

WaterFootprint C³ Calculator[©]

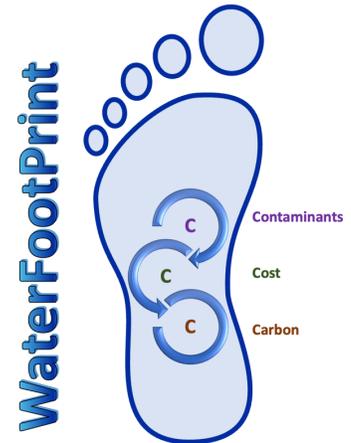
Frequently Asked Questions (FAQs)

This FAQ sheet provides quick answers to common questions about the WaterFootprint C³ Calculator[©], a decision-support tool developed by Auckland Council to help assess contaminant loads, life cycle costs (LCCs), and carbon emissions from various stormwater treatment interventions.

Model Development Report and User Manual

September 2025 - WaterFootprint C³ Calculator[©]

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1. What is the WaterFootprint C³ Calculator?

The WaterFootprint C³ Calculator (simply C³ calculator) is a simple, web-based tool developed by Auckland Council to model how different stormwater management options affect contaminant loads, life cycle costs, and carbon emissions. It's designed to help planners and engineers compare stormwater treatment scenarios to determine their overall “WaterFootprint”.

2. What makes the C³ Calculator unique?

It's the first model in New Zealand that integrates contaminant load reduction, life cycle cost, and carbon emissions into one tool. It enables easy side-by-side comparison of different intervention options.

3. What does 'C³' stand for?

C³ refers to the three main outputs of the model: Contaminant loads, Costs, and Carbon.

4. Who is this tool for?

It's designed for council staff, civil engineers, scientists, stormwater planners and developers who need to understand the environmental and economic impacts of urban stormwater interventions.

5. What types of developments can it be used for?

The C³ Calculator has been designed specifically for urban areas in the Auckland region. It is applicable to both brownfield and greenfield developments and supports subdivision-scale and catchment-scale analysis.

6. What scale is it best suited for?

The tool is intended for subdivision- or catchment-scale planning. The model is most accurate for sites with more than 1,000m² of impervious area. It is not suitable for very small sites or individual properties.

7. What contaminants does it assess?

It models annual loads (in kg/yr) for:

- Total Suspended Solids (TSS)
- Total Zinc (TZn)
- Total Copper (TCu)
- Total Nitrogen (TN)
- Total Phosphorus (TP)
- E. coli

8. Does the model include long term costs and carbon emissions?

Yes. It includes:

- Life cycle costs over 50 years for different stormwater devices, based on a 4% discount rate. Costs include the initial planning and construction costs, routine maintenance costs and large scale renewal costs (often called corrective maintenance costs in life cycle costing). The costs do not include land costs – these would need to be included over and above the analysis.
- Estimated carbon emissions from construction, maintenance, and renewal phases.

9. Can I use the model to size stormwater devices?

No. This is not a design tool. It estimates performance and costs based on the assumption that devices are designed and sized in accordance with Guideline Document 01 (Stormwater Management Device Guideline for the Auckland Region). It doesn't provide sizing specifications.

10. What if I want to model a site outside Auckland?

The C³ Calculator has been designed and calibrated specifically for urban areas in the Auckland region (with Auckland specific contaminant yields). You can use it elsewhere, but you must replace contaminant yield data with locally appropriate contaminant yields.

11. What kinds of stormwater devices can I test in the model?

You can model treatment trains using devices like wetlands, swales, rain gardens, permeable paving, filter systems, and more. Load reduction factors are based on international literature.

Additionally, you can cost devices such as rain tanks and green roofs which are primarily used to reduce water quantity effects (rather than to provide for water quality treatment).

Only those devices, for which relevant data exists, is included in each part of the model. The model will be continuously updated as new data becomes available, and devices added as or when necessary.

12. Does the model support multiple scenarios?

Yes. You can compare different development or treatment scenarios side-by-side to understand their relative impacts relating to contaminant load removal, cost and carbon emissions.

13. Are existing treatment devices included?

Yes. If there is an existing device already located within the area you are modelling, then the

contaminant load reduction from that device will have already been taken into account. This enables assessment of upgrade scenarios or the impact of adding new devices to an existing network.

14. Does the model include land or consenting costs?

No. The model includes direct life cycle costs only. Land costs, consenting, and feasibility assessments need to be done separately.

16. What assumptions should I be aware of?

- Median contaminant yields, generated from Auckland Council's Freshwater Management Tool, from the various land uses are used (**Auckland Council's Freshwater Management Tool: Report 2. Baseline Configuration and Performance** - <https://knowledgeauckland.org.nz/media/2466/fwmt-report-2-baseline-configuration-and-performance-auckland-council-2021.pdf>).
- Load reduction factors (LRFs) are indicative and based on a detailed global literature review. In general we recommend use of the medium or low LRF. The use of the High LRF is not recommended without careful consideration and justification.
- Life cycle costs are based on average costs from Auckland Council's research and are indicative estimates (**Auckland Council's Freshwater Management Tool: Report 9. A Total Economic Valuation Approach to Understanding Costs and Benefits of stormwater interventions – Part 1 Urban Devices** <https://knowledgeauckland.org.nz/media/2472/fwmt-report-9-total-economic-valuation-part-1-urban-devices-auckland-council-2021.pdf>).
- Carbon values are based on average emissions identified from Auckland Council's research (**Auckland Council's Post-Processing the Carbon Footprint for Rural and Urban Actions in the FWMT (Stage 1)** <https://www.aucklanddesignmanual.co.nz/content/dam/adm/adm-website/developing-infrastructure/freshwater-management--tool/supporting-model/POST-P-1.pdf>) and are indicative only.

17. How are load reduction factors (LRFs) determined?

They are derived from a comprehensive literature review (**Assessment of the Water Quality Performance of Urban Stormwater Interventions for Auckland Council's Freshwater Management Tool: A Literature Review. Report prepared by Koru Environmental (2024) for Auckland Council**) of national and international stormwater treatment device performance. The LRFs represent **indicative average efficiencies**. Remember, if you are unsure of what LRF to use, use the default "Medium" LRF provided in the model. The "High" LRF should only be used as an exception and the tool requires users to provide a rationale for why it has been used.

18. Does the model account for treatment trains?

Yes. Users can assign up to **two 'at-source'** and **two 'catchment-level'** devices in series. LRFs are adjusted to reflect reduced treatment efficiency for downstream devices.

19. How are life cycle costs calculated?

Costs include **acquisition** and **50-year maintenance** costs, based on **Auckland-specific data** and maintenance practices. LCCs vary by device size using **nonlinear cost functions**. The model uses a **4% discount rate** and adjusts costs to **2025 values** using Reserve Bank inflation data.

20. Does the tool include co-benefits or indirect costs?

Not yet. A **future companion tool** is planned to assess co-benefits and avoided costs for a more complete evaluation.

21. Can the outputs be used for consents or policy decisions?

Yes, but **as a planning support tool only**. Decisions must also consider **site-specific details, feasibility**, and other planning information.

22. Are there limitations to the cost and size estimates for devices?

Yes. The LCC calculations are based on a non-linear relationship with device size and are valid only within a defined size range for each intervention type. Using areas outside the defined range may result in inaccurate estimates.

Devices	Size Limitations
Wetlands (LCC\$/m ² /yr)	100 - 10,000 m ²
Ponds (LCC\$/m ² /yr)	2,000 - 6,000 m ²
Rain gardens (LCC\$/m ² /yr)	5 - 1,000 m ²
Swales (LCC\$/ m/yr)	100 - 5000 linear m
Filter systems (LCC\$/ha area treated/yr)	1 - 30 ha
Permeable paving (LCC\$/m ² /yr)	50 - 600 m ²
Green roofs (LCC\$/m ² /yr)	200 - 400 m ²
Rain tanks (LCC\$/tank size/yr)	1,0000 - 30,000 L tanks

23. Why are there some devices included in the contaminant portion of the model and not in the cost portion, and vice versa?

Rain tanks and green roofs are not included in the contaminant calculator tool as they are generally not designed for provide water quality treatment. However, by reducing the volume of run-off from a particular site they will, by default, mitigate contaminants.

The cost calculator does not include costs of undertaking source control of roofing materials. This cost is usually incurred as a 'business as usual' cost during the development process or as part of upgrading a roof and is not required to be separately costed. In terms of the replacement of existing roofs, the cost assumption is that this will occur as part of natural roof replacement over time.

23. How should I interpret the model outputs?

Focus on the *relative differences between options*, not the absolute numbers. The model is best used for screening and comparison, not compliance, budgeting or design certification.

24. Is the tool free to use?

Yes. It is freely available to users.

25. Who developed the tool?

It was developed by Koru Environmental Consultants Ltd and LimnoTrack for Auckland Council as part of the Freshwater Management Tool (FWMT) programme.

26. Where can I find more information?

Refer to the user manual included in the tool package and the full technical report titled:

- *WaterFootprint C³ Calculator: Model Development and User Manual (2025)* [LINK HERE](#).

You can also watch this user video [LINK HERE](#).