

Inspection of Stormwater Treatment Devices on Non- Industrial Private Lands

Comprehensive Stormwater Network Discharge Consent (CSNDC), Schedule 4J

Christchurch City Council

December 2022

Report: Schedule 4J Inspection of Stormwater Treatment Devices on Non-Industrial Private Lands

Document control	
Document location	FOLDER21/20: Comprehensive Stormwater Network Discharge Consent (CSNDC) – Schedule 4 – Source Control Investigations
Related documents	<p>CRC214226 Consent document (TRIM 21/838872)</p> <p>CRC214226 2021 Scope of work (TRIM 21/1199853)</p> <p>Comprehensive Stormwater Network Discharge Consent Environmental Monitoring Programme Version 8 (TRIM 21/904749)</p> <p>Stormwater and Land Drainage bylaw 2022 TRIM 20/777996</p> <p>Stormwater Treatment Devices on Private Lands_ Consents TRIM 21/1197472</p> <p>Christchurch City Council Onsite Stormwater Mitigation Guide TRIM 21/1201426</p>

Version control	
Version number	1
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Changes/updates to the new version	N/A

Executive Summary

Under the Comprehensive Stormwater Network Discharge Consent (CSNDC) -Schedule 4J – source control investigations, Christchurch City Council (Council) is required to develop a program for the operational inspection of a sample of private stormwater treatment and/or retention devices on non-industrial sites for the purposes of ensuring proper function and maintenance. In 2021, of the 15 representative stormwater treatment devices across the different catchments inspected, 11 of them were in good condition and were fully functional. Four of the devices were non-compliant and currently are under investigation. Therefore, 11 inspected reports were obtained in 2021. Details of the inspection site and the type of inspected device can be found in Appendix IV.

The CSNDC requires work under this condition to be a long-term project. Each year representative devices from the various catchments will be inspected and maintained as per the manufacturer’s guidelines. The internal database and workflow have been established to record the inspections and maintenance reports and to track down the devices for future follow-up. The recommendations have been made to integrate approved stormwater treatment devices in the Council’s mainstream legal documents such as Land Information Memorandum (LIM) to keep track of its ownership and regular maintenance.

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1. Introduction

The Comprehensive Stormwater Network Discharge Consent (CSNDC, CRC214226) was granted to the Christchurch City Council on 20 December 2019. The consent defines the conditions under which the Council may discharge Stormwater into the territory’s water bodies, into the land, and to the coast. The CSNDC includes a requirement to develop a programme for the operational inspection of a sample of private stormwater treatment and/or retention devices on non-industrial sites for the purposes of ensuring proper function and maintenance. The requirements of the programme are set out in Schedule 4J and have a specified timeline to instigate the project:

The primary objective of this project is to develop an ongoing programme to ensure the proper functioning of an installed stormwater device in non-industrial private lands. The secondary objectives of the programme are:

- a) To establish a process that will involve the development of a programme
- b) To access the current status of representative samples of approved stormwater treatment devices on non-industrial private lands
- c) To understand how well they are performing since installations and report if there are any non-compliant

Table 1. Description of the project and the timeline

Description	Action Start Date	Action Completion Date
Stormwater Treatment Devices on Non-industrial Private lands Schedule: 4J Develop a programme for the operational inspection of a sample of private stormwater treatment and/or retention devices on non-industrial sites for the purposes of ensuring proper function and maintenance	Within 2 years of the commencement of the resource consent 19 December 2021	Ongoing

2. Background

2.1. Project Description

The scope of work was prepared by the Council and peer-reviewed by the review panel to comply with CSNDC requirements, and to assess what processes, strategies, and technical inputs are required to develop a programme and to implement it as a long-term project. The scoping document highlighted the existing gaps and helped to develop a framework to meet both the requirements of the CSNDC as well as the Council’s internal requirements for a better understanding of the performance of Council approved stormwater treatment devices on non-industrial private land such as commercial business complex, rest homes, residential homes and multi-apartment building, education centers and so forth..

Under Sections 23 and 25 of the Council’s Stormwater and Land Drainage Bylaw 2022, the occupier(s) of any property with a private stormwater system must ensure that it is maintained in good operating conditions, and allows for the free flow of stormwater. The customer owns and is responsible for all repairs and associated costs with regards to the private stormwater drains within the the property, right up to the point of discharge. Conditions could include providing onsite rainwater storage to avoid increasing flooding downstream, or a treatment system to remove contaminants from stormwater ([Stormwater connections and discharge approval](#)). Below are the acceptable stormwater treatment options the Council has approved.

The acceptable Treatment - Water Quality options are:

- A rain garden or tree pit designed to Council's Rain Garden and/or Tree Pit Design Criteria
- Soil adsorption or sedimentation basin designed to capture the runoff from the first 25 mm of rainfall
- A vegetated swale designed in general accordance with Auckland Council's TP10 to treat the runoff from a 5 mm/hr intensity storm
- One of the following proprietary devices is designed to treat the runoff from a 5 mm/hr intensity storm:
 - Stormwater360 Stormfilter
 - Stormwater360 Filterra
 - Hynds Up-Flo Filter
 - SPEL Bayfilter
 - SPEL Hydrosystem

The acceptable Attenuation- Water Quantity options are:

- Storage
- Balance Tank

2.2. Gaps

The following gaps were identified during a peer-reviewed process.

- a) The Council has obligations under the Stormwater and Land Drainage Bylaw 2022 for the inspection of all privately owned stormwater systems that are designed, constructed, managed, and maintained by the owner, at the owner’s expense or by some other arrangement acceptable to the Council. Every property owner who breaches this bylaw commits an offence and is liable on summary conviction as set out in the Local Government Act 2002. As such, no plan or programme has been developed or set up to capture these maintenance requirements as of now by the Council.
- b) Council does not hold any information on stormwater treatment devices that are not functioning correctly due to poor design, inappropriate construction methodologies, or insufficient maintenance.

- c) There is very little information on the Council website that covers generic consideration, consents and other legal compliance, construction specifications, documentation, monitoring, and technical guidance.
- d) Council has not established/disseminated any communications with the property owners regarding their responsibilities to maintain these devices at the time when we approved the consent (APPENDIX I) or contacted the property owners regarding their stormwater treatment maintenance requirements in the past years.

2.3. Assumptions and Limitations

There are a few assumptions and limitations to the current consent approval process.

- a) Approximately, 80% of consent applications are received through the Building Consent application process. The consenting team does not have a process in place to capture maintenance requirements under the property's building warrant of fitness.
- b) Although there are no maintenance schedules in place, it is believed that all the installed devices are performing well as we have not heard otherwise.
- c) For smaller private properties (except for larger subdivisions), it is perceived that all the installed devices have followed appropriate design guidelines, methodologies, and legal compliance requirements.

3. Methods

To address the existing gaps and limitations that the Council has identified, a high-level project workflow was established that involves four steps: 1) Identification of sites 2) Communication, plan and processes 3) Collation of inspection and maintenance reports, 4) Data management and record keeping (Figure 1, APPENDIX II). A brief description on operational inspection and maintenance requirement for each device type was 15 stormwater treatment devices (both proprietary and non-proprietary) were selected across the city representing the four catchments (Avon, Heathcote, Styx, and Halswell).

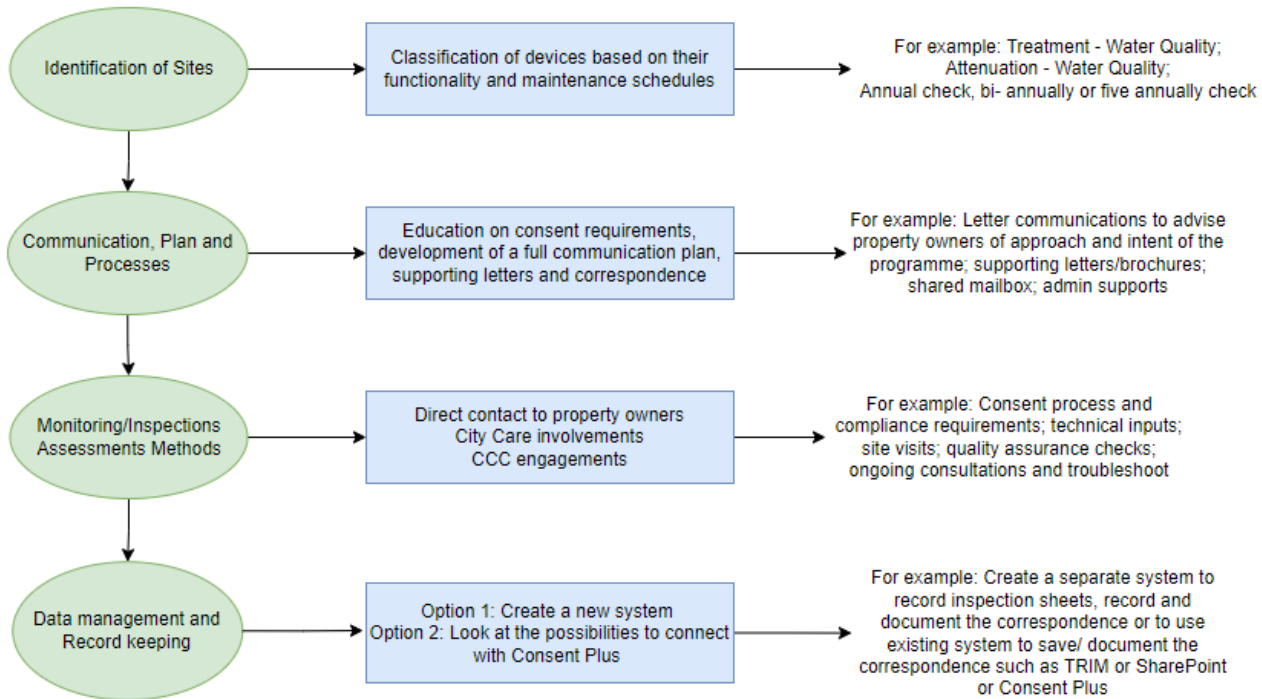


Figure 1. High Level Project Workflow

4. Findings

In 2021, of the 15 representative stormwater treatment devices across the different catchments inspected, 11 of them were in good condition and were fully functional. Four of the devices were non-compliant and currently are under investigation.

Table 2. Summary of inspection and maintenance of stormwater treatment devices on private lands

S.N	Site Address	Device Type	Inspection Report # TRIM	Property Type	Consent Start	Date of the Inspection	Summary of the inspection report	Waterways catchment impacted
1	1 School Road, Halswell, Christchurch	Soil absorption or sedimentation basin	22/1175887	Commercial – Specific Purpose	2013	22 March 2022	The stormwater systems are working well as designed, and the rainwater retention tanks around the premises holding water, as a part of the sealed system were in good condition.	Halswell Catchment
2.	68 Curletts Road, Upper Riccarton, Christchurch	Oil and Grit	22/1165442	Commercial	2013	12 January 2022	Robsons environmental services was engaged to suck the traps out, the traps were full of silt dirt and a slight membrane of oil sitting on the water. The device is fully functional and recommended a 3 monthly clean out of the oil interceptor traps.	Heathcote Catchment
3.	9 Wilsons Road South, St Martins	SW360 Stormfilter	22/1165024	Residential	2019	4 April 2022	Removed trash and debris, replaced cartridges, installed Lid o-rings, and relief valve is in good condition and the device is fully functional.	Heathcote Catchment
4.	309 Durham Street North, Central City	SW360 JellyFish	22/1161124	Commercial	2017	4 April 2022	Floatable debris removed, drain down cartridges externally rinsed and recommissioned, Hi-Flo cartridges externally rinsed and recommissioned, sediment removed, cartridge lids intact.	Avon Catchment
5.	392 Moorhouse Avenue, Sydenham, Christchurch	SPEL Hydrosystem	22/1160024	Commercial	2018	6 April 2022	General service and inspection of SPEL Hydrosystem Vault – good condition cartridges, good condition vacuumed the top of cartridges, vacuumed the sump via central riser, back flushed cartridges until clear, re-vacuumed sump. Good condition and functioning as designed.	Avon – Heathcote Catchment
6.	1/36 Creyke Road, Ilam	SW360 Jellyfish	22/900002	Residential	2018	10 March 2022	Floatable debris removed, drain down cartridges externally rinsed and	Avon Catchment

							recommissioned, Hi-Flo cartridges externally rinsed and recommissioned, sediment removed, cartridge lids intact	
7.	165 Papanui Road, Merivale	Rain Garden	22/899818	Residential	2014	2 June 2022	<p>The rain gardens are performing as expected. The plants are not flourishing at the same phase. Dead foliage and grass blades blanketed part of the rain gardens surface. There has not been any ponding water in the rain gardens after storms.</p> <p>Recommendation was made to engage a horticultural expert and advice on the planning for both rain gardens and to perform a general cleaning and maintenance around the drainage inlets and weirs.</p>	Avon Catchment
8.	438 Papanui Road, Papanui	Raingarden	22/899247	Residential	2017	7 July 2022	Operating effectively. The 150 mm outlet pipe from the over flow sump was clean. 3 monthly inspection to check for condition of terrain and plantings of rain garden to minimise sediment accumulation.	Avon Catchment
9.	250 Pages Road, Bromley	Rain Garden	22/1159633	Commercial – Specific Purpose	2012	14 July 2022	Inspection completed and maintenance required	Heathcote Catchment
10.	4/61 Lindon Road, Addington, Christchurch	Storage Tank		Residential	2014		<p>No further investigation required :</p> <p>House demolished and subdivided in 2017 into 4 one-story buildings.</p>	Heathcote Catchment
11.	40 St Albans Street, Christchurch	Swale		Residential	2010		<p>No further investigation required :</p> <p>Incorrect property address was recorded in Consent Plus database.</p>	Avon Catchment
12	52 Innes Road, St Albans, Christchurch	Soak Pit		Residential	2015		House demolished and subdivided in to 4 town houses	

Table 3. List of devices that need further investigation

S.N	Site Address	Device Type	Property Type	Consent Start Date	Reasons for the non-compliant/further investigation	Remarks
13.	16 Southwark Street, Central City	Oil and Grit Interceptor	Mixed use	2013	The consent was approved in 2013. The device was not found at the property	Ongoing investigation
14.	476 Ferry Road	Rain Garden	Specific Purpose	2010	Inspection report yet to be received	Ongoing follow up
15.	14 Wilkinsons Road, Belfast, Christchurch	Swale	Residential	2010	The device is shared by the multiple owners. The inspection job has been forwarded to the CCC Stormwater operations task.	Being inspected by CCC Operations Team

5. Conclusion and recommendations

The majority of the devices inspected were constructed prior to 2015. Out of the 15 devices inspected, 73% of the devices were found in good functional condition whereas the remaining 27% need further follow up and investigations. To achieve the long-term goal, the following recommendations have been made:

- a) Development of operational and maintenance guidelines manual for the CCC approved stormwater treatment devices. The council shall provide the operational and maintenance guidelines manual to the property owners along with their code of compliance document. The objective of the manual would be to assist the property owners and maintenance contractors by providing details and advice on the operation and maintenance of the council approved stormwater treatment devices commonly used in the Christchurch district. The manual is expected to provide advice on whom to engage for an inspection, how to overcome operational and maintenance issues, log books to record maintenance work and maintenance schedules to prolong the life and performance of each device that the Council approved.
- b) Integration of the inspection and maintenance report in the Council Consent Plus database to schedule annual maintenance plan for the devices that are captured through CSNDC programme.

Documentation of stormwater treatment devices in the Council's mainstream report such as the LIM to keep track of required Stormwater treatment device at the property in relation to changes to ownership.

APPENDIX I Classification of CCC approved stormwater treatment devices based on functional types - 2021

Stormwater Treatment Device Category	Stormwater Device Type	Total Number
Treatment - Water Quality	Balance Tank	1
Treatment - Water Quality	Hynds Up-Flo Filter	44
Treatment - Water Quality	Oil & Grit	89
Attenuation - Water Quantity	Rain Garden	4
Treatment - Water Quality	Rain Garden	41
Treatment - Water Quality	Soil Absorption or Sedimentation Basin	18
Treatment - Water Quality	SPEL Bayfilter	1
Treatment - Water Quality	SPEL Hydrosystem	24
Treatment - Water Quality	SPEL Spelfilter	1
Treatment - Water Quality	Storage	128
Attenuation - Water Quantity	Storage	514
Treatment - Water Quality	SW360 Jellyfish	25
Treatment - Water Quality	SW360 Stormfilter	145
Treatment - Water Quality	Swale	57
Treatment - Water Quality	Other	56
Attenuation - Water Quantity	Soak Pit	83
Total		1,230

APPENDIX II A detailed outline of scope, methodology, deliverables, and actions

Scope	Methodology
Identification of sites	Desktop analysis using previous data gathered <ul style="list-style-type: none"> - Selection of 15-17 Stormwater treatment devices (representative sample which covers both quantity and quality types as well as land use (residential, commercial, mixed,) and catchment types (Avon, Heathcote, Styx).
Communications plan and process	Full communication plan is to be developed and agreed <ul style="list-style-type: none"> - Supporting letters (drafted) for the property owners - Set up the shared mailbox (completed) - Set up a fulcrum app to capture field visits, inspections and quality checks (in the process)
Monitoring/Inspection and assessments methods	Inspection-assessment method to be agreed and documented <ul style="list-style-type: none"> - Establish communication with the property owners - Set up an appointment for an inspection - Liaise with Council's Laboratory to agree on the schedule with anticipation
Data management and record-keeping	Setting up a system to accommodate/document all records, checks/inspections sheets such as SharePoint or TRIM <ul style="list-style-type: none"> - Compilation of fulcrum/blueworks inspection sheets - Collate additional information as required to support the report such as the maintenance sheet
Preparation of final report	Write a summary report <ul style="list-style-type: none"> - Produce a summary report as required by CSNDC condition 4J - Include feedback from the Surface Water Drainage Team and Quality and Compliance Team for the finalisation of the report - Submit a final report

APPENDIX III Operational inspection and maintenance requirement for each device type

Name of the device	Frequency of inspection and maintenance
Hynds 'Up Flo' Filter	<p>Inspection - Regularly during the first year of installation, every six months after the first year of installation</p> <p>Floatables Removal - Twice per year or as needed, or following a spill in the drainage area</p> <p>Sediment Removal - Twice per year or as needed, or following a spill in the drainage area</p> <p>Media Pack Replacement - Once per year or as needed, or following a spill in the drainage area</p> <p>The Council requires documentation of any replacement based on the manufacturer's recommendations to demonstrate compliance.</p>
SPEL Bayfilter	<p>Standard Inspection- Standard inspections are conducted at regular four months intervals.</p> <p>General Cleaning- After the standard inspection, trigger measures will identify if general cleaning is required, for example, if a build-up of debris/pollutants within the vault is greater than 150 mm or there is an accumulation of debris on the outlet chamber of the SPELfilter Vault.</p> <p>Undertake additional inspections after large storm events, tidal or flooding impacts at the request of the owner.</p> <p>Cartridge Replacement- The life of SPELfilter is between 5-7years (guaranteed 5 years).</p> <p>The Council requires documentation of Cartridge Replacement based on the manufacturer's recommendations to demonstrate compliance.</p>
SPEL Hydrosystem	To be determined.
SW360 Jellyfish	<p>Inspection- Twice during the first year of operation, inspection frequency based on the maintenance plan developed in the first year</p> <p>Maintenance- Generally, a minimum of once per annum cleaning frequency, filter cartridge cleaning, re-commissioning, or replacement every 12 months or when the automatic backwash feature no longer functions due to cartridge saturation with sediment; whichever occurs first</p> <p>The Council requires documentation of cartridge replacement based on the manufacturer's recommendations to demonstrate compliance.</p>
SW360 Stormfilter	<p>Inspection- At least one scheduled inspection should take place per year.</p> <p>Maintenance- Based on the results of inspection (the average maintenance lifecycle is approximately 1-3 years). Inspect after major storms.</p> <p>Note: Once an understanding of site characteristics has been established, maintenance may not be needed for one to three years, but inspection is warranted and recommended annually.</p> <p>The Council requires documentation of Cartridge Replacement based on the manufacturer's recommendations to demonstrate compliance.</p>

Rain Garden	<p>Major maintenance:</p> <ul style="list-style-type: none"> • Removal and disposal of sediments every 20 years • Complete replanting every 20 years • Major maintenance of drainage system e.g. replacement of parts every 10 years <p>Inspection Filter Media- should be inspected three monthly or after a rain. The horticultural- aspect should be inspected three monthly or as desired for aesthetics. Drainage- annually</p> <p>The Council requires documentation of the replacement of any parts based on the manufacturer’s recommendations to demonstrate compliance.</p>
Swale	Annually - inspect once per year
Soak Pit	<p>Soak holes should be cleaned annually where there is a sediment trap/sump chamber or catch-pit manhole.</p> <p>Rock-filled soak-pits as per the NZBC cannot be cleaned annually and will instead need to be monitored for performance and re-built as and when required.</p>
Soil absorption or sedimentation basin	Sediment removal is only required approx. every 5 years (triggers when sediment accumulates to half the basin depth, determined from regular monitoring of sediment depth with a measuring post during maintenance visits).
Oil and Grit Interceptor system	Inspection: During the first year of operation, a Hynds Oil and Grit Interceptor system should be inspected monthly or bimonthly to determine the frequency of maintenance.
Storage tanks	<p>Inspection: At least annually, clean out and make any repairs as necessary.</p> <p>Maintenance: Water supply pumps and associated electrical work and replacements of the filters should be undertaken as per the manufacturer’s requirements.</p> <p>The Council requires documentation of the replacement of any parts based on the manufacturer’s recommendations to demonstrate compliance.</p>

APPENDIX IV List of the devices inspected 2021-2022

Type of device	Stormwater Catchment Area	District Plan Zone	Address
Rain Garden - Hardstand – 11,000m ² - First Flush via rain garden plus on-site attenuation	Heathcote	Commercial	Sydenham, Christchurch
Rain Garden - Hardstand – 640m ² - First Flush provided by tree pits	Avon	Commercial	Harewood, Christchurch
Rain Garden - Site – 940m ² - 5m ² rain garden to provide treatment and attenuation	Avon	Residential	Bishopdale, Christchurch
Rain Garden - Hardstand – 2,700m ² - FF treatment via 3 rain gardens	Avon	Residential	Avonside, Christchurch
SW360 Jellyfish - Roof and hardstand - 291m ² of roof discharging into the pond for attenuations and 311 m ² of the carpark going through the Jellyfish for treatment.	Avon	Mixed used	Central City, Christchurch
Hynds Up-Flo Filter	Styx	Commercial	Belfast, Christchurch
SPEL Hydrosystem	Heathcote	Residential	Halswell, Christchurch
SW360 Stormfilter-SW360 - Hardstand – 312m ² - Roof straight to the network and hardstanding to the SW360 device	Coastal	Residential	Linwood, Christchurch
Oil and Grit	Heathcote	Residential	Beckenham, Christchurch
Soak Pit discharging on-site - Hardstand – 2,000m ² - 4 soak pits, one of each dwelling and some of the hardstanding. Total catchment = 2,000m ²	Heathcote	Residential	Opawa, Christchurch
Swale- Site - 7,760m ² - FF via swale + 58m ³ storage for attenuation	Heathcote	Residential	Woolston, Christchurch
Swale - site 85,030m ² - two swales/first flush basins	Avon	Residential	Bryndwr, Christchurch
Soil absorption or sedimentation basin- Stormwater Basin - Hardstand – 6,900m ² - first flush treatment from infiltration basins SOUTHWEST	Coastal	Residential	Moncks Spur, Christchurch
Storage	Heathcote	Residential	Heathcote, Christchurch
Storage	Styx	Residential	Casebrook, Christchurch
Storage	Heathcote	Specific purpose	Central City, Christchurch
Storage	Heathcote	Residential	Sydenham, Christchurch