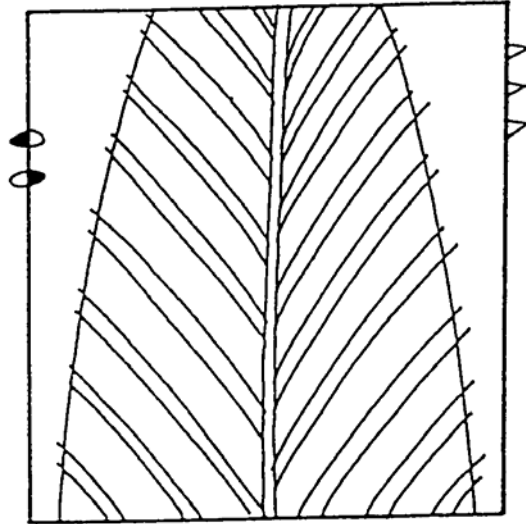


SITE EARTHWORKS



Waitakere City Council
Te Taiao o Waitakere

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This chapter is part of the Waitakere City Council's Sustainable Home Guidelines. The complete set can be obtained through most libraries or from the Waitakere City Council, Private Bag 93109, Henderson, Waitakere City 0650, New Zealand, phone (09) 839 0400, email: info@waitakere.govt.nz.

The guidelines are also available on the council's web site: <http://www.waitakere.govt.nz>



Why worry about earthworks?

Bare soil is picked up by rainstorms and carried away. A certain amount of erosion is natural, but an exposed earthworks site can generate a thousand times more silt than an undisturbed site. A single rainstorm can erode up to four truckloads of soil from your house site. New Zealand weather is changeable and difficult to forecast, and many of the clay soils of Waitakere – especially on steeper sites – are extremely vulnerable to erosion.

The larger sediments may settle out in stormwater cesspits or streams, where they contribute to ongoing flooding problems. The finer clay particles common in Waitakere soils may stay in suspension for weeks or even months, causing dirty water in our streams and harbours. Not only does this look ugly and cause public complaint, but it smothers plant and animal life, and permanently affects fish feeding and breeding areas – both in streams and in the rich mangrove and shellfish beds of the harbours.

Sediment is the most significant water pollutant in the Auckland region.

The legal requirement

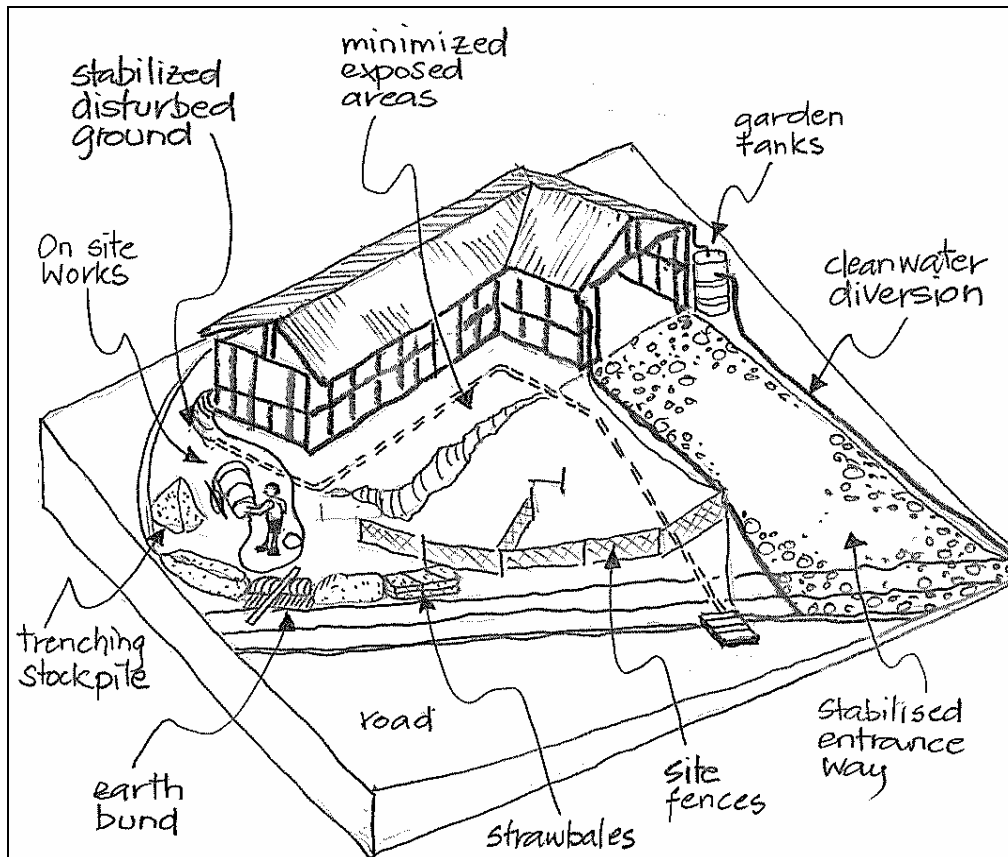
The Waitakere City Council's District Plan incorporates rules for earthworks. Earthworks means any earthmoving operation that exposes soil to the elements, apart from gardening and horticulture, or work associated with pile foundations for houses, effluent disposal fields for septic tanks, or the maintenance or installation of underground pipes and cabling.

So long as you carry out the erosion/sediment control measures described in the appendix to the District Plan (and summarised below) you can excavate for the following without a consent:

1. a building platform anywhere in the city
2. up to 50 cubic metres if your site is within the General Natural Area.

All other earthworks require a resource consent from the council. The District Plan Rules are subject to change, so you should always check with council's Duty Planner (phone 839 0400) to verify if a resource consent is needed. For large earthworks you may also need a consent from the Auckland Regional Council (ARC). The ARC has comprehensive guidelines (Technical Publication No. 90) which are helpful for larger projects. However, regardless of the size of the earthworks, you are required to take the appropriate measures to prevent soil loss and erosion.





Here's what you can do to reduce erosion and sediment discharge from your site

Effective sediment control

There are two complementary approaches to preventing silt getting into our streams. One is to use various devices to trap some of the silt before it can leave your site. This is the “ambulance at the bottom of the cliff” approach. Even more important is to prevent water eroding the soil in the first place:

- ❑ Avoid the need for earthworks by working within the natural contours of the site rather than modifying it. Avoid massive earthworks and expensive retaining walls by stepping the house up the slope. Use pile or pole footings rather than excavations.
- ❑ Carry out earthworks in the summer if possible – it makes for easier working as well as reducing the erosion risk.
- ❑ Before you open up the ground, avoid erosion by diverting surface water away with devices described in the next section.
- ❑ Install a single stabilised entranceway to your site. Ensure that all workers on site know to use this entranceway only.
- ❑ Put in place silt control measures (as described below) before starting the earthworks, and keep them going until the site is permanently protected against erosion.
- ❑ Open up the ground only when you're ready to start work.

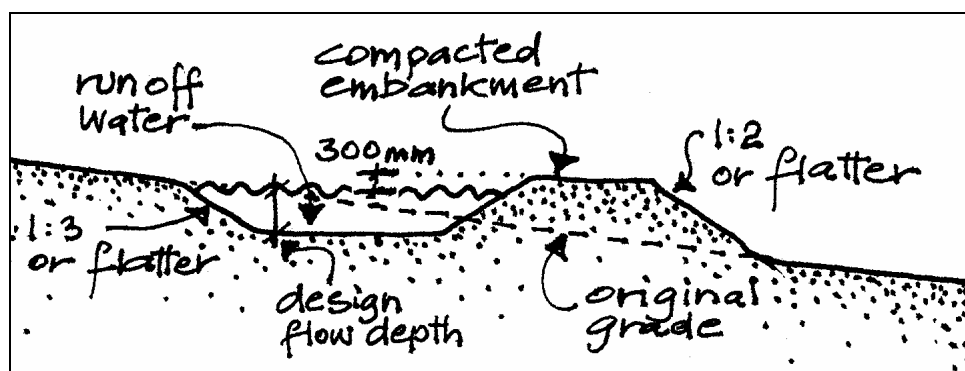
- ❑ Expose only as much ground as you need to work on at any one time.
- ❑ Clean out silt control devices before they are half full of sediment, and make sure that the material is deposited in such a way that it cannot run off into any waterways or coastal waters.
- ❑ Ensure stockpiles of earth are wholly on the construction site and are placed behind a sediment control measure.
- ❑ As soon as you get the roof on any building, hook it up to the stormwater system.
- ❑ Replace topsoil and regrass the exposed ground as soon as possible. In winter you will have to use mulch, in summer irrigation may be necessary. Alternatively, stabilise all bare soil with permeable paving or plants.

Avoiding erosion

Ideally you minimise the amount of silt by making sure that the only water that runs across exposed ground is what actually falls on it. Divert any other water away from the earthworks onto stable ground (grassed, semi-permeable or sealed) by means of runoff diversion channels, contour drains or earth bunds, built before you open up the ground.

Runoff diversion channels

- ❑ Use channels to protect work areas from run-off higher up.
- ❑ Guide the water away into vegetation or into sediment control structures.
- ❑ Make the gradients down the channel gentle (1 in 100) to prevent scouring.
- ❑ You may need to stabilise the channel against erosion by regrassing or lining with a geotextile fabric where grades exceed 1 in 100.

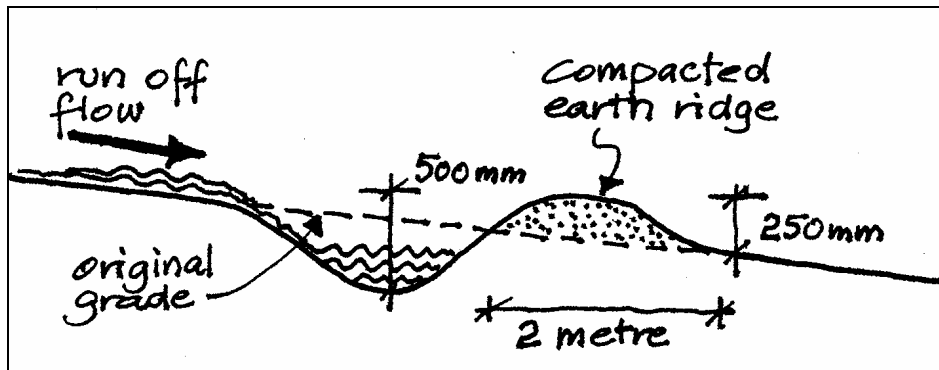


Run off diversion channel

Contour drains

- ❑ Use contour drains across earthworks to break up the slope.
- ❑ Use more than one drain on steeply sloping sites.
- ❑ For steeper slopes have more drains closer together.
- ❑ Guide the water away into vegetation or into sediment control structures.





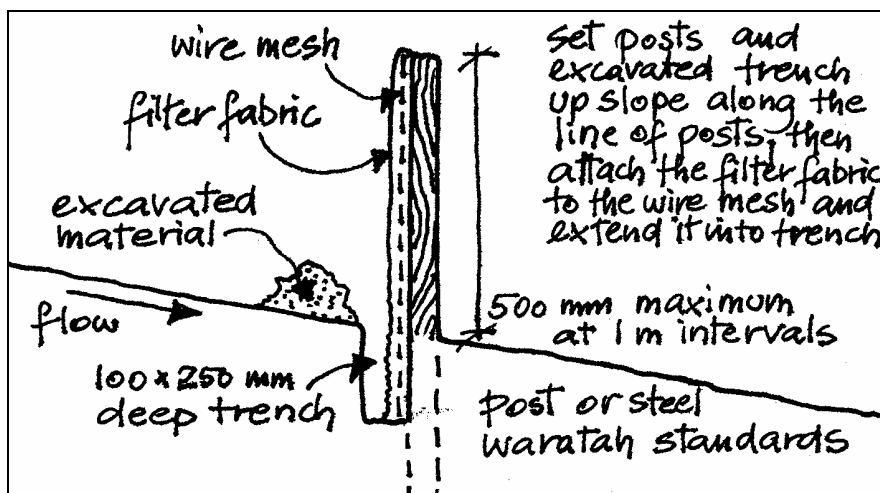
Contour drain

Catching the silt

While the above steps will prevent erosion by keeping excessive water away from your exposed ground, the rain that falls on the actual ground will inevitably erode away some of the soil. You can catch a lot of this soil before it leaves your site and heads for the nearest stream. Devices that will help include silt fences, hay bales, vegetation buffer strips, sediment ponds and earth bunds.

Silt fences

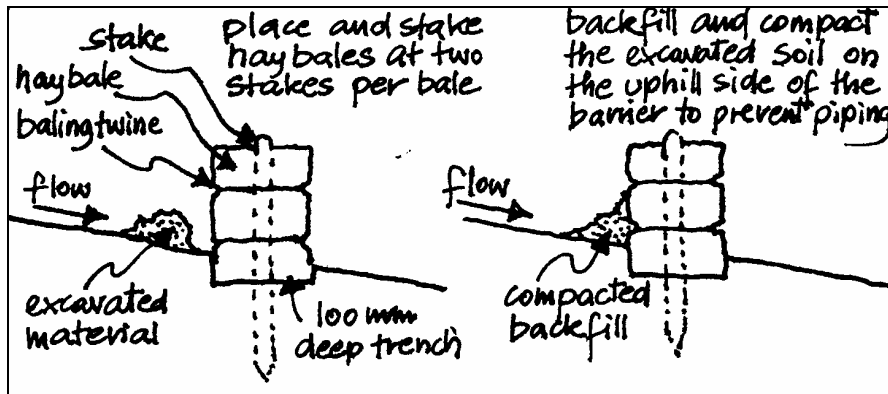
- ❑ Use silt fences with geo-textile fabric (NOT shade cloth) for house sites and other relatively small disturbed areas.
- ❑ For steeper slopes have more silt fences closer together.
- ❑ Place posts for the fence no more than 2 metres apart.
- ❑ Dig a trench on the uphill side and run filter fabric between the posts, burying the base of it in the trench.



Silt fences

Hay bales

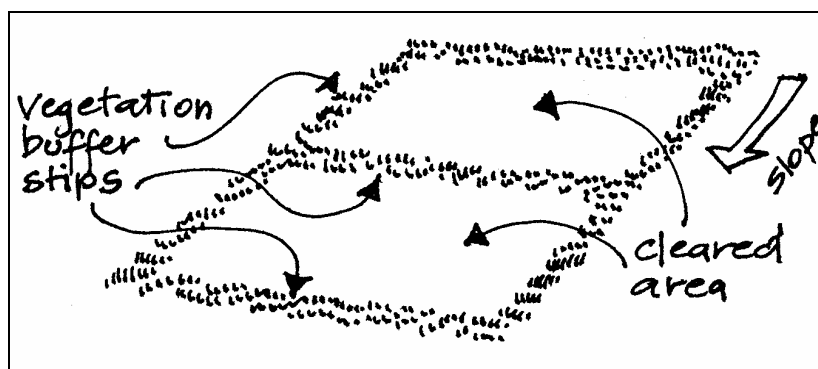
- ❑ Hay bales are effective for short-term control on small sites.
- ❑ Dig them into the ground slightly, and lay them down so the twine is running around the sides rather than along the top and bottom.
- ❑ Anchor them by tying them together and staking.
- ❑ You must inspect and maintain them regularly. They will rot and need replacing in 3-4 months.



Hay bales

Vegetation buffer strips

- ❑ Buffer strips can filter sediment from overland flow where the runoff rate is low and not concentrated.
- ❑ For steeper slopes have more buffer strips closer together.
- ❑ Alongside a watercourse you should always keep aside a vegetation buffer strip.



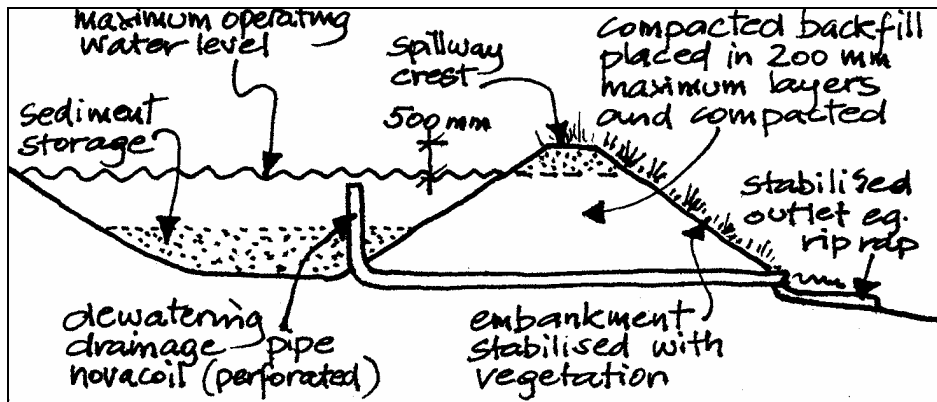
Vegetation buffer strips

Sediment ponds

- ❑ Serious quantities of muddy water need sediment ponds.
- ❑ For every 100 square metres of exposed site area you will need 1-2 cubic metres of sediment pond capacity.
- ❑ The pond must have a dewatering/drainage facility and an appropriate spillway that won't be eroded in a really big storm.



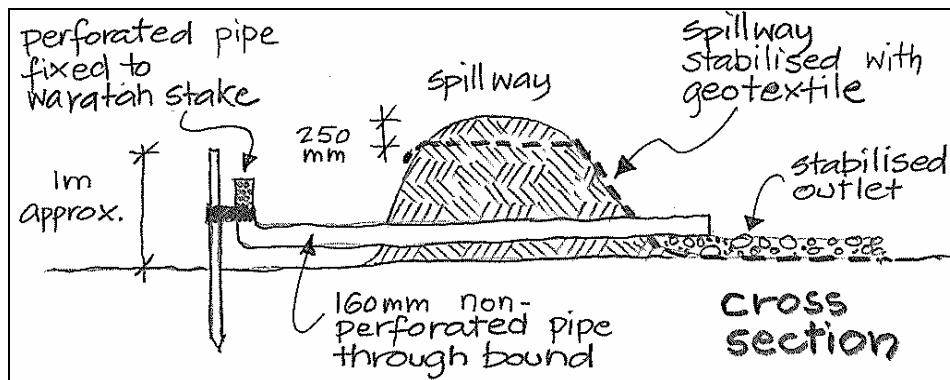
- ❑ Regularly clean out the sediment that settles to the bottom. Put it in an area where no runoff will occur.
- ❑ Never build a sediment pond in a stream.



Sediment ponds

Earth bunds

- ❑ Build earth bunds across the slope like contour drains to control and detain runoff.
- ❑ Use near the edge of the site to prevent sediment from leaving the area.
- ❑ You can use topsoil from the earthworks to create a bund where ponding of runoff can occur and suspended material can settle before runoff is discharged.
- ❑ Earth Bunds need a constructed outlet structure and spillway as designed for Sediment Retention Ponds
- ❑ Construct the Earth Bund such that the maximum contributing catchment does not exceed 0.3 ha.



Earth bunds

Pumping water from the site

If you have to remove water from trenches or other areas of the site, you should try to prevent sediment going with it. Take water from the top rather than the bottom of any trench. Filter out sediment by an appropriate means (see above). Once the sediment has settled within the trenches you can discharge the water to a grassed area, or into a tank for removal.

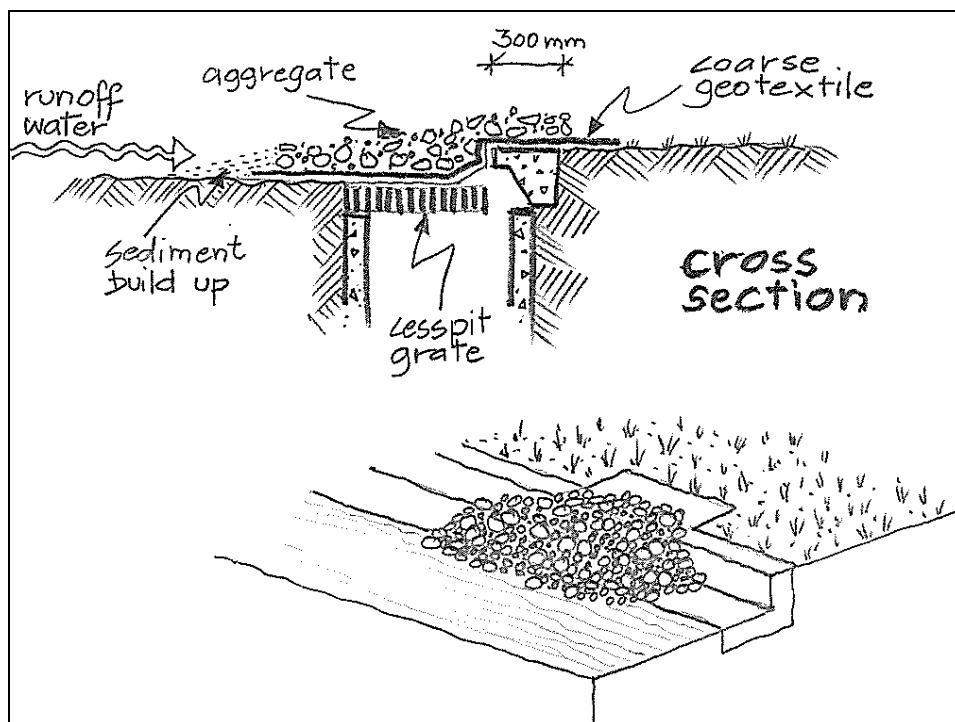


Keeping soil off the roads

Trucks leaving a building site can take a lot of mud on their tyres to drop on the roads. This is a road safety issue as well as a sediment control one. To prevent it from occurring, a stabilised entranceway must be built. The simplest method is to establish a single entrance to the site and spread metal aggregate over a geotextile “mud stop” filter cloth base. This will stop the entry being churned up and reduce the amount of mud leaving the site on truck tyres. Other methods for larger sites are cattle grids or a wheel wash. The site manager or site owner is responsible for cleaning up any spilt soil or other materials that get onto the road from the site. Remember also to protect the footpath, berm and kerb from damage by crossing vehicles.

Stormwater inlet protection

Stormwater Inlet Protection provides at best limited sediment retention and should not be used as a primary method of sediment control. The need to use Stormwater Inlet Protection can indicate poor erosion and sediment control and/or inadequate stabilisation on the site. Use additional measures up-slope to minimise the volume of sediment reaching any stormwater inlets. Cesspits must at all times remain able to convey flow from the site to prevent large concentrated highly erosive flows from building up and causing washouts in secondary overland paths.



Stormwater inlet protection

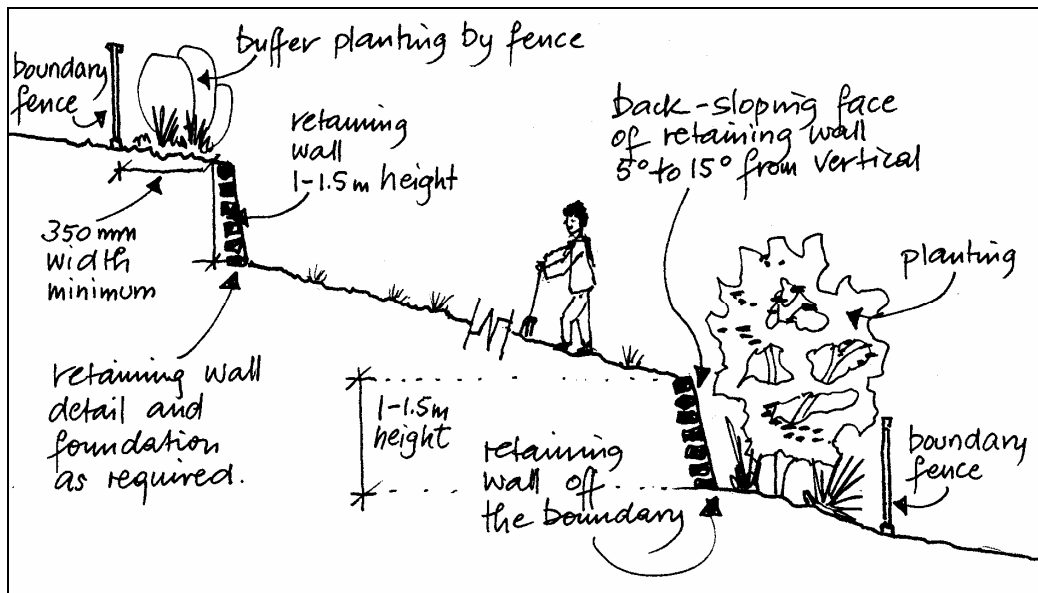
Retaining walls

It is generally better to work with stabilised slopes than to build retaining walls, which interrupt the natural flow of the landscape. Avoid the need for expensive retaining walls by working within the natural contours of the site – stepping the house up the slope, for instance.

Retaining walls on a house site should be in scale with people – up to a metre, certainly no more than 1.5 metres. Two low walls are generally better than a single high one – and almost certainly cheaper.

Retaining walls become part of the earthform, so materials that reflect the earth have the lowest visual impact. The ideal material is local stone, followed by stone from elsewhere, concrete (preferably as a crib wall or split concrete) and timber. Materials should be left unpainted, and the rougher the surface the more easily plants and other life-forms can start to blend the wall in with nature. Remember that quite steep slopes can now be supported using reinforced earth methods.

Retaining walls should be kept away from boundaries if possible. In this way the landscape continues at natural ground level on the boundary, drainage issues can be resolved on-site, fencing is not added to the top of the wall, and there is scope for softening or screening the wall with planting.



Further information

Advice at the Waitakere City Council:

Phone the call centre (09) 839 0400

Ask for: Duty Planner
 Environmental Monitoring Officer

In print

Erosion & Sediment Control on Construction Sites, Site Management for Earthwork Activities – Waitakere City Council.

Erosion & Sediment Control Guidelines for Earthworks – Technical Publication No. 90, Auckland Regional Council.

Environmental Impacts of Accelerated Erosion & Sedimentation– Technical Publication No. 69, Auckland Regional Council.

On the web

www.smarterhomes.org.nz is a mine of up-to-date and independent information. Designed for the general public, it's easy to use, has case studies, and includes features such as Homesmarts, a calculator you can use to find information relevant to your needs or simply to run a home-health check.

If there are questions you can't find answers to on Smarterhomes, www.level.org.nz goes into more depth and is aimed at the design and building industries, with drawings and links to Building Code compliance documents.

The North Shore City Council has a pdf document summarising the information above on sediment control which may be useful to have on site, or as an addendum to the site working drawings or contract documents. There is also a checklist available to download. Both documents are available on the website www.northshorecity.govt.nz – search for their titles:

“Erosion and Sediment control on Small Development Sites”

“Erosion and Sediment Control Guide and Checklist for Small Sites”.

This chapter was last reviewed in September 2008.

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