demonstrate that the post-development peak event stormwater discharge (including the effects of climate change) from the site does not exceed the pre-development peak event stormwater discharge, using the 2 year and 5 year Average Recurrence Intervals (ARI). The effect of climate change on rainfall can be obtained from the HIRDS v4 database (NIWA, 2019).

25.1.1 Climate Change Scenarios

If the project is targeting the 'Adaptation and Resilience' credit (3), the Risk Assessment included in this credit submission shall be used to determine the appropriate climate change scenario.

If the project is not targeting the 'Adaptation and Resilience' credit (3), the project may refer to local council flood level guidance.

25.1.2 Management of Stormwater Peak Flows

Management of stormwater peak flows may include one or more of the following techniques:

- Water detention;
- Water retention:
  - Infiltration
  - Harvesting and reuse
  - Evapotranspiration

- Infiltration to native soils, or otherwise, filtered through an appropriately designed soil and plant stormwater treatment system, such as vegetated swales, raingardens and pervious paving;
- Stormwater reuse (including roof collection and use); and
- Stormwater evapotranspiration.

Where specific measures are in place to collect and store stormwater in lakes, rivers or groundwater aquifers, projects are advised to submit a Technical Question to the NZGBC.

25.2 STORMWATER POLLUTION TARGETS

Where criterion 25.1 has been achieved, one (1) additional point is awarded where it is demonstrated that all stormwater discharged from the site meets the required pollution reduction targets for the identified contaminants of concern when compared to untreated runoff in accordance with the following requirements.

It is noted that some local governments may provide pre-determined infrastructure solutions that are 'deemed to comply' with the aim of this credit criterion. If this is the case the project team shall have this approach approved by a Technical Question.

In circumstances where this credit specifies levels or targets that are less stringent than those specified in relevant local legislation/regulations, the local legislation/regulations shall take precedence.

Appropriate calculations must be undertaken by suitably qualified professionals. Any calculations and assumptions must be outlined, easy to follow, and in accordance with common practice protocols (see Guidance).

25.2.1 The project must meet the average reductions listed in Column A of Table 25.1 when compared to untreated runoff over the simulation period:

Table 25.1 Pollution Reduction Targets

Pollutant	Reduction Target (% of the typical urban annual load)		
	A	B	C
Total Copper	60%	70%	80%
Total Zinc	60%	70%	80%
Total Suspended Solids (TSS)[1]	80%	80%	90%
Gross Pollutants	85%	90%	95%
Total Nitrogen (TN)[2]	30%	45%	60%
Total Phosphorus (TP)[2]	30%	60%	70%
Total Petroleum Hydrocarbons[3]	60%	90%	90%
Free Oils[3]	90%	90%	98%

Notes:

1. Load based on the following particulate size distribution (by mass): 20% <20 µm; 20% 20-60 µm; 20% 60-150 µm; 20% 150-400 µm; 20% 400-2000 µm.
2. Load includes particulate and dissolved fraction.
3. This requirement is not applicable where the site contains less than a total of 200m^2 of uncovered areas where vehicles are likely to transit and/or park e.g. roads, loading docks, refuelling bays, car parking etc.

While petroleum hydrocarbons and free oils cannot be readily modelled in MUSIC, it is possible to address petroleum hydrocarbons and free oils via stormwater treatment devices such as gross pollutant traps (GPTs).

If the project would like to nominate other contaminants for the identified concern for certain building types, contact the NZGBC via a Technical Question.

25.2.2 Stormwater treatment performance for TSS, gross pollutants, TN and TP must be demonstrated for compliance by numerical modelling of pollutant export. Modelling must be undertaken based on a continuous simulation of catchment hydrology using models, parameters and methodologies in accordance with the relevant local government requirements (see Guidance).

If the project team can provide evidence as to why the building and its associated site will not generate pollutants, i.e. Zinc and/or Copper, they are not required to include them in the model. For example, if it can be shown that a steel roof has been appropriately coated to remove the likelihood of Zinc runoff than the project would not need to include Zinc in the model. Please submit a TQ to NZGBC with supporting documentation if this is to be pursued.

INNOVATION

Exceeding Green Star Benchmarks – Stormwater Pollution Targets

Up to two additional points may be awarded where projects can demonstrate achieving Pollution Reduction Targets from column B (1 point) or C (2 points) as stated in Table 25.1.

Currently, the use of biological treatment systems is generally considered the only viable method of achieving compliance with the Pollution Reduction Targets of column C. Where a treatment train that does not contain biological treatment is being used to achieve the Pollution Reduction Targets in column C, independently verified performance certification is required to show that the equipment is capable of achieving those targets.

Innovation Challenge - Water Sensitive Urban Design

Project teams may develop an Innovation Challenge that demonstrates that the criteria of the credit have been exceeded by employing Water Sensitive Urban Design principles.

GUIDANCE

Date of Site Purchase

Where indicated, the requirements are applied to the state of the site that existed at the date of site purchase. In cases where the site has been owned by the current owner for more than five years (from the project's Green Star registration date), the requirements are applied to the state of the site that existed at least five (but not more than ten years) prior to the project's Green Star registration date.

Modelling

Pollutant export modelling should predict the discharge pollutant loads from a given area. The results of the simulation must show a comparison against the relevant reduction targets for the specified treatment system/train.

Rainfall Data for Modelling Programs Using Continuous Simulation

The following considerations for rainfall simulation shall be adopted:

- Continuous simulation of a minimum of 5-year rainfall series;
- 5-minute time step (intervals);
- Localised climatic sequences;
- Water balances; and
- Treatment train operation.

The selection of the software varies due to the different purpose and the variety of targeted contaminants. Available water quality modelling software includes MUSIC, DHI package, Innovyze package (Infoworks ICM), SWMM, delft3D and QUAL2E. The model of the catchment contaminant load model (C-CALM) from NIWA and Freshwater management tool that Auckland Council is developing can also be the tool to model the water quality modelling. Project shall contact NZGBC if an alternative, yet equivalent modelling software is to be used.

As an alternative to computer modelling, stormwater treatment performance calculations may be performed manually, in accordance with methodologies outlined in procedural manuals such as WSUD Engineering Procedures – Stormwater (CSIRO, 2005).

Reducing Stormwater Impacts

Stormwater impacts from a site result from runoff from impervious and semi-pervious surfaces. Runoff from a site has impacts on both water quality and flow rates occurring offsite. Techniques which can reduce these offsite impacts include flow management, which slows runoff rates and/or reduces the total volume of water that impacts on waterways, and pollutant management, which treats a range of pollutants in stormwater runoff. Both are necessary to protect receiving waters from degradation by stormwater runoff.

To reduce the offsite impacts from stormwater runoff, pollutant management and flow management techniques can be considered individually or in combination to achieve the desired offsite impacts. The final stormwater management strategy should be chosen to suit site constraints, and has the potential to affect other Green Star credits, such as those in the Water Category.

Stormwater Design Considerations

Effective Stormwater Systems must be able to adequately manage small, minor and major storm events. They can be designed to do this by considering the management objectives of

each design event and the scale at which the solution is to apply, examples as stated in Table 25.2.

Table 25.2 Management Objectives and System Performance Outcomes Related to Rainfall Design Events (extract from Water Sensitive Urban Design: Stormwater Design Considerations, Government of Western Australia Department of Water, June 2011)

Up to 1-year ARI	Greater than 1-year ARI and up to 5-year ARI for residential and rural-residential, and 10-year ARI events for commercial and industrial areas.	Up to the 100-year ARI event
• Retain or detain stormwater runoff from constructed impervious surfaces generated by up to the 1-year, 1-hour ARI event at its source, preferably in lots and road reserves. • Reduce the area and connection of impervious surfaces. • Maintain pre-development peak flow rates and total volumes runoff from the whole sub-catchment at outlets from the site at the critical 1-year ARI event. • Control pollutants at their source. • Improve water quality, via soil and vegetation filtration. • Protect ecological values and maintain hydrological regimes.	• These flows use the 'minor system conveyance' (road gutters, overflow pipes, verges, swales and living streams) and detention or retention areas. • Attenuate critical 5-year event flows to the capacity of downstream natural channels or constructed drainage infrastructure. • Maintain serviceability of roads and infrastructure. • Manage flow rates to prevent erosion.	• Flow paths need to be identified during urban design. • Contain flows within 'major system conveyance' - roads, verges, public open space, living streams, waterways and wetlands. • Protection of people and buildings – establish or confirm design flood levels. • Reduce risk of flooding and manage flow rates.

Typical Urban Annual Load

Typical urban annual loads can be estimated using continuous simulation modelling. Where available, relevant guideline values for pollutant concentrations for the catchment land use and surface type should be used.

Water Sensitive Urban Design

Water-sensitive urban design (WSUD) is a land planning and engineering design approach which integrates the urban water cycle, including stormwater, groundwater and wastewater

management and water supply, into urban design to minimise environmental degradation and improve aesthetic and recreational appeal.

DEFINITIONS

Average Recurrence Interval (ARI)
The average, or expected value of the periods between exceedances of a given rainfall total accumulated over a given duration. Data can be obtained from the *National Institute of Water and Atmospheric Research (NIWA).*

Pre-development
The conditions of the site at the date of site purchase.

Site
The 'site' is defined by the scope of Green Star assessment. If a development consists of several buildings, the site must be defined for each registered building.

Untreated Runoff

The post development stormwater runoff with no pollutant treatment.

Stormwater
For the purposes of this credit, all rainwater falling on the site is stormwater. Rainwater hitting the roof of a structure and running into the stormwater system (either directly or indirectly) is stormwater, and must comply with the credit criteria. For stormwater that is captured, used on site, and not discharged to the stormwater system, there is no requirement to treat the pollutants in that stormwater beyond those required under the relevant legislation. Rainwater hitting the roof of a structure, being captured, and then used in a system that discharges or overflows to the stormwater system, must be treated in accordance with the credit criteria prior to discharge.

Suitably Qualified Professional
A professional with a formal tertiary environmental, hydraulic or civil engineering qualification or with a minimum five years' experience in developing and implementing designs for water management.

Referenced Documents

The following documents are referred to in this credit:

MfE. (1998). Environmental Guidelines for Water Discharges from Petroleum Industry Sites in New Zealand. [Online]. https://www.mfe.govt.nz/sites/default/files/media/Hazards/water-discharges-guidelines-dec98_0.pdf

Model for Urban Stormwater Improvement Conceptualisation (MUSIC) model (CRCCH, 2005)

NIWA. 2019. HIRDSv4 Usage. [Online]. https://www.niwa.co.nz/information-services/hirds/help

STORM computer modelling program

WSUD Engineering Procedures – Stormwater (CSIRO, 2005).

Auckland Council Guideline Document GD01 (2017) – Stormwater Management Devices in the Auckland Region

Auckland Council Technical Publication 108 (1999) Guidelines for Stormwater Runoff Modelling in the Auckland Region
http://www.aucklandcity.govt.nz/council/documents/technicalpublications/TP108%20Part%20A.pdf

Additional Information

Additional information can be found in the following:

http://www.wsud.org/

http://waterbydesign.com.au/whatiswsud/

http://www.newwaterways.org.au/About-Us/What-is-water-sensitive-urban-design

DOCUMENTATION REQUIREMENTS

Please refer to the *'How Documentation is Described in the Submission Guidelines'* section within the *Introduction* for further guidance on Documentation Requirements for project submissions.

Design Review submissions are optional.

Project teams must submit documentation supporting credit compliance. A list of recommended supporting evidence is provided in the following section, which can be used to demonstrate compliance. Alternate documentation to that listed below can also be used by project teams to demonstrate compliance.

The key requirement is that evidence is provided to support each claim made within the Submission Template.

SUBMISSION CONTENT

- Project teams must submit the following documentation:
- Submission Template
- **Evidence** to support claims made in the Submission Template

Recommended Supporting Evidence

25.1 STORMWATER PEAK DISCHARGE & 25.2 STORMWATER POLLUTION TARGETS

- **Calculation/Modelling Report** by a suitably qualified professional. The report should describe:
- Software or calculation methods used.
- Data sets and tables that were applied.
- Sizing of all stormwater treatment systems installed.
- Quantity of stormwater discharge to be addressed by each stormwater treatment system (annually).
- Comparing the results of the pollutant export modelling/calculations with the Pollution Reduction Targets in the relevant column of Table 25.1 (where Stormwater Pollution Targets criterion is targeted).
    - If relevant, summarizing how hydrocarbons and free oils have been addressed.
- **Civil/Hydraulics drawings** showing the stormwater collection, storage and treatment facilities and detailing their functional elements.
- **Hydraulics drawings** showing all the capture, storage, piping and discharge route.

- **Site plans** showing the total areas of uncovered areas where vehicles are likely to transit and/or park (e.g. roads, loading docks, refuelling bays, and car parking, etc).

25.2 STORMWATER POLLUTION TARGETS

Independently verified performance certification for each manufactured stormwater treatment device, proving its ability to achieve the pollution reduction targets nominated in Table 25.1.

REVISIONS AND AMENDMENTS

Revision No.	Date of Release	Description
NZv1.0	11/04/2019	Initial release.
	20/03/2020	Changes on credit 25.1 stormwater peak discharge requirements, clarifications on acceptable modelling software.