

The countryside living **TOOLBOX**

Water Supply Public Health Guidelines and
Wastewater Management Considerations

April 2010



THE COUNTRYSIDE LIVING TOOLBOX:

A GUIDE FOR THE MANAGEMENT OF STORMWATER DISCHARGES IN COUNTRYSIDE LIVING AREAS IN THE AUCKLAND REGION

April 2010

There are 4 publications in this series

The Countryside Living Toolbox: Background

The Countryside Living Toolbox: Site Design and Prevention of
Stormwater Effects

The Countryside Living Toolbox: Stormwater Management
Device Design Details

The Countryside Living Toolbox: Water Supply Public Health
Guidelines and Wastewater Management Considerations

Acknowledgement:

This Toolbox is Version 4.0 of several original documents done by and on behalf of the Rodney District Council and the Waitakere City Council over the past eight years. It has borrowed from the earlier versions where changes were not needed and it supercedes those documents.

Permission was given by Rodney District Council and Waitakere City Council to use information from the earlier documents where use of that information was appropriate.

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Documents in the Series

The Countryside Living Toolbox is divided into 4 publications.

Countryside Living Toolbox: Background and Application – This section defines the applicability of the Toolbox; provides background information on stormwater effects in rural areas; details the regulatory context of this guideline; describes the key stormwater design objectives and approaches; and summarises the different techniques available for use.

Countryside Living Toolbox: Site Design – This section provides information on how site design can affect the volume and rate of stormwater which is discharged as a result of development. This section of the Toolbox will assist developers to “avoid” or “prevent” effects.

Countryside Living Toolbox: Stormwater Management Device Design Details – This section provides design information for structural stormwater practices. Ponds, wetlands, filter strips, swales, rain gardens, infiltration trenches and rain tanks are discussed. This section of the Toolbox will assist developers to “mitigate” effects.

Countryside Living Toolbox: Water Supply and Wastewater Management Considerations – This section of the Toolbox briefly discusses requirements relating to both potable and non-potable water supply. It also provides an overview of the design features and maintenance considerations associated with on-site wastewater treatment and disposal systems.

Disclaimers

Waitakere District Council

In situations where there are differences to the earlier versions and where they have been relied on or embodied into planning documents such as Structure Plans or Resource Consents then the requirements of the earlier versions shall take precedence over Version 4.0.

Rodney District Council

Infiltration in Rodney District Council

Rodney District Council has significant areas of countryside where soil stability is strongly dependent on and particularly sensitive to changes in moisture content and the hydrological cycle in general. For that reason infiltration as a means of stormwater management is not seen as a viable management tool.

Water Supply for re-use

This section is not applied in Rodney District Council. RDC has its own provisions for re-use. Where a particular re-use application is required RDC can make available a protocol for calculating storage v consumption requirements to estimate tankage against supply.

Papakura District Council

The guideline provides for a number of methods and tools to mitigate the effects of storm water run-off from countryside living areas but the acceptance of any particular method and tool will depend with the respective TLA (PDC) . The extent and sharing of responsibility by TLA, property owners and developers to ensure continued performance from these methods and tools is not covered in this guideline and will depend on the consenting and approval processes of respective TLA.

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Countryside Living Toolbox: WATER SUPPLY PUBLIC HEALTH GUIDELINES And WASTEWATER MANAGEMENT CONSIDERATIONS

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OVERVIEW

Water tanks can be designed to cater for both potable (drinkable) and non-potable (non-drinkable) water supply. Where the intent is to use a water tank for potable water use additional design features are generally needed in order to ensure that the water is safe to drink.

This toolbox provides details on water tanks for potable water use in accordance with local council requirements and New Zealand Drinking Water Standards.

Information on water tank selection, operation, and maintenance relating to public health issues is also included.

THE COLLECTION SYSTEM

Roofing material

Water can be collected from iron roofing, galvanised iron, copper, clay tiles and slates. It is important that no lead is used as roof flashing or gutter solder as the slightly acidic quality of rain can dissolve the lead and contaminate the water supply. The same can be said about galvanised iron or copper roofs in that zinc and copper can leach from the roofing material into the domestic water supply.

Gutters and downpipes

In most cases, the water from the roof is funnelled along gutters and into downpipes connected to the water tank. If a water tank is to be used as a potable water source, alterations to the guttering may be required. In summary:

- Install appropriate screens to stop debris, animals and insects entering the tank. Leaf guards are primary screening devices to prevent leaves and other debris entering the rainwater collection system.
- Gutters and downpipes must be properly sized, sloped and installed to maximise the quantity of rainwater collected. Seamless extruded aluminium, galvanised steel or PVC are commonly recommended for use as gutters and downpipes. The connection between the downpipes and the storage tank is generally made of PVC pipe.

First flush diverters

The first flush devices are designed to divert the first part of the rainfall that picks up most of the dirt, debris and contaminants (e.g. bird droppings) from entering the water tank. It does this by diverting the first water into a separate small chamber. Typically 40 litres for every 100 m² of roof area is diverted. Once the chamber has filled, the rest of the water flows to the downpipe connected to the water tank. The small chamber has a small tube in the base that allows it to empty before the next rainfall.

First flush diverters are essential for drinking water use.

Backflow prevention devices

Backflow prevention devices stop contaminated water from flowing back into the home supply. This device should be installed between the drinking water tap and anywhere the water supply is connected to equipment containing chemicals, faecal material, or other potential contaminants. Commercially purchased WC flushing cisterns have a backflow preventer built in, but any “do it yourself” device needs a backflow preventer.

Backflow prevention devices must be to the specifications of AS 3500.1, which will meet the requirements of Building Regulations.

TREATMENT/POINT OF USE DEVICES

As rainwater falls, it is mostly free of microorganisms and other contaminants. However, during collection and storage, it is possible that rainwater can become contaminated.

For this reason, New Zealand’s Ministry of Health does not advise using untreated rainwater for drinking purposes. A point of use device is to be installed to treat water from your rainwater tank before it is used for drinking purposes.

A point of use device is like a mini treatment plant. It can be used to treat all household water or it can be put on the end of a tap for treating drinking water only.

Before purchasing a point of use device check that it complies with AS3497: Domestic type water treatment appliances and has been tested to AS/NZS 4348: Water Supply - Domestic type water treatment appliances - Performance requirements. By boiling your water for one minute, all biological and most gaseous contaminants will be removed or destroyed.

STORAGE TANKS

There are a lot of options available in tank materials (e.g. plastic, steel, concrete, fibreglass). The tank should have a durable, watertight, opaque exterior and a clean, smooth interior. A tight fitting top cover is required to prevent evaporation, mosquito breeding and keeping insects, rodents, birds and children out of the tank. It is best to locate the tank in a cool place, out of sunlight so that algae do not grow. A suitable overflow outlet and access for cleaning is also important.

PIPES

Effective plumbing is important for efficient rainwater collection and to protect your household or mains water supply from contamination. Debris needs to be diverted and backflow preventers need to be installed. All plumbing should be carried out by a qualified plumber as all work is required to meet recognised plumbing standards.

Waters, which are not treated in a full-scale municipal treatment plant, are often corrosive. As corrosive waters can leach out metals from metallic pipes and from taps you are advised to use plastic pipes for cold-water reticulation purposes.

Water pressure issues and top-up systems

If the catchment area is not sufficient to cater for all potable water, a top-up system may be needed or in the case of rural water tanks, deliver of water when supplies are low. You are required to maintain the minimum water levels in your tank.

A top-up system could be available to deliver water to your tank through a pipe from the Council water supply. An air-gap is required between this pipe and the water tank. This is to ensure no backflow can go into the mains water supply from your tank. The flow from your top-up system should be limited. If the flow rate is too high, it can affect the water pressure supplied to you and your neighbours.

Your plumber can advise of the requirements of the top-up system for your property, including determining the air-gap required and flow rate restriction required.

A licensed plumber will need to connect a “top-up” system from the Council water main supply and can help you with the following:

- Install a flow restrictor to ensure the flow rate of water used to top-up the tank does not affect you or your neighbour’s water pressure,
- Fit a proper backflow prevention device to your meter, and
- Label tank outlets and pipes appropriately.

PUMPS

If your tank is not sufficiently elevated to allow gravity to provide the required water pressure, you will need to install a pump. Your installer can advise you about the range of pumps on the market. Low voltage pumps are generally safer and quieter than high voltage pumps and are usually powered by a solar panel and battery system.

You will need to supply the following information to the pump supplier:

- Height,
- Height difference between the pump and the water surface from where the water is taken,
- Height difference between the pump and where the water is to go, or the highest point along the way,
- On line pumps, the maximum flow rate through all possible outlets and minimum pressure required at the point of outlets,
- Storage tank pumps - requires the daily flow out of the tank,
- Internal diameter and type of pipes intended for use, and
- Total length of pipes for both the suction and discharge sides of the pump.

PLANNING

Considerations

Before buying a tank it is important to make a plan first so that you end up with a tank that best suits your needs and situation.

If you intend to use rainwater in your home and garden, you will need to install a tank with at least a 5,000 litre capacity. However, your tank size will depend on your site's constraints.

Work out the following:

- The number of people living in your home (if you want to use rainwater for toilet flushing),
- The amount of water you currently use,
- The size of your garden,
- Intended use of rainwater (e.g. garden, toilet flushing, full household use including drinking water),
- Available fittings and components to suit your needs,
- The size of the roof catchment area, and
- The location of the property (coastal areas are generally wetter than inland areas so a larger tank is required inland to be as effective as a tank on the coast).

Tank size

It is important to make sure that you get the right size rainwater tank to suit your needs. Generally, the larger the tank, the more reliable and effective it is in conserving water or managing stormwater.

The water tank size will depend on the volume of water needed, the amount and pattern of rainfall in your area, the area of the collection surface, and the security of the supply needed. Section 4.6 of Part C of the toolbox provides device design details.

TANK TYPES

Polyethylene tanks

These tanks come in many sizes and colours and are suitable for both above and belowground use. They last a long time, are UV-resistant, cost less than metal tanks and, because of their lightweight construction, are easy to transport.

Metal tanks

Metal tanks are light and easy to transport, are suitable for above or below ground use, can be custom made and are usually corrugated or straight rolled. They can be made from a variety of metals including:

- Galvanised steel - zinc- coated Z600 steel (prone to rusting),
- Aquaplate or colorbond - coloured polymer - coated steel (lasts longest),
- Zinalume - silver - coloured zinc/aluminium - coated steel (prone to rusting)
- Copper and stainless steel - used for specialised applications.

Concrete tanks

Concrete tanks can be built above or below ground. They are usually made on site and are durable and long lasting. They can sometimes crack - especially when they are below ground in clay soils. They are good for preventing algal growth (light can't penetrate) and they keep water cool.

Fibreglass tanks

Fibreglass tanks are resistant to rust and chemical corrosion and are suitable for both ground and stand installations. They are tolerant of extreme temperatures, come in a large range of colours and sizes and, because of their lightweight construction, are easy to transport. Fibreglass tanks can be more expensive than other varieties.

ABOVE GROUND TANKS VERSUS BELOW GROUND TANKS

Above ground tanks

Advantages:

- Easy to detect cracks and leaks,
- Can extract water via gravity and/or pumps,
- Can be raised off ground to increase water pressure,
- Easy to drain for cleaning, and
- Usually cost less than belowground tanks.

Disadvantages:

- Take up space,
- Susceptible to weather, and
- Require anchoring (to the ground) for when the tank has less water.

Below ground tanks

Advantages:

- Save space and are unobtrusive.

Disadvantages:

- More difficult to extract water from - usually need a pump,
- Hard to detect leaks or problems,
- Hard to empty when top is left on - difficult to drain for cleaning,
- Risk of contamination from groundwater or floodwaters,
- Can be damaged by tree roots,
- If access point is left uncovered, there is a risk of children, adults and animals drowning or contaminating the water,
- Can be damaged by heavy vehicles driving over them, and
- Excavation.

OPERATION AND MAINTENANCE

General

It is important to maintain your water tank and components so that they work effectively and reduce the risk of contamination.

Preventing problems before they arise will save you time, money and water.

Roofs and gutters

Gutters and roof catchment areas should be regularly inspected and kept clean and clear of leaves and debris. Any overhanging branches should be removed. It is a good idea to use screens or guards, and these should also be regularly cleaned. Keeping your rainwater screened and flowing cleanly and quickly from your catchment area into your tank reduces the build up of sludge as well as the risk of mosquitoes breeding in your tank.

Tanks

Check your tank for sludge at least every two to three years. If sludge is covering the bottom of your tank you will need to remove it by siphoning it out or completely emptying your tank (contact a professional tank cleaner if you are unsure). Excessive sludge build up is a sign of inadequate roof and gutter maintenance. Remember; make sure you prevent mosquito access to your tank. If you find mosquitoes in your tank, find the entry point and close it.

Cleaning and disinfecting your tank is likely to be required every 6-12 months. Flush tank with water and push sludge through the scour valve. Disinfect the tank using about 167 ml (about 2/3 cup) of household bleach per 1000 litres of water. Run

mixture through all pipes and taps until it is gone. If you have a water filter, it requires regular maintenance also.

Point of use device checks and replacements

When you select a point of use device, consideration should be given to the length of time it will operate before parts need replacing, and the cost of replacement. Suppliers of each device will be able to supply this information.

Replacement of cartridges will be required periodically including activated carbon types, reverse osmosis and ultrafiltration membranes, ion exchange resins, and the tubes used in ultraviolet light apparatus.

DRINKING WATER QUALITY REQUIREMENTS

Rainwater captured from the roof generally has poor biological qualities, good chemical qualities and corrosive aesthetic qualities.

Because drinking water can be affected by contaminants, which make it undesirable, or dangerous to use, treatment is required before tank water is to be used for drinking purposes. If you intend to use water tank water for drinking purposes, you will need to treat the water yourself.

The table below lists common potential contaminants found in some waters and treatments, which can remove or reduce them.

POTENTIAL CONTAMINANTS	PROBLEM	LEVEL OF CONCERN	TREATMENT/POINT OF USE DEVICE
Bacteria	Waterborne disease	Any faecal coliforms	Ultraviolet radiation/(only effective in low turbidity waters)/chlorine/reverse osmosis/boil
Carbon dioxide	Corrosive	20 mg/l	Aerate carbon/akdolit granules
Colour	Appearance	03 hazen units	Activated carbon/reverse osmosis
Copper	Possible health problems. Taste and staining can occur at lower levels	2.0 mg/l	Make water less corrosive, treat as for carbon dioxide
Hardness	Scale, excessive soap usage	200 mg/l as Ca CO ₃	Ion exchange
Iron	Staining, taste, pipe clogging	0.5 mg/l	Aerate and filter/chlorinate & filter/ion exchange
Lead	Poisonous to humans, especially infants, young children and unborn children	0.10 mg/l	Make water less corrosive, treat as for carbon dioxide
Manganese	Staining, taste	0.2 mg/l	Ion exchange/chlorinate & filter/ potassium permanganate & filter
Nitrates	Bottle fed infants can have	11 mg/l as N	Ion exchange

	breathing problems		
PH	Corrosion of plumbing materials possibly causing copper or lead to be dissolved into water OR scale formation on hot water cylinders and heating elements causing reduced efficiency and early failure	Below 6.5 Above 8.5	If too low, treat as for carbon dioxide/If too high, treat as for hardness
Protozoan Cysts	Waterborne disease	Any cysts	Reverse osmosis, boil, cartridge filter
Taste and odour	Taste and odour	Objectionable	Activated carbon, reverse osmosis, boil
Turbidity	Appearance, masking disease causing organisms	5 NTU	Cartridge filter, reverse osmosis, ultrafiltration
Viruses	Waterborne disease	Any virus from faecal sources	Chlorine, reverse osmosis, boil, ultraviolet radiation, ultrafiltration

You may need your tank water checked for suitability as a household supply. See Laboratories Analytical and Laboratories Testing in the Yellow Pages or contact your local public health service for details.

Your hot water cylinder should be set at 60 degrees Celsius or above to ensure that organisms do not grow within the hot water cylinder.

FURTHER INFORMATION

SOURCE	EXPERTISE	CONTACT DETAILS
Rodney District Council	All aspects	50 Centreway Road, Orewa Phone 09 426 5169
Waitakere City Council	All aspects	Ecowater Solutions, 133 Cenral Park Drive, Henderson, Waitakere Phone 09 836 8000
Franklin District Council	All aspects	82 Manukau Road Private Bag 5 Pukekohe Phone 09 237 1300
Papakura District Council	All aspects	35 Coles Crescent Papakura 2110 Phone 09 295 1300
Manukau City Council	All aspects	Kotuku House Wiri Station Road 09 262 5104
Auckland Regional Council	Local water sources and likely contaminants, restrictions on use.	21 Pitt Street Auckland Phone 09 366 2000
Public Health Service	All aspects.	Cornwall Complex, Floor 2 Building 15

		Greenlane Clinical Centre 09 262 1855
Water testing laboratories	Water analysis and interpretation	Analytical laboratories in the Yellow Pages
Specialist water treatment equipment suppliers	Capabilities of their equipment	Water treatment in the Yellow Pages
Specialist environmental consultants	All aspects, especially system design	Environmental consultants in the Yellow Pages
Master Plumber	System installation cost	Plumbers in the Yellow Pages

OVERVIEW – Wastewater Management Considerations

This part provides an overview of the design features and maintenance considerations associated with on-site wastewater treatment and disposal systems. The design of the wastewater system is to be carried out in accordance with TP 58 On-site Wastewater Systems Design and Management Manual, Third Edition, 2004, Auckland Regional Council.

Advice from a chartered engineer competent in on-site wastewater design is necessary to achieve a satisfactory outcome. It is essential that the design and location of the wastewater disposal field be considered in conjunction with the stormwater and geotechnical constraints and requirements to ensure that the resultant systems complement each other rather than diminish the effectiveness and efficiency of each independent system.

Problems with on-site systems invariably arise from overuse, poor design or poor maintenance. Many technical factors need to be assessed in the choice of system for the site and there are other personal preferences in terms of maintenance, which also may need to be considered. A very common problem which results in abatement notices being served by Council is the one of stormwater runoff and or seepage penetrating the wastewater irrigation field effectively putting the field out of operation. The consequences to health of this occurring cannot be overstated.

In most instances, the health problems are on adjoining lots. In most cases careful selection of treatment device and location and operation of the irrigation field will avoid this happening. Attempting to compromise on the requirements for the disposal of the two waters will however result in expense and problems for the future.

Some minor additional expense in ensuring good design and installation practices is good insurance against major expense and nuisance if system failure occurs due to cost cutting and poor practice during initial design and installation.

The type and location of stormwater practices must therefore be selected with the wastewater treatment in mind.

Figure 1 shows a typical dwelling layout for a residential dwelling with on-site stormwater and wastewater disposal. The key issues to be addressed are that the location and operation of the two forms of disposal are mutually independent and supportive, not intermingled and destructive.

KEY REFERENCE

On-site wastewater systems must be designed in accordance with TP 58, On-site Wastewater Systems: Design and Management Manual produced by the Auckland Regional Council. Please be advised that this document is being revised and the appropriate citation may change in the near future. A competent chartered engineer must oversee the design.

Figure 1
Typical On-site Wastewater Disposal System

