



# SWALES & FILTER STRIPS

## Operation & Maintenance Guide

STORMWATER DEVICE INFORMATION SERIES

## What are swales and filter strips?

Swales, also known as bioretention, filter or infiltration strips, are broad, grass channels used to treat stormwater runoff. They direct and slow stormwater across grass or similar ground cover and through the soil. Swales also help filter sediments, nutrients and contaminants from incoming stormwater before discharging to downstream stormwater system or waterways. Some swales have liners to direct filtered runoff, or rocky linings to slow fast flows. Swales are simple to maintain and can fit well in urban design.

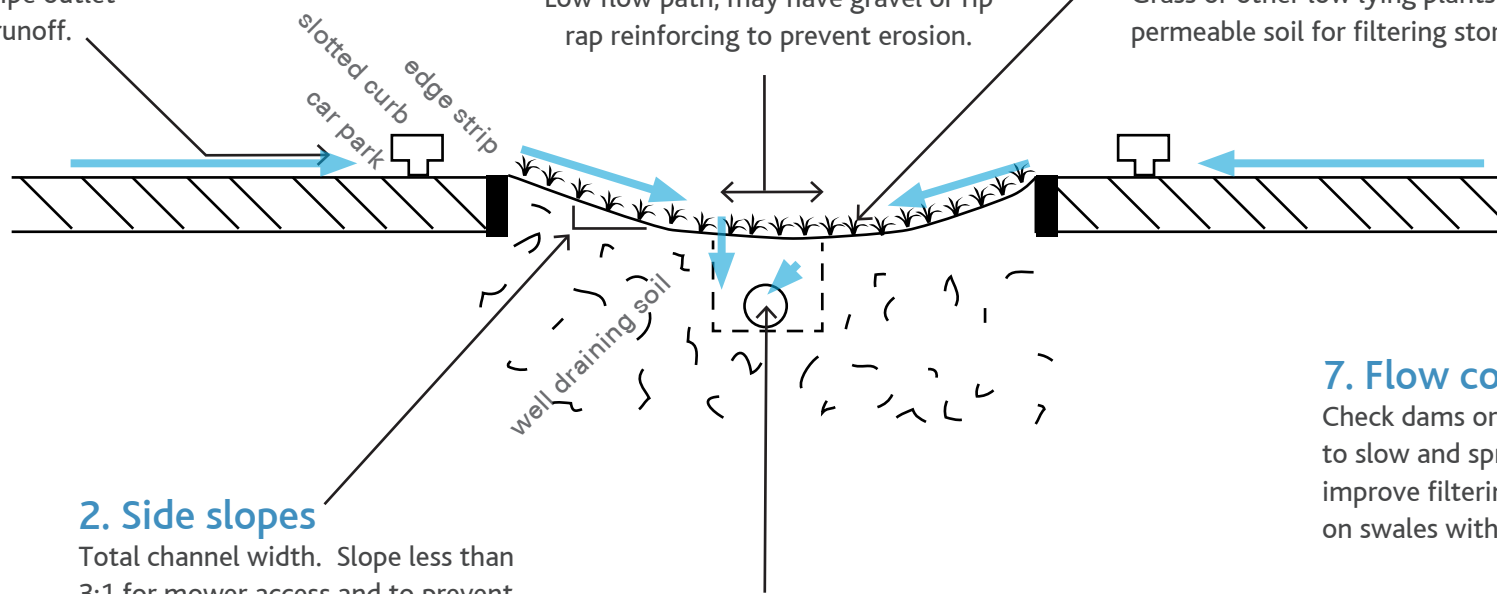


Fig.1 Swale in Waitakere City

# Seven key components of swales and filter strips

## 1. Inflow points

Stormwater flow entry, via pipe outlet or surface runoff.



## 2. Side slopes

Total channel width. Slope less than 3:1 for mower access and to prevent scour.

## 3. Channel base

Low flow path, may have gravel or rip rap reinforcing to prevent erosion.

## 5. Plants and soil

Grass or other low lying plants in permeable soil for filtering stormwater.

## 4. Underdrain (if present)

Usually perforated pipe, buried under channel to capture filtered flow and connected to stormwater system.

## 6. Outlet

Discharge point for filtered stormwater.

## 7. Flow controls

Check dams or spreaders, used to slow and spread flows to improve filtering. Often used on swales with slopes over 5%.



Fig.2 Waitakere City Hospital car park swale

- Slotted kerbs not too close to edge of swale.
- Sign post in centre of swale are compromising underdrain.



Fig.3 Henderson Valley Road – newly constructed road side swales

- Geotextile used to protect catchpit (swale outlet) during construction.
- Dish channels for each driveway controls flows and allow high flows to pass above.



Fig.4 Manawa Wetland vegetated swale

- Native vegetated swale following contours and overland flow paths.
- Check dams used to slow flow and allow for filtration.



# MAINTENANCE SCHEDULE

TIMING	COMPONENT	ACTION
Following storms	Inflow points	<ul style="list-style-type: none"> <li>• Check for scouring, channelling and erosion, and repair as necessary.</li> </ul>
	Side slopes	<ul style="list-style-type: none"> <li>• Check for scouring, channelling and erosion, and repair by adding soil and replanting as necessary.</li> </ul>
	Channel base	<ul style="list-style-type: none"> <li>• Check for scouring, channelling and erosion, and repair by adding soil and replanting as necessary.</li> </ul>
	Plants and soil	<ul style="list-style-type: none"> <li>• Check stormwater is filtering through soil following storm runoff.</li> <li>• Remove weeds.</li> </ul>
Monthly	Outlet	<ul style="list-style-type: none"> <li>• Check outlet for scouring or erosion and repair to suit.</li> </ul>
	Inflow points	<ul style="list-style-type: none"> <li>• Remove rubbish and debris.</li> </ul>
	Channel base	<ul style="list-style-type: none"> <li>• If grassed, mow channel no shorter than 150mm length.</li> <li>• Use catcher and remove clippings.</li> <li>• Re-seed bare patches of grass and water in dry conditions to establish.</li> </ul>
	Plants and soil	<ul style="list-style-type: none"> <li>• If planted, check plants are healthy and growth is dense.</li> <li>• Remove weeds.</li> <li>• Replant gaps and water new plants in dry conditions until established.</li> </ul>
Two yearly	Outlet	<ul style="list-style-type: none"> <li>• Remove rubbish and debris from outlet grate or catchpit.</li> </ul>
	Channel base	<ul style="list-style-type: none"> <li>• Check for boggy patches and ponding water.</li> <li>• Check soil is not compacted, and aerate surface or top up dips to repair.</li> </ul>
	Grass, plants and soil	<ul style="list-style-type: none"> <li>• Remove weeds, rubbish and debris.</li> <li>• Replant gaps and re-seed bare patches, and water if required to establish.</li> <li>• Aerate soil to prevent natural compaction, similar to coring sportsfields and lawn bowls greens.</li> <li>• Check stormwater is filtering through soil, by either monitoring after storm runoff or by running water across swale.</li> </ul>

# TROUBLESHOOTING

SYMPTOM	POSSIBLE PROBLEMS	SOLUTION
<b>Water not draining. Ponding</b>	Soil compacted	<ul style="list-style-type: none"><li>• Aerate soil with rotating aerator or core, as for sports fields.</li></ul>
	Soil clogged with fine sediments	<ul style="list-style-type: none"><li>• Remove top layer of soil and replace, turning soil.</li></ul>
	Underdrain, if present, may be blocked – check for discharge at outlet.	<ul style="list-style-type: none"><li>• Re build underdrain.</li></ul>
<b>Water flowing straight to outlet</b>	Soil not free-draining.	<ul style="list-style-type: none"><li>• See above - aerate soil, replace top layer of soil, replace soil with free draining mix.</li></ul>
	Swale slope too steep.	<ul style="list-style-type: none"><li>• If slope over 5%, construct check dams to slow flows.</li></ul>
	Plants or grass not dense enough.	<ul style="list-style-type: none"><li>• Leave grass longer, and re-seed to increase density. Mow less frequently during dry periods.</li></ul>
<b>Scouring / Channels appearing</b>	Inflow concentrated at inlets.	<ul style="list-style-type: none"><li>• Remove blockages including rubbish, debris and sediment build up.</li><li>• Fill channels as necessary, replanting.</li></ul>

## Quick maintenance check

- ✓ Maintain grass length to between 50-150mm.

## Avoid

- ✗ On roadside swales, keep plant height below line-of-sight for motorists .

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