Waikato Regional Council Technical Report 2012/09

# Potential for effects from on-site wastewater in the Waikato region, with particular focus on development south and east of Hamilton

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## Disclaimer

# Executive summary

This report has been produced in response to a request by the Future Proof Implementation Committee. This committee oversees implementation of the Future Proof growth strategy; a strategy for the sub-region comprising Waikato District, Hamilton City and Waipa District.

The report assesses the potential for cumulative effects from on-site wastewater systems in the Waikato region with particular focus on development south and east of Hamilton. It responds to concerns raised in Future Proof's "Southern Sector Study" about potential adverse effects from continuing development in the Tamahere area serviced by on-site wastewater systems. The report also investigates potential for effects from on-site wastewater discharges in small urban areas, particularly Pirongia and Ohaupo.

The report describes local authority management responsibilities for on-site wastewater. It describes the types of wastewater treatment and disposal systems commonly used and their treatment efficiencies. It then describes the main potential adverse environmental and health effects from on-site systems.

Communities in the Future Proof area (Waipa District, Hamilton City and Waikato District) serviced by on-site wastewater systems are identified.

The report describes what is known about on-site wastewater systems in Waipa and Waikato Districts including evidence of adverse effects. The description includes findings from the Waikato Regional Council On-site Wastewater Risk Assessment Model. This model was developed to identify areas in the Waikato region where there is a high risk of adverse effects from on-site wastewater systems.

The report reviews relevant studies, guidelines and standards in order to identify when communities serviced by on-site wastewater systems may be subject to a risk of adverse environmental and health effects from these systems.

Regional plans are the primary mechanism for managing potential for effects from on-site wastewater systems. The review summarises the main regional plan provisions used in New Zealand to manage on-site wastewater and compares the Waikato Regional Council provisions.

The main conclusions are as follows:

1. There are a number of ways in which on-site wastewater systems can adversely affect the environment.

2. When systems are appropriately installed, sited and maintained, the risk of adverse effects is generally very low.

3. As on-site systems become more numerous and older, the risk of adverse effects increases, particularly systems near domestic water supply bores or water bodies, or in areas of poor soakage and/or high ground water.

4. There are a number of communities in the Future Proof area, particularly in Waikato District, which are serviced by on-site wastewater systems where the risk of adverse effects is high due to a combination of site conditions, age of systems and small section sizes. Risk from on-site systems in Pirongia and Ohaupo appears to be relatively low.

5. The risk of adverse effects from on-site wastewater systems in the Tamahere Country Living Zone is likely to be low, even when it is fully developed (given current restrictions on section sizes). However the risk will increase as

wastewater systems become older, particularly where systems are near surface water bodies.

6. The Waikato Regional Plan permitted activity conditions for on-site wastewater are at least as rigorous as most other regional plans and, in general, are adequate for managing the adverse effects of new on-site wastewater discharges. The current minimum section size for new septic tank systems of 2,500$m^2$ appears to remain appropriate.

7. The risk of health effects from wastewater viruses is still not well understood and there is no accepted view yet as to how regional plan wastewater conditions can adequately protect domestic water supply bores from this risk.

8. The single biggest issue that results in risks of adverse effects from on-site systems is the lack of monitoring and maintenance of systems.

9. Regional councils and territorial authorities both have responsibilities for the management of on-site wastewater. There is currently insufficient co-ordination of on-site wastewater management by local government in the Waikato region.

**Recommendations:**

1. That Waikato Regional Council and the region's territorial authorities work together to improve management of on-site wastewater systems for communities serviced by on-site wastewater systems, where there is a combination of factors that create a high level of risk to health and the environment. Roles and responsibilities with respect to ensuring such systems are appropriately maintained and monitored need to be clarified. This should be progressed through the Local Government Forum.

2. That territorial authorities develop programmes for inspections of communities serviced by on-site wastewater systems where the risk is high, to ensure they continue to comply with Building and Health Act requirements over time and that improvements are made where they do not. Wastewater bylaws under the Local Government Act should be considered as a means of ensuring owners of systems monitor and maintain their systems in high risk communities.

3. That the regional council carries out monitoring for environmental effects where the risk of such effects is particularly high.

4. That the Waikato Regional Council continues to monitor research on appropriate separation distances from water and domestic water supply bores, to protect against potential for viral disease from on-site wastewater discharges. When the Waikato Regional Plan is reviewed, further research should be undertaken to ensure permitted activity provisions for on-site wastewater management are appropriate with respect to risk of viral disease.

5. That when the Waikato Regional Plan is reviewed:

    a. Changes are sought so that the regional plan identifies communities where there is a high risk of adverse effects from on-site wastewater systems, and includes stronger provisions for monitoring and maintenance of the on-site systems.

    b. Changes are sought to the permitted activity rule for new advanced on-site wastewater systems that would impose a minimum section size.

c. Consideration is given to extending the separation distance between new on-site wastewater discharges and ‘other’ surface water bodies to 20 metres (in line with most other regional plans).

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# 1 Introduction

This report has been produced in response to a request by the Future Proof Implementation Committee. Future Proof is a sub-regional growth strategy developed for the area comprising Waikato District, Hamilton City and Waipa District (refer Appendix One for map of sub-region). The strategy manages development in the sub-region to 2061, including by the establishment of a broad land use pattern.

The purpose of this report is to assess the potential for cumulative effects from on-site wastewater systems in the Waikato region with particular focus on development south and east of Hamilton. The report responds to concerns raised in Future Proof's "Southern Sector Study" about potential adverse effects from continuing development in the Tamahere area serviced by on-site wastewater systems.

Based on the request of the Future Proof Implementation Committee, the report also discusses on-site wastewater discharges in small urban areas within the region, and particularly Pirongia and Ohaupo.

On-site wastewater discharges are mainly authorised by Waikato Regional Council's permitted activity rules. The study therefore also reviews the ability of these rules to ensure adverse effects from on-site systems are avoided, particularly with respect to the nature and extent of development in the Tamahere area and small urban areas.

The Waikato Regional Plan, including the on-site wastewater rules, is programmed for a review starting 2014. The issues discussed in this report are relevant to management of on-site wastewater discharges in the wider Waikato region. The report will therefore also inform the upcoming review of the on-site wastewater rules.

## 1.1 Background

The Future Proof Growth Strategy and Action Plan 2009 (the strategy) has been jointly developed by the Waikato Regional Council, Hamilton City Council, Waipa District Council, Waikato District Council and tāngata whenua, in close association with the New Zealand Transport Agency. The Strategy was developed to coordinate and integrate growth management in the Future Proof area of Hamilton City, Waipa District and Waikato District.

At a meeting of the Future Proof Implementation Committee on 23rd September 2010, the following motion was declared carried:

*That the Future Proof Implementation Committee requests that Environment Waikato assess the cumulative effects of septic tanks within the rural area on the long term health of groundwater and river health as recommended in Action 11 only within the Southern Sector Study* (Crs Southgate/Westphal).

The Southern Sector Study has been prepared by Beca Carter Hollings & Ferner Ltd to review and comment on land use and infrastructure issues in the area immediately south of the Hamilton City Boundary extending east of Temple View, north of Mystery Creek and west of Matangi. The study was in response to Action 8, section 8.15.4 of the strategy (*Undertake and identify long-term land-use options through an integrated and collaborative study of the area to the south of Hamilton City . . .*).

One of the key issues identified in the Southern Sector Study was:
*Growth of the Tamahere Country Living Zone area up to approximately 5,000 people (approximately 1,600 lots) without reticulated wastewater has the potential to create cumulative adverse environmental effects in the medium to long term* (Southern Sector Study page iii).

Action 11 of the Study is:

*Assess the cumulative effects of septic tanks within the rural area on the long term health of groundwater and river health. The outcomes of this should feed into the 3 Waters Strategy to assist with making a recommendation on the reticulation (or other means of servicing) of wastewater to any existing or planned unreticulated locations* (Beca Carter Hollings & Ferner Ltd, 2010, p29-30).

It should be noted that at the September 2010 Future Proof Implementation Committee meeting, the Committee requested that the on-site wastewater report also investigates the potential for adverse effects from on-site wastewater discharges in small urban areas, particularly Pirongia and Ohaupo. This matter was not recorded in the resolution however.

## 1.2 Project scope

In deciding on the scope of this study, the following matters were taken into account:

1. The Waikato Raupatu Claims (Waikato River) Settlement Act and similar legislation with respect to Ngati Tuwharetoa, Raukawa and Te Arawa River Iwi means that greater efforts are needed to restore and protect the health and wellbeing of the Waikato River. This is supported by the Vision and Strategy being deemed into the Regional Policy Statement.

2. Method 3.5.7.2 of the regional plan is to, as a matter of priority, develop a change to the regional plan to address a number of matters including identifying where wastewater systems are having adverse effects on ground water and amending rules to address situations where systems are shown to be inadequate (refer Appendix Two for full wording of method).

3. The regional plan is shortly due for review in any case, and part of that review will be to assess whether the on-site wastewater provisions are still appropriate.

4. In the Tamahere Country Living Zone, there could eventually be 1600 on-site wastewater systems on 5000 square metre sections (Beca Carter Hollings & Ferner, 2010). The nature of unserviced development in the Tamahere area was not envisaged when the current regional plan wastewater rules were drafted. There is a need to check whether the rules are still appropriate to manage the potential effects from on-site wastewater systems given this kind of development.

5. There are a number of smaller 'urban' areas in the Waikato region which are serviced by on-site wastewater systems (such as Pirongia and Ohaupo). In such cases, the section sizes can be even smaller than in the Tamahere Country Living Zone. These are continuing to grow, particularly in the Future Proof sub-region, and it is important to check that Waikato Regional Council's wastewater rules are sufficient to manage effects from this kind of development.

6. Recent work on risks associated with on-site wastewater in the Waikato region is providing new information which will help to better understand how best to manage on-site wastewater.

7. The proposed RPS has new provisions for water quality in general and on-site wastewater in particular including that territorial authorities should *provide for the regular inspection of communities serviced by onsite wastewater systems, such as in villages and concentrated rural-residential areas, to identify and address any surfacing of effluent from on-site wastewater systems* (section 8.3.9i) and that Waikato Regional Council will *encourage the replacement of onsite wastewater disposal with reticulated wastewater systems where applicable* (section 8.3.10e).

Given these matters, the study will:

1) Describe local authority responsibilities for the management of on-site wastewater discharges;

2) Determine potential on-site and cumulative effects from on-site wastewater systems;

3) Assess the nature of on-site wastewater development in the Tamahere/Tauwhare/Matangi area, and in small urban areas in the Future Proof area such as Pirongia and Ohaupo;

4) Review relevant studies of similar unserviced development;

5) Review relevant on-site wastewater guidelines, standards and controls in other regions;

6) Review the adequacy of Waikato Regional Council's permitted activity rules for on-site wastewater to manage effects;

7) Make conclusions and recommendations about:
   a) the potential for adverse effects from on-site wastewater servicing in the Tamahere/Tauwhare/Matangi area, and in small urban areas in the Future Proof area such as Pirongia and Ohaupo
   b) the need for changes to the way on-site wastewater is managed, including changes to the relevant Regional Plan rules.

# 2 Management of on-site wastewater

Both regional councils and territorial authorities have responsibilities with respect to the management of on-site wastewater systems. The main legislation which controls the management of on-site wastewater systems and discharges would be the following:

- Resource Management Act 1991 (RMA)
- Building Act 2004
- Health Act 1956
- Local Government Act 2002 (LGA)

Most of the following observations about these four Acts are drawn from the Ministry for Environment web site: http://www.mfe.govt.nz/publications/rma/nes-onsite-wastewater-systems-discussion-jul08/html/page5.html.

**Resource Management Act 1991**
On-site wastewater discharges are primarily managed under the RMA. Such discharges are controlled by regional councils and require a consent unless permitted by a rule in a regional plan. The RMA requires that the effects of discharges are avoided, remedied or mitigated. Effects to be considered would include health effects.

**Building Act 2004**
The Building Act provides controls related to building work. Controls seek to ensure health and safety of people is protected. On-site wastewater systems need building consent from territorial authorities under this Act. Territorial authorities are required to ensure systems are appropriately designed and installed, and will operate such that no threat is posed to safety or public health. Once a system is installed and a code of compliance issued, the territorial authority has no further obligation with respect to the system under the Building Act.

Note also that the New Zealand Building Code, clause G13 (Foul Water) has the following Objective (G13.1):

a. safeguard people from illness due to infection or contamination resulting from personal hygiene activities; and
b. safeguard people from loss of amenity due to unpleasant odours of the accumulation of offensive matter from foul water disposal.

G13.3.4 has regulations for where there is no sewer available. Included are such matters as ensuring the likelihood of contamination of potable water supplies by foul water is avoided.

**Health Act 1956**
Under the Health Act, territorial authorities have a duty to improve, promote and protect public health. The MfE web site states "*The Health Act gives district and city councils powers to address problems with nuisances* [from on-site wastewater systems] *as they arise, and environmental health officers have powers to act where on-site wastewater management practices are having local or community health impacts. In practical terms, the Act gives territorial authorities the power to require that actions are taken by a property owner to remedy a situation where a failing on-site system is creating a nuisance or risk to public health*."

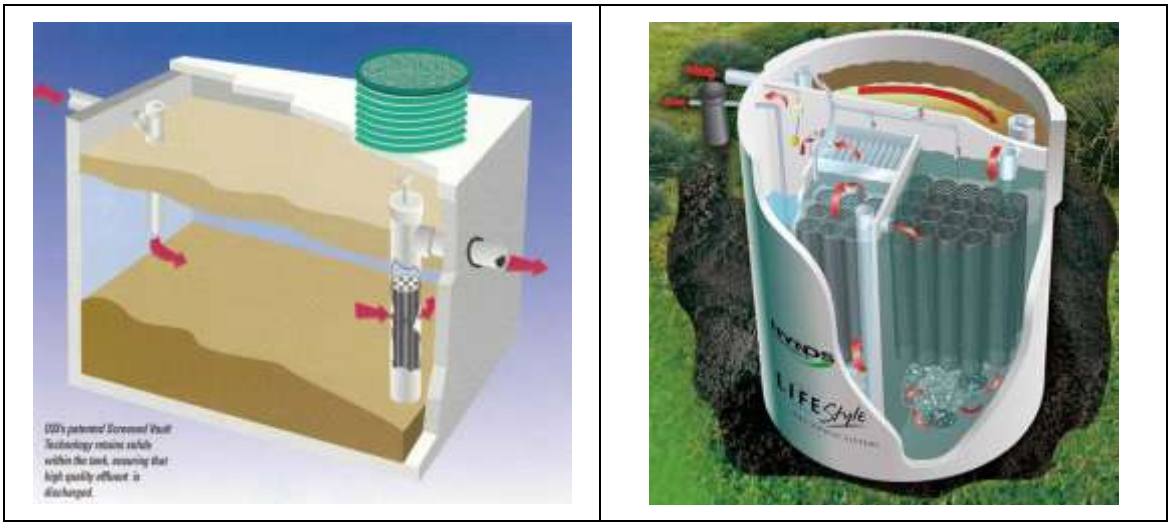
**Local Government Act 2002**
Under the LGA, territorial authorities are responsible for provision of water and sanitary services and are required to assess provision of these services. Requirements for assessments of sanitary services includes an assessment of any risks to the community relating to the absence in any area of a reticulated wastewater service. The LGA gives territorial authorities (not regional councils) the ability to make bylaws for the purpose of managing on-site wastewater systems (such as to impose operation and maintenance requirements).

# 3 Potential effects from on-site wastewater

This section briefly describes the way that wastewater is treated in standard and advanced on-site wastewater systems, and how it is discharged into the environment. It then describes the main potential effects from wastewater discharges.

## 3.1 On-site wastewater treatment systems

The majority of on-site wastewater treatment systems in the Waikato region are septic tank systems. More recently, improved on-site treatment systems have become common and rules were introduced into regional plans in the early 1990's to address these systems (Waikato Regional Council, 1994). Figure 1 below illustrates of the main differences between septic tank and improved on-site treatment systems. Note that most septic tanks in the region would not have an outlet filter as shown in the left hand diagram in Figure 1, although new systems are now required to have them.



Source: Gunn, 2010

**Figure 1: Example of a septic tank, and an improved on-site wastewater system**

Septic tank systems generally comprise a single or double tank that capture and settle out solids. They are primary treatment systems that provide an elementary level of treatment through anaerobic (low oxygen) digestion. The discharge from a septic tank typically contains high concentrations of bacteria and relatively high concentrations of nutrients such as nitrogen and phosphorous. The ammoniacal form of nitrogen tends to be the dominant nitrogen form in septic tank effluent (Scholes, 2006).

In recent times improved types of wastewater systems that provide a higher degree of treatment have become commercially available. Such systems incorporate an additional stage into the treatment process, which typically involves the use of active aeration to intensify the rate of biological activity within the system to produce a higher quality of discharge compared to that from a septic tank.

Since 1998 the Waikato Regional Council has had a permitted activity rule that allows improved systems to be installed on sites where it is no longer appropriate to use a septic tank system, so long as the improved system discharge can produce a predetermined secondary quality effluent. Despite the higher quality discharge, improved systems still have potential to have adverse environmental effects if inappropriately designed, located, operated or maintained. With advanced systems, due to aerobic treatment, the oxidised form of nitrogen, nitrate-nitrogen, tends to be dominant in the discharge. Bacterial concentrations, depending on the type of system, can either be similar or significantly less compared to a septic tank discharge (Scholes, 2006).

The type of on-site wastewater system and the contaminants that wastewater contains are therefore important considerations when gauging the likelihood of any effects occurring as a result of onsite wastewater discharges entering the environment. The following table sets out the quality differences between raw wastewater, and primary and secondary treated discharges.

**Table 1: Typical range influent/effluent quality**

| **Parameter** (mg/l), (cfu/100ml) | **Raw domestic Wastewater (influent)** | **Septic Tank effluent** | **Advanced system effluent (e.g. Aerated WWP)** |
|---|---|---|---|
| BOD | 210 - 400 | 120 - 180 | 15 - 50 |
| SS | 220 - 350 | 60 - 80 | 10 - 80 |
| TN | 45 - 100 | 45 - 60 | 20 - 45 |
| $NH_4$ | 42 - 90 | 40- 50 | 6 - 40 |

| | | | |
|---|---|---|---|
| $N0_3$ | 0.5 - 2 | 0.5 - 2 | 10 - 35 |
| TP | 4 - 18 | 4 - 12 | 6 - 10 |
| FC | $10^7$ - $10^9$ | $10^5$ - $10^7$ | $10^{4-}10^6$ |
| E coli | $10^6$ – $10^7$ | $10^4$ – $10^6$ | $10^3$ – $10^5$ |

(Data source: Bay of Plenty Regional Council, Crites & Tchobanoglous, 1998, Metcalf & Eddy Inc.1991, NZLTC 2000; Roberts 1999; & Taupo DC 2011).

The above figures are assumed for properly operated and maintained systems. It should be noted that on-site systems have to operate over a range of incoming wastewater (influent) quality and discharge quality (effluent). The effluent quality can vary due to factors such as the flow, concentration, and the type of wastewater entering the septic tank or advanced system as the case may be.

## 3.2 Wastewater discharge pathways and effects

To understand the types of effects from on-site systems it is important to consider the discharge pathways by which contaminants enter the environment. In the Waikato region, most on-site wastewater systems discharge wastewater into land via a subsurface soakage drain or similar mechanism. The soakage system may vary in configuration and size, but the inherent principle involved is to apply treated wastewater (effluent) into or onto land in a way that enables further treatment by soil processes. Soil treatment is an important process for removing harmful substances before the treated effluent enters the groundwater table. If an on-site system is functioning properly, groundwater should be the first water body that renovated discharge from an on-site system will enter.

Surface water bodies should not normally receive any wastewater directly from an onsite wastewater system. If there is direct contact of wastewater with either groundwater or surface water, the disposal system would not be functioning properly.

In some instances, an on-site system may have a specialised discharge system that applies (irrigates) wastewater to the land surface. As with subsurface disposal systems, it is important that surface irrigated effluent is properly renovated through the soil, and that there is no overland flow into surface water bodies. If overland flow of wastewater to a surface water body occurs, the effects tend to be more pronounced as the land treatment component of the treatment process is by-passed. With household on-site systems it is preferable that wastewater is applied to land beneath the ground surface. The topsoil covering provides a safeguard to minimise the likelihood of human contact with effluent, plus there is a lesser chance of overland flow to surface water occurring during rainfall events.

The discharge of wastewater contaminants into the environment can have adverse effects on receiving soils, groundwater, and nearby surface waters. Even a well designed, appropriately installed and maintained system, may impart some changes on the receiving environment over a long period of time. The approach of on-site wastewater treatment and land application is that it will be as sustainable as practicably possible with any effects being no more than minor.

Wastewater discharges from on-site wastewater systems typically contain high concentrations of pathogens such as bacteria and viruses, elevated nutrients and to a lesser extent toxic substances. These contaminants can present health risks to people and/or give rise to negative environmental effects. To avoid such effects it is essential that every on-site wastewater system is correctly installed and maintained.

The types of effects that are typically associated with on-site systems are:

- Impacts on groundwater quality
- Impacts on surface water quality

- Impacts on soils; and
- Impacts on amenity values (i.e. public health, aesthetic values, cultural).

## 3.3 Domestic wastewater contaminants

**Pathogens**

Pathogens are disease causing organisms such as some types of bacteria and viruses. Faecal Coliform bacteria have been the traditional indicator used to gauge health risk to humans because these types of bacteria come from the intestines of warm blooded mammals. More recently a specific type of Faecal Coliform bacteria called Escherichia Coliform (E Coli) has become the main public health risk indicator when testing drinking water supplies for the presence of harmful bacteria.

Viruses can present a greater risk to health than bacteria in some cases because they are environmentally more persistent than bacteria, can travel further and are generally more infectious.

Pathogens can cause disease and infection where people consume or recreate in water contaminated by wastewater from on-site systems. Also, where disposal systems fail, such as due to clogging of the disposal lines, effluent can come to the surface. This poses a health risk, such as to children playing in the vicinity of the disposal system.

**Nitrogen**

The main risk from wastewater nitrogen is that it can enter surface water and increase plant growth (nitrogen is a nutrient). Nitrogen enters wastewater mainly from human urine excretion. The oxidised form of nitrogen (nitrate nitrogen) is very mobile and therefore moves through soil to water bodies very easily. In high quality surface water bodies, which can be nitrogen limited, even small amounts of nitrogen entering the water can promote the accelerated growth of undesirable algae, slimes and weeds. In open water bodies this enhanced growth effect can lead to a reduction in the quality of that water, and therefore the values that are associated with the water also diminish. In more extreme situations where a lot of nutrients have been able to enter a body of water the resultant slime and weed growth is prolific, the water clarity suffers and the ecological balance of the water body is notably changed. In some situations a highly undesirable ecological condition that is difficult to reverse, called eutrophication, may result.

Source: Rae R et al, 2000

**Figure 2: Example of nutrient stimulated weedy growth in fresh water body**

Nitrogen in drinking water can also be a health risk. At high concentrations (above 11.3 mg/L nitrate nitrogen based on the NZ Ministry of Health Drinking Water Standards, 2005) nitrogen in a drinking water supply can present a health risk for bottle fed infants

from methaemoglobinaemia (blue baby syndrome); the inability of the blood to hold sufficient oxygen for respiration.

**Phosphorus**
As is the case with nitrogen, phosphorus is a nutrient that can be assimilated by plants and organisms to stimulate growth. While generally present in wastewater discharges in concentrations that are a scale lower than nitrogen, phosphorus can become an issue if introduced into the environment in freely available concentrations, such as shallow water bodies and streams. A minor proportion of wastewater phosphorus is absorbed by organic compounds within the wastewater treatment system and contained in the settled sediment. Most is converted to a reactive form (dissolved reactive phosphorous) and is discharged into the environment. Fortunately phosphorus is also adsorbed to soil and for most on-site systems, should not normally end up in groundwater bodies in high concentrations. That said, it is not without potential for adverse effects in circumstances where the soil has reached adsorption capacity, if effluent moves too quickly through the soil profile, or if partially treated wastewater can enter surface water bodies directly.

**Biochemical oxygen demand**
Wastewater contains a high concentration of organic material that, if discharged to water in large amounts, represents a food source for micro-organisms. This can cause a bloom of micro-organisms which can consume a large amount of oxygen. This can reduce oxygen to levels unsustainable for fish life. Ensuring that wastewater does not discharge to water bodies will successfully prevent such an event.

High BOD can also result in clogging of distribution systems, particularly if the effluent is not evenly distributed over the discharge field. This in turn can lead to clogging and failure of the discharge system.

**Other contaminants and effects on soils**
The NZ Guidelines for the Utilisation of Sewage effluent on Land (New Zealand Land Treatment Collective, 2000) advises that domestic effluents are not considered to contain heavy metals and toxic compounds in quantities that would limit biological activity or cause harm to the receiving environment. The heavier compounds tend to settle with the sediment (sludge) in the primary (septic) tank.

Studies are ongoing, however, to look at other compounds that end up in the wastewater stream such as antibiotics and estrogen. Ultimately such research assists with the development of new standards and treatment technologies that can be brought into practice to minimise identified risks. In the meantime it is considered that discharges from domestic on-site systems are not high risk in respect of other contaminants that tend to be present in very low concentrations.

# 4 On-site wastewater in the Future Proof area

It is estimated that there are 40,000-45,000 on-site wastewater systems in the Waikato region. Appendix Three shows excerpts from a Waikato Regional Council study in 2007 which sought to identify communities in the Waikato region serviced by on-site wastewater systems and to see if there is evidence of adverse effects from these systems. The study showed that there are a number of settlements where there are a combination of risk factors which could indicate potential for adverse effects from the on-site systems. Note that a number of communities discussed in the 2007 study have since had community reticulated wastewater systems installed to replace septic tanks which reduces the risk of adverse effects. Table 2 shows the main communities in the Future Proof area where there are still communities served by on-site wastewater systems.

**Table 2: Communities in Waikato and Waipa Districts serviced by on-site wastewater systems**

| Waikato District | Waipa District |
|---|---|
| Glen Afton | Leamington – Crowley Drive/Milton Street. |
| Glen Massey | Maungakawa |
| Glen Murray | Ngahinapouri |
| Gordonton | Ohaupo |
| Horsham Downs | Pirongia |
| Mercer | Pukeatua |
| Onewhero | Rukuhia |
| Port Waikato | Te Miro |
| Pukemiro | Te Pahu |
| Renown | |
| Rotokauri | |
| Te Akau South | |
| Waikokowai | |
| Whale Bay | |
| Whatawhata | |

As already noted, on-site wastewater systems can adversely affect the environment, such as by contaminating ground or surface water, and can result in a health risk to people and communities. There are a number of risk factors which can be used to indicate the level of risk of effects from septic tanks. Waikato Regional Council has recently developed a risk model which identifies where particular on-site wastewater risks may occur in the region (Beca Infrastructure Ltd, 2010). The risk factors used in this model are:

1. System age – older wastewater systems can be too small for modern household utilities such as dish washers, they are more likely to have cracks causing leakage, and are more likely to have disposal systems which are collapsing or clogging.

2. Soil type – some soils have poor soakage and therefore are more likely to result in surfacing of effluent, other soils have very high soakage rates which can mean effluent reaches ground or surface water without normal soil renovation of the effluent.

3. Lot size – where there are a number of septic tanks on small properties, the higher density of discharges can mean greater cumulative contamination of ground or surface water.

4. Depth to ground water table – if ground water is near the surface, effluent can discharge directly to the water. This does not allow the intermittent drying needed for bacteria die-off.

5. Aquifer conductivity – high conductivity increases the rate of migration of contaminants which can result in greater concentrations of contaminants in surface water bodies and water supply wells.

6. Proximity to surface water – communities serviced by septic tanks, which are near surface water bodies will result in a greater risk of contaminants reaching these water bodies.

It should be noted that effects from septic tank failure can result from failure of a single system or a larger issue where many systems in a particular location fail. In the former case, the failure may relate to the design and installation of that particular system in combination with the site characteristics. The risk model does not take into account individual system design parameters, such as loading rates and the general the adequacy of the disposal system to handle the quality of effluent being produced by the treatment system. The risk model is intended to indicate the level of risk irrespective of the characteristics of each treatment and disposal system.

Based on the 2007 study mentioned above, there would appear to be a number of communities serviced by septic tanks where two or more of the risk factors occur. This appears to be the case for a number of communities or parts of communities in the Future Proof area, including Ohaupo, Rukuhia, Glen Afton, Glen Massey, Gordonton, Pukemiro, Renown, Waikokowai, Whale Bay and Whatawhata. As previously stated some communities where risks were flagged in the 2007 study have since been provided with wastewater reticulation. Also the study was based on feedback from territorial authorities to give a 'first-cut' feel about where on-site wastewater systems may result in risks. The study did not involve a formalised study of risk factors and did not involve site visits by Waikato Regional Council staff. Finally, it should be noted that the Waikato Regional Council on-site wastewater risk model identifies Ohaupo as being low risk, not high risk as may be inferred by the 2007 study.

**Proportion of on-site septic tanks versus secondary treatment systems in Pirongia, Ohaupo and the Tamahere rural-residential area**

Waipa and Waikato District Council staff indicated that there is no identifier recorded against property data bases that would allow easy identification of the type of wastewater system installed. When a new system is installed, it is recorded through the building consent process and an engineering certificate is supplied. Any available information regarding the type of system, is held on the individual property building files. The only way of accurately assessing the numbers of standard versus advanced on-site systems would be by going through each property file and manually extracting the information.

Given the age of most of the on-site systems, it is clear that most systems in the Waipa and Waikato districts would be predominantly standard septic tanks. Where sections are over 2500m$^2$, it is also likely that most wastewater systems on those sections are standard septic tanks. Waipa District Council staff have confirmed this for Pirongia and Ohaupo.

A review of Waikato Regional Council GIS data shows the following property characteristics for Pirongia, Ohaupo and the Tamahere-Southern Sector area:

**Table 3: Sections in Pirongia, Ohaupo and the Tamahere-Southern Sector area under 2,500 m$^2$ serviced by on-site wastewater systems**

| Community | Percent of sections under 2,500 m$^2$ | Number of sections under 2,500 m$^2$ |
|---|---|---|
| Pirongia | 40% | 177 |
| Ohaupo | 55% | 115 |
| Tamahere-Southern Sector area | 15% | 86 |

Most of the properties in these areas were developed prior to the implementation of the Waikato Regional Plan rules and the use of septic tanks is considered to be permitted under the existing use rule (3.5.7.4).

As there are only a small number of resource consents to discharge wastewater in these three areas (and those that exist are generally for businesses or larger dwellings

wishing to use septic tanks), it can be assumed that those properties which are less than 2,500 $m^2$ and have dwellings constructed in the decade 2000-2010, must be serviced by a secondary treatment plant to have permitted activity status. Using the GIS model information there are 21 properties in Pirongia, no properties in Ohaupo and 3 properties in the Tamahere-Southern Sector area which fit this description. The other option whereby a secondary treatment plant would be required to be installed would be for a dwelling producing more than 3,000 litres per day of wastewater.

**System maintenance and monitoring**

Maintenance of on-site wastewater systems under permitted activity rules is the responsibility of the owner. Most household on-site systems operate under permitted activities rules. In terms of Waikato Regional Council's monitoring function, the few that do have discharge consents are primarily priority four sites which means they would only be monitored if there was good reason to; for example in response to a complaint or as part of non routine project such as a survey.

The district councils do not have a dedicated tank pump out scheme and maintenance of sites is purely home owner based, however Waikato District indicated that manufacturers of secondary systems generally require a maintenance contract. The district council has periodically received copies of site visit checklists from some contractors but this is very intermittent and there is no requirement for this to occur. When maintenance check reports are received by the council, the information is simply placed on the individual property file. No register of on-site maintenance information is kept.

Waipa District Council indicated it does not undertake maintenance, management or monitoring of on-site domestic wastewater systems. Waipa has no arrangements with the Regional Council to undertake such activities. For sites less than 2,500 $m^2$, the council does inform people through Land Information Memorandums (LIMs), that if the existing system fails, the replacement system will have to be an improved secondary treatment system rather than a standard septic tank (to comply with Rule 3.5.7.6 of the Regional Plan).

**Evidence of adverse effects**

Waikato Regional Council's complaints and enquiries database was searched for complaints regarding on-site wastewater systems within the Waikato and Waipa Districts. Over the time period from 1999 to 2012, 24 genuine complaints/incidents were identified (there were a number of complaints which were classed as 'unjustified' after investigation). Of these incidents, 21 or 87.5% were in locations within the Waikato District and 3 or 12.5% were within Waipa District. Only one site was located within the Pirongia, Ohaupo and Tamahere areas of interest.

The issues and frequencies of each are summarised below:

**Table 4: Complaints regarding on-site wastewater systems within Waipa and Waikato Districts, recorded on the Waikato Regional Council complaints database**

| Identified issue | Frequency |
|---|---|
| Secondary treatment plant failure and overflow | 1 |
| Dripper irrigation system failure | 1 |
| Septic tank failure (including deliberate emptying onto land) | 4 |
| Trench disposal system failure | 9 |
| Disposal system too close to watercourse or bore | 3 |
| Unlawful long drop or composting toilet issue | 2 |
| Septic tank or disposal system across property boundary | 2 |
| Septic tank cross connected to stormwater drain or stream | 2 |

Waikato District

Waikato District Council advises that it has very few callouts to septic system failure in the Tamahere area, although there have been several incidents of malfunctioning secondary systems in Cherry Lane and Bilsthorpe Lane in the north-west Tamahere area. In any case, the failures experienced were short-term operational issues involving excessive odour production and disposal system clogging, rather than a general cumulative failing of systems which could result in a greater level of environmental effects.

A Tonkin and Taylor study in 1998 conducted across the Tamahere-Matangi area concluded there were some instances of localised well contamination, but overall considered that microbial contamination of groundwater through on-site wastewater was unlikely.

The Mangaone Stream at Annebrook Road is monitored by Waikato Regional Council and Fonterra. The council officer who monitors the Fonterra site indicated that the stream has improved greatly over the past 10 years but that impacts from Fonterra Hautapu would be expected to mask any on-site wastewater effects. To confirm the presence of on-site wastewater contamination would require human wastewater-specific tests such as monitoring for viruses, faecal sterols or whiteners.

Waipa District

Waipa District Council indicated that they have no evidence of adverse effects from the existing on-site wastewater disposal systems in Pirongia, Ohaupo and the Tamahere area, and do not carry out any research to look for effects.

Council staff searched the last two years of Building Consents in their data base and found only 3 Building Consents in the Pirongia village for repairs or replacements to existing on-site wastewater disposal systems and none in the Ohaupo Village. They do not have a call out system for failures but do respond to complaints from neighbours were there is a nuisance. Complaints are not kept on a database as they will normally result in a Building Consent for the repairs.

**Results from on-site wastewater risk assessment model**

As previously stated the Waikato Regional Council has developed an on-site wastewater risk assessment model to identify areas in the region which may have a particular risk of adverse effects from discharges from on-site wastewater systems. The model identifies risk based on system age, soil type, lot size, depth to high ground water table, aquifer conductivity and proximity to surface water.

With respect to the communities particularly targeted by this report, risk values have been summarised for Pirongia and Ohaupo as distinct communities, but not for Tamahere (which has not been identified in the model as a 'community'). However risk maps of the Tamahere area can be generated (see Figure 1).

The following table provides risk information for Pirongia and Ohaupo. Overall risk values range from one to five, with five being the highest risk possible in the model.

**Table 5: On-site wastewater risk statistics for Pirongia and Ohaupo**

| Community Name | Average risk value | Max risk score on a property | Number of properties | Total area in hectares |
|---|---|---|---|---|
| Pirongia | 2.19 | 4.65 | 442 | 218.4 |
| Ohaupo | 1.78 | 2.45 | 207 | 94.5 |

On average, the risk of adverse effects from on-site wastewater, based on the model inputs for Pirongia and Ohaupo, is not high. There are a few individual properties in Pirongia however where risk is high. In terms of comparison to all assessed

communities in the region, Pirongia and Ohaupo are ranked 93rd and 95th respectively out of 98 communities, that is, they are relatively low risk compared to other communities.

Figures 1-3 provide map outputs for the Tamahere area, Pirongia and Ohaupo. The red properties have higher risks from septic tanks (3-5 on the risk scale) than the green properties (0-2 on the risk scale).

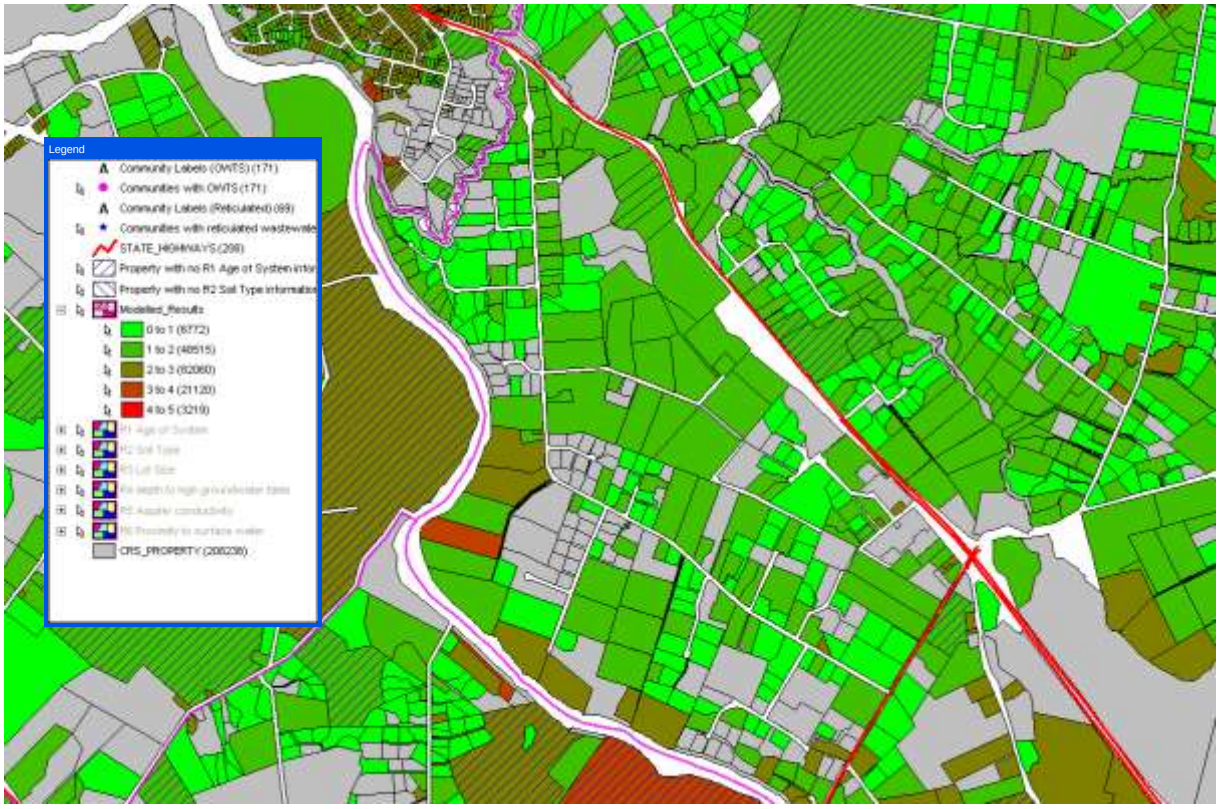



**Figure 3: On-site wastewater GIS risk assessment - Tamahere**

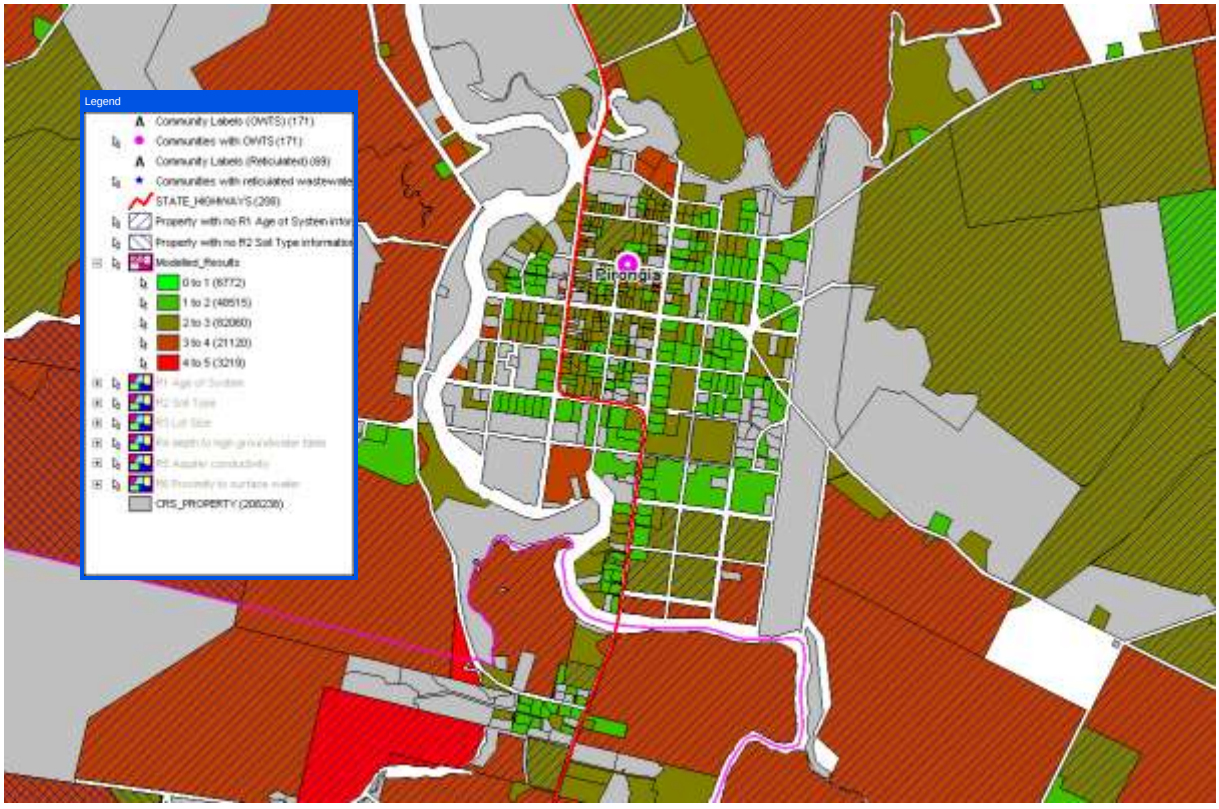


**Figure 4: On-site wastewater GIS risk assessment - Pirongia**

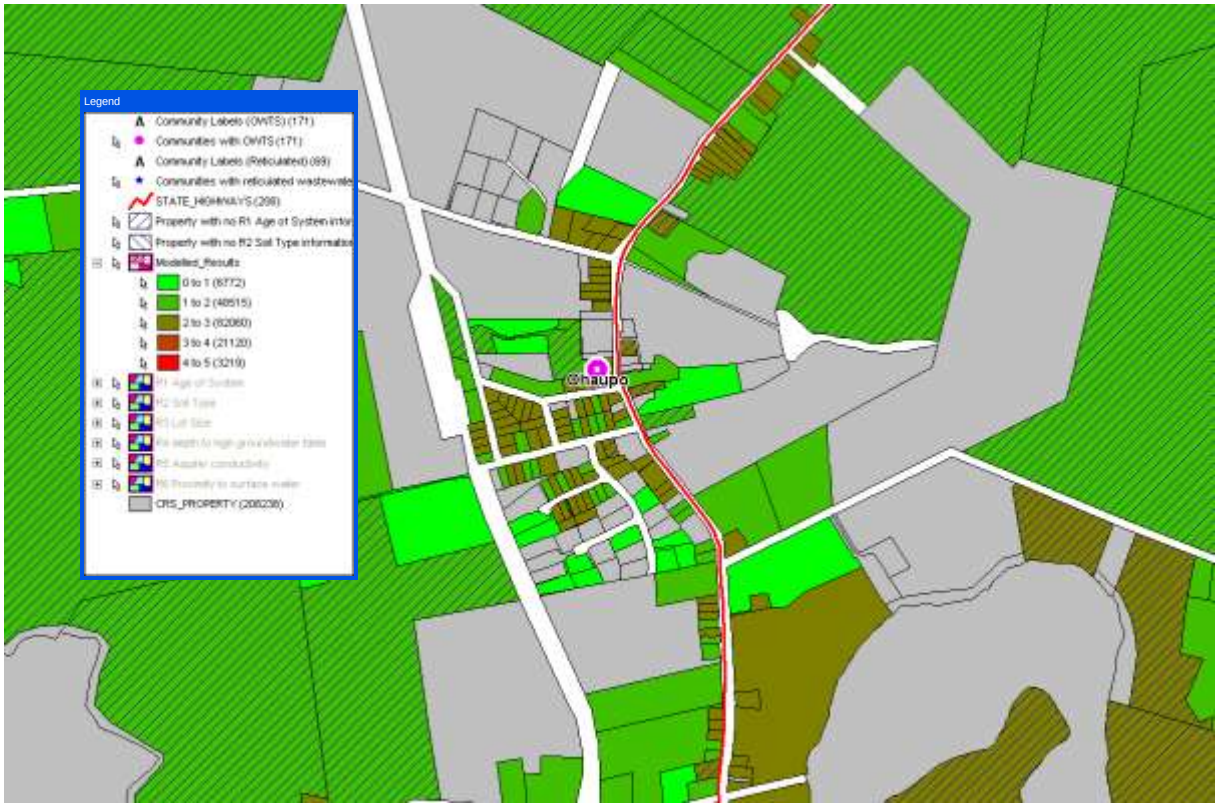



**Figure 5: On-site wastewater GIS risk assessment - Ohaupo**

Figure 3 shows that risk from septic tanks is low for the Tamahere area based on the model inputs. Risk is also low for Ohaupo and relatively low for Pirongia, although there are some areas of higher risk. Note that the rural area around Pirongia is rated high in terms of the risk of septic tank failure, but the low number of on-site systems in rural areas would mean that the cumulative risk from on-site systems would be very low.

A separate analysis using the risk model was carried out to view potential changes to risk values in the Tamahere Country Living Zone (TCLZ) over time under two different hypothetical development scenarios:

- Scenario 1: where each lot is subdivided to no less than 2,500 $m^2$ (at present, in 10 years time and in 30 years time); and
- Scenario 2: where the total number of lots in the TCLZ is 1,600 (at present, in 10 years time and in 30 years time).

The results showed that if properties in the TCLZ were subdivided down to a minimum of 2.500 $m^2$, or if subdivision continued until there were 1600 properties serviced by on-site systems in the TCLZ, the risk of adverse effects from on-site wastewater would still be low in both cases (note that the current minimum section size under Waikato District Plan is 5,000$m^2$).

The risk model makes the assumption that older wastewater systems result in greater risk of adverse effects than newer systems, for the reasons described on page 9 of this report. The above model run shows the geographic effect of this in the Tamahere area over time. As systems start to age, the risk will increase, which will be particularly significant along the margin of the Waikato River. After 30 years the risk in the TCLZ along the Waikato River is assessed as high for Scenario 1 and moderate to high for Scenario 2. This graphically shows how monitoring and maintenance of on-site systems in the TCLZ would need to be significantly improved, so that as systems age, they are maintained and upgraded as needed to avoid adverse effects on water bodies. Note that this would be the case for any community serviced by on-site systems in close proximity to water bodies.

# 5 Review of relevant studies, guidelines and standards

This report seeks to understand the risks from on-site wastewater systems in communities such as the Tamahere Country Living Zone where there could eventually be 5,000 people serviced by 1600 on-site wastewater systems on 5,000$m^2$ sections (Beca Infrastructure Ltd, 2010), and existing communities where section sizes are smaller, such as Pirongia and Ohaupo. This section reviews relevant studies, guidelines and standards in order to identify when communities serviced by on-site wastewater systems may be subject to a risk of adverse environmental and health effects from these systems.

## 5.1 Observations from studies and literature reviews

A review of relevant studies shows that in general, if on-site wastewater systems do result in adverse environmental effects for groundwater and surface water bodies, it is most likely because of a high density of systems or specific localised conditions such as a high water table, hard basement rock, or coarse soils close to high quality water bodies.

During surveys undertaken in Kihikihi (1999) and Piopio (2004), a number of failing and problematic on-site systems were observed. Failing septic tank soakage fields, upwelling gully traps, wastewater ponding and overland flow of wastewater into surface waterways were contributing factors to the eventual reticulation of these communities to a centralised treatment system. The monitoring of surface waterways around Kihikihi showed that water quality was being adversely affected by leakage from on-site wastewater systems. In Piopio a number of homes on low lying and relatively small sections were found to have seriously failed systems that were presenting a health hazard to property owners and having wider environmental effects.

The USA National Small Flows Clearing House (NFSC) web site contains references to a number of case studies that make similar conclusions. Closer to home a recent Australian report on a study (Geary et.al, 2007) of contamination in Tilligerry Creek Estuary, NSW did not establish a clear linkage between on-site systems, groundwater contamination and the emergence of the contaminants in the estuary. Leakage of effluent from on-site systems to surface water ways was considered the more likely contaminant pathway.

The observations to come out of studies such as Kihikihi (2000), Piopio (2004) and Mapara Road, Taupo (2009), would suggest that where properties are large (over 2,500 $m^2$), the potential for environmental effects from on-site discharges is small.

The studies undertaken by Gibbs (1977 & 1991) in the Taupo catchment over two decades revealed that nutrient contamination was occurring and that the effluent was leaching into the near shore area of the lake from high densities of on-site systems. In this case, it is likely to be the high density of on-site systems, very porous soils and close proximity to surface water which resulted in the leaching effect. In a number of cases also, discharge was to soak holes rather than trench systems, which would also have increased the potential for effluent effects on surface water.

The Cooks beach on-site debate that was waged for a decade was similarly about a community with septic tank systems on small sections with sandy soils. In that case, it was generally concluded that there was a relationship between the septic tank discharges and negative groundwater impacts, of sufficient significance to compel the Thames-Coromandel District Council to reticulate the village. Initial documentation of groundwater supply contamination occurring from septic tanks was provided by Diaz

(1990). Further reports by Hadfield (1996) and McDonald (1996) describe the contamination mechanisms and hydrogeologic constraints.

In many of the sites that Waikato Regional Council staff have personally observed (refer the above noted surveys), those with well drained soils (such as loam category 2, 3 and 4 soils) combined with large lots were more often than not working well and not experiencing widespread soakage problems. It is acknowledged that a minority number of sites had at some stage experienced soakage problems but had been repaired. The problematic sites tended to be where the soils were tighter or wetter, the lot sizes smaller and in particular where maintenance seemed to be lacking.

Where problems have been observed the main cause routinely points to a lack of maintenance and subsequent loss of performance with the on-site treatment and or the soakage system. In that respect overland flow and leakage to surface waters as a result of problematic soakage systems is considered more likely to be the contributing factor to water quality issues than direct contamination of groundwater supplies from infiltration on large lots.

Lack of maintenance was both apparent and obvious in the Mapara Road survey (Simonson, 2009), where owners of large allotments on free draining soils had failing systems which were recently installed. Inquiries undertaken with owners indicated that they were unaware about how their on-site system worked and how to maintain the system. The lack of requirements for even basic maintenance for on-site systems seems to be an issue for the Mapara Road sites surveyed. It is a central theme observed in overseas studies (Port Stevens Council, 2004)) and is probably an issue with on-site systems across the Waikato region.

**Modelling to inform development of regional plan rules**

The 1993 Waikato Regional Council report prepared by PR Cochrane and N Selvarajah (1993), which informed the Waikato Regional Plan rules in 1994, adopted conservative criteria to model the impact of nitrogen from a septic tank discharge on section areas of 800$m^2$ and 2500$m^2$ respectively. The modelling adopted 60g of Nitrogen discharged per day from a four person household to consider groundwater impacts. No rainfall contribution on the land area of the respective sections was assumed, relying only on dilution of the discharge from groundwater.

That modelling exercise concluded that nitrate-N in groundwater at boundaries of effective disposal area of 2500$m^2$ and 800$m^2$ were likely to be about 10g/$m^3$ and 15g/$m^3$ respectively, though the estimates were considered to be conservative by about 50%. Minimum section sizes for septic tank discharges were recommended after which an improved standard of treatment would be required.

Today the permitted activity rules of the Waikato Regional Plan for on-site wastewater discharges (excepting the Taupo Catchment) are still based on the section size of 2500$m^2$ being the threshold between when a septic tank can be installed and when a secondary treatment capable system is required.

## 5.2 Review of relevant guidelines and standards

There are a number of guidelines which relate directly and indirectly to the management of on-site wastewater systems. Their relevance and ability to assist with guidance on managing the number and/or density of on-site wastewater discharges is discussed below.

Auckland Regional Council's guideline document 'On-site Wastewater Systems: Design and Management Manual' Technical Publication 58 (TP58) discusses the potential cumulative effects from individual on-site wastewater management systems. This document states that:

*Cumulative effects need to be considered where a number of separate on-site systems are located in close proximity (e.g. more than one dwelling per 3,000 $m^2$ of total site area). In such situations the cumulative (combined) effects from a number of separate on-site systems can become significant.*

TP58 does not give a reason for this concern when the density of wastewater systems exceeds one per 3,000$m^2$.

AS/NZS 1547:2012 is the current Australia and New Zealand standard for on-site domestic wastewater management. The standard does not limit the density of discharges or indicate when density may be a concern. Instead it provides guidance on how to design, install and maintain systems so that adverse effects are avoided.

The permitted activity rule for new standard septic tanks in the Waikato region would allow one system per 2,500$m^2$. There is no minimum section size for advanced systems although Waikato Regional Council staff currently take the view that there should be a minimum, and that it should likely be at least 800 $m^2$ (this is discussed further in Section 4.5). This will need to be further assessed during the review of the Waikato Regional Plan on-site wastewater rules beginning 2014.

**Receiving Environment Standards**

The NZ Ministry of Health Drinking Water Standards 2005 (Revised 2008) has a limit for Nitrate of 50mg/L (which is 11.3 mg/L as nitrate nitrogen). At concentrations above 11.3 mg/L the concentration of nitrate nitrogen in a drinking water supply can present a health risk for bottle fed infants from methaemoglobinaemia, which is also known as blue baby syndrome; the inability of the blood to hold sufficient oxygen for respiration.

The NZ Ministry of Health Drinking Water Standards 2005 (Revised 2008) has a maximum acceptable value for E coli in drinking water of less than 1 coliform unit in a 100ml sample (i.e. < 1.0 cfu/100ml).

The Waikato Regional Plan has standards for the Contact Recreation Water Class. These state that the median concentration of E. coli should not exceed 126 per 100 millilitres in this water class.

Providing the Waikato Regional Plan rules are complied with, there should be little risk of on-site wastewater discharges, either individually or cumulatively, causing these receiving environment standards to be exceeded (this matter is discussed further in Section 4.5). Note that this assumes systems are kept in good condition. It should also be noted however that the rules are not always complied with and systems are not always kept in good condition.

**Viruses**

ESR has developed guidelines that estimate how far domestic water supply bores need to be from on-site wastewater discharges (separation distances) to protect against disease from viruses (Moore et al., 2010). Separation distances are estimated for rotaviruses and hepatitis. These viruses are used as the former is most likely to result in infection and requires greatest separation whilst the latter has the highest consequence from infection but requires smaller separation distances.

Soils can provide substantial removal of viruses dependent on their type and thickness. The Waikato region has a wide variety of soils. In some soils, adequate virus protection could be achieved within a few metres, while in other soils a separation distance of several hundred metres would be required (and in worse cases more than a kilometre).

Soils are variable and create the need for differing requirements for on-site wastewater design. Because of variable soil conditions, a single set of requirements to protect against viruses cannot be easily developed for a region, or even a single community. For example, Horotiu soils and Te Kowhai soils predominate in the Tamahere area. Horotiu soils are most common and are very effective at removing viruses from

wastewater effluent. The ESR guidelines would indicate that a few metres separation distance would protect against Hepatitis and a 40 metre distance would protect against Rotovirus in Horotiu soils. Te Kowhai soils are mainly in the Tamahere gullies. Much larger separation distances would be needed to protect water supply bores from viruses in these soils (about 200 metres to protect against Hepatitus and 370 metres to protect against Rotovirus). It should be noted that conventional septic tank soakage in Te Kowhai soils is problematic given they are not free draining and are generally associated with high water tables (saturated conditions recur within these soils).

Pang et al., (2005) also estimated separation distances for viruses and bacteria in a range of conditions based on available published studies. These studies show that greater separation distance is needed in already contaminated aquifers. A setback of only 37 to 44 m is estimated to be required in contaminated sand aquifers (compared to 1.7 to 3.9 kms in coarse gravel aquifers).

Drinking water taken from domestic bores is almost always untreated. It is clear therefore that if bores are too close to on-site wastewater discharges, there could be a risk of viral disease from consumption of the bore water. Viruses present the greatest health concern of pathogens present in wastewater because they are environmentally more persistent than bacteria (can travel further) and are more infectious. The calculated separation distances in the ESR guidelines therefore would protect against bacteria as well as viruses.

Work on how far on-site wastewater discharges should be from domestic water supply bores to protect against disease from viruses is continuing. Based on modelling, existing separation distances for discharges and bores in the Waikato Regional Plan (30 metres) may not always be sufficient to protect against viruses, although there is no clear evidence of actual health effects occurring in the region due to bores being too close to discharges. Further work will be needed on this matter when the regional plan rules for on-site discharges are reviewed. The risk of disease is also likely to increase as the numbers and densities of on-site discharges increase.

# 6 Review of Waikato Regional Plan on-site wastewater rules

The discharge of on-site wastewater effluent is regulated by Section 15 of the Resource Management Act. Section 15 states in effect that no person shall discharge on-site wastewater effluent to land or water unless the discharge is allowed by a rule in a regional plan or a resource consent. Regional Plan rules are therefore the main vehicle for managing on-site wastewater discharges.

The Waikato Regional Plan has permitted activity rules for existing on-site wastewater discharges (Rule 3.5.7.4), new septic tank systems (Rule 3.5.7.5) and new improved systems with secondary treatment (Rule 3.5.7.6). A copy of these rules is provided in Appendix Four. Other discharges require consent under rule 3.5.7.7. In addition, there are specific rules that apply to the catchment of Lake Taupo (Rules 3.10.6.1-3.10.6.6).

Based on the assessment in section 4.2 the main effects to be avoided from on-site wastewater discharges are pathogens, nitrogen and phosphorus. The following table summarises the main ways in which regional plans control these effects.

**Table 6: Typical regional plan restrictions in New Zealand to control effects from on-site wastewater discharges**

| Contaminant | Main controls used in Regional Plans |
|---|---|
| Pathogens | • Vertical separation distance from bottom of disposal trench to ground water level – In general, bacteria cannot remain viable in dry conditions. If the disposal system is working satisfactorily, |

| | |
|---|---|
| | and if there is sufficient vertical separation distance, bacteria will not enter ground water (or surface water via ground water).<br>• Horizontal separation distance from the disposal area to surface ground water bodies or ground water bores – adequate horizontal separation distances provide a buffer to ensure pathogens do not reach surface water or bores.<br>• Limiting effluent volumes – this will ensure vertical and horizontal separation distances are sufficient for the effluent quantity.<br>• Ensuring effluent does not surface so that direct contact with effluent is avoided. |
| Nitrogen | • Nitrogen can either be removed through a wastewater treatment process (such as secondary wastewater treatment) or through denitrification in soil. For standard septic tanks (primary treatment only) the main regional plan requirement to limit nitrogen discharge to water to acceptable levels is by limiting the density of on-site systems (such as the Waikato Regional Council's requirement for a minimum 2,500$m^2$ disposal area). |
| Phosphorus | • Due to the tendency for phosphorus to adhere to soil particles, in general land disposal of effluent, with appropriate vertical and horizontal separation distances, will not result in significant phosphorus discharges to water. This is particularly so where soils have some proportion of clay particles. |
| General treatment effectiveness | • Septic tank size – if the septic tank is sized appropriately to the volume of effluent being discharged, biological processes and settling of solids in the tank will occur to an appropriate degree.<br>• Effluent outlet filters – these will reduce solids carry-over to the disposal field and therefore also reduce the potential for contaminants to enter the environment.<br>• Provisions that ensure treatment and disposal systems are appropriately located, designed and maintained will help to avoid adverse effects from wastewater discharges. |

Waikato Regional Council staff reviewed regional plan permitted activity provisions for on-site wastewater in New Zealand. Following are the main conclusions from this review.

**Density of disposal systems and sizes of disposal areas**

Many regional or unitary plans do not have maximum densities for on-site systems or minimum disposal areas. Instead they rely on other provisions such as design criteria and conditions about effects that discharges must not have. For standard septic tank systems, where minimum disposal areas do exist, they range from 800$m^2$ to 5,000$m^2$. The Auckland Region uses a flow to area ratio (lot area:discharge volume > 1.5 $m^2$/litre/day). For an effluent volume of 1.3$m^3$ per day, this would equate to a minimum disposal area of 1,950$m^2$. The Waikato Regional Plan requires a minimum disposal area of 2,500$m^2$ for a maximum effluent volume of 1.3$m^3$ per day, for new standard on-site wastewater systems. Most regional plans do not have minimum densities or disposal areas for advanced on-site treatment systems (although for the Auckland region the same flow to area ratio applies and in Gisborne the minimum disposal area of 800$m^2$ applies to both standard and advanced systems).

**Vertical separation distance**

Where minimum vertical separation distances are provided by regional permitted activity rules for new standard septic tanks with trench systems, they range from 500mm to 1500mm (600mm being the most common requirement). In most cases, this minimum separation distance also applied to advanced treatment systems. The Waikato Regional Plan has a 600mm separation distance that would generally apply to

standard septic tanks and 300mm that would generally apply to advanced systems discharging through dripper lines.

**Horizontal separation distance**
For new standard on-site treatment and disposal systems, horizontal separation distances to surface water bodies range from 10 metres to 50 metres. The large majority of the 14 regional/unitary plans reviewed have 20 metre distances. The Waikato Regional Plan requires a 20 metre separation distance to natural state and fisheries class water bodies and 10 metres to other water bodies. This is probably to give a greater buffer to reduce nutrients in natural state and fisheries class water bodies. However, given that for 'other' water bodies the separation distance is only half that used in other regions, there should be further investigation about the original reason for, and adequacy of, the 10 metre buffer.

Horizontal separation distances to bores from standard septic tank discharges range from 20 to 50 metres (about 40% of plans specify 20 metres and 40% specify 50 metres). The Waikato Regional Plan requires a 30 metre separation distance to bores.

**Daily effluent volume**
Most regional plans have a permitted activity limit for the daily volume of discharge from new standard septic tank systems. The large majority of rules limit the volume to $2m^3$ per day (11 person household based on 180 litres per person per day discharge). Waikato Regional Council limits the volume to $1.3m^3$ (about a seven person household). Larger households would require an advanced wastewater system.

**Septic tank size**
Larger septic tanks would generally treat effluent better as there is a greater residence time for effluent in the tank. Most regional rules do not require that septic tanks are a particular size. However the Waikato Regional Plan has a minimum size of 3,000 litres. This is the minimum size recommended by AS/NZS 1547:2000 On-site domestic wastewater management standard.

**Effluent outlet filters**
Effluent outlet filters reduce solids carry over to the disposal field and therefore help to improve effluent treatment and maintain the successful operation of the disposal field over time. Half the reviewed regional plans require effluent outlet filters for new standard septic tanks, including the Waikato Regional Plan.

**Other rule provisions**
Most regional plans also have a number of qualitative requirements such as that effluent does not discharge directly to surface water or result in surface ponding. Some require that the systems are designed in accordance with a standard such as Auckland Regional Council's Technical Publication No. 58 (TP58) or AS/NZS 1547. The Waikato Regional Plan states that TP 58 should be used as a guide to the design, construction, operation and maintenance of on-site systems.

# 7 Conclusions

This study shows that there are a number of ways in which on-site wastewater systems can adversely affect the environment. However it is also clear that when systems are appropriately installed, sited and maintained, the risk of adverse effects is very low. Despite the many systems installed in the Waikato region, and the long history of their use, there are few instances of reported adverse effects, and these are typically isolated.

While this is a general conclusion, there are communities in the Waikato region where clear evidence of risk to people and the environment from on-site wastewater systems was established, resulting in territorial authorities deciding to replace the on-site systems with reticulation and centralised treatment of wastewater. Furthermore, it is

evident that the risk of adverse effects increases as on-site systems become more numerous and older. For these reasons, there is a need for ongoing proactive planning to manage the key risk areas for on-site wastewater servicing.

The single biggest outstanding issue with on-site systems is wide-spread lack of maintenance. Few council's in New Zealand have monitoring programmes in place. It is suggested that where adverse effects do occur from on-site systems, lack of maintenance is generally the primary cause (assuming of course that the system was correctly installed in the first place). Lack of maintenance has been the message conveyed by the on-site industry in recent conferences in NZ and Australia, and is nearly always a central theme in studies about management of on-site systems.

Discharges from on-site systems are controlled by regional plan rules. The installation of systems is managed through building consents from territorial authorities. Territorial authorities also are responsible for responding to health effects from on-site systems. The Waikato Regional Plan has permitted activity conditions that are at least as rigorous as most other regions, and which adequately manage the effects of on-site wastewater discharges. One specific requirement that may not be stringent enough is the 10 metre horizontal separation distance between on-site discharges and 'other' surface water bodies. Most regional councils require a 20 metre distance from surface water bodies.

It is recommended that in future, the regional plan sets a minimum section size for permitted advanced on-site systems. Due to the physical limitations of fitting a modern package plant system and dripper field on site, and to allow for the dwelling, garage, paths, and gardens it is suggested that minimum area limit is reached at or about 800m$^2$. However further work is needed to verify an appropriate minimum area during the regional plan review.

Although the regional plan rules are generally appropriate to the region, as stated above, there are clearly some areas where risk of adverse effects is higher due to site conditions, age of systems and small section sizes. The risk is particularly high where a number of risk factors occur together. It is likely that the best way of dealing with this is by identifying existing communities where the combination of risk factors is high, and putting in place systems to manage the risk. The view of the authors of this paper is that both the regional council and local authorities need to be involved in managing such risks. In particular:

- The regional plan should identify where these communities are, and should have stronger provisions for monitoring and maintenance of on-site systems by the owner of the system.
- The regional council should carry out monitoring for environmental effects where the risk of such effects is particularly high.
- Local authorities should carry out inspections of systems where the risk is high to ensure they continue to comply with Building and Health Act requirements over time, and should require improvements where they do not. It should be noted that in general, on-site systems will not produce an environmental effect if the Building and Health Act requirements are met.

Discharges from on-site wastewater systems can produce health risks, particularly when there is a nearby bore used for potable water supply or where a number of systems are near a surface water body used for contact recreation. It appears from the literature that bacterial contamination can be (and usually is) avoided via appropriate horizontal and vertical separation distances. However there are still questions about appropriate provisions with respect to viruses and further work is required on this.

The research appears to support the adequacy of the current section size limit of 2,500m$^2$ for standard on-site systems. It would appear that large numbers of such systems can be installed without resulting in adverse environmental effects. However it is also clear that the risk increases as wastewater systems age. Appropriate monitoring

and maintenance systems are again therefore needed to manage such risks. In the case of the Tamahere/Matangi area, soil conditions are generally appropriate for on-site wastewater systems. However, where properties are near surface water bodies, the risk of effects will increase over time and this needs to be appropriately addressed.

The Waikato Regional Plan rule for new improved on-site systems, requires that the system treats effluent so that Biochemical Oxygen Demand does not exceed 20 grams per cubic metre and suspended solids do not exceed 30 grams per cubic metre. The adequacy of these requirements should be assessed during the full review of the regional plan in 2014. It may be that different limits (including for different contaminants such as pathogens and nutrients) could be appropriate for systems in higher risk areas.

The risk of adverse effects from on-site systems in Pirongia and Ohaupo generally appears to be low, apart from for a few individual properties in Pirongia. In general section sizes are large and site conditions are appropriate for on-site systems. There are however a number of communities in the Future Proof area (and undoubtedly in other parts of the Waikato region) where a combination of risk factors results in a cumulative high total risk.

It is clear from this research that there is not sufficient coordination of regional and territorial authority management of on-site wastewater. There are synergies to be gained from better collaboration. It is clear that regional plan rules can help to achieve Health Act requirements that territorial authorities are responsible for. It is also clear that territorial authority consent processes (including subdivision consents and building consents) can be very helpful in avoiding cumulative effects of on-site systems over time. It is noted that the Waikato Triennial Agreement Forum is currently seeking ways to improve collaboration with respect to strategic matters and service delivery. Efforts should be made to use this process to improve coordination of the management of on-site wastewater systems.

# 8 Recommendations

Based on the findings of this report the following recommendations are made. Given that the matters addressed relate to the whole Waikato region, and not just the Future Proof area, the recommendations are to the Waikato Regional Council and the Waikato region's territorial authorities.

1) That Waikato Regional Council and the region's territorial authorities work together to improve management of on-site wastewater systems for communities serviced by on-site wastewater systems, where there is a combination of factors that create a high level of risk to health and the environment. Roles and responsibilities with respect to ensuring such systems are appropriately maintained and monitored need to be clarified. This should be progressed through the Local Government Forum.

2) That territorial authorities develop programmes for inspections of communities serviced by on-site wastewater systems where the risk is high, to ensure they continue to comply with Building and Health Act requirements over time and that improvements are made where they do not. Wastewater bylaws under the Local Government Act should be considered as a means of ensuring owners of systems monitor and maintain their systems in high risk communities.

3) That the regional council carries out monitoring for environmental effects where the risk of such effects is particularly high.

4) That the Waikato Regional Council continues to monitor research on appropriate separation distances from water and domestic water supply bores, to protect against potential for viral disease from on-site wastewater discharges. When the Waikato Regional Plan is reviewed, further research should be undertaken to

ensure permitted activity provisions for on-site wastewater management are appropriate with respect to risk of viral disease.

5) That when the Waikato Regional Plan is reviewed:

   a) Changes are sought so that the regional plan identifies communities where there is a high risk of adverse effects from on-site wastewater systems, and includes stronger provisions for monitoring and maintenance of the on-site systems.

   b) Changes are sought to the permitted activity rule for new advanced on-site wastewater systems that would impose a minimum section size.

   c) Consideration is given to extending the separation distance between new on-site wastewater discharges and 'other' surface water bodies to 20 metres (in line with most other regional plans).

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## Appendix One: Map of Future Proof sub-region

# Appendix Two: Waikato Regional Plan method to review on-site wastewater provisions

### 3.5.7.2 Plan Change

As a matter of priority, develop a change to the Waikato Regional Plan and, if necessary, Waikato RPS addressing the following matters:

1. Refining the rules in this Plan to provide greater flexibility and clarity for resource users, including provision of design requirements for in-ground renovation where necessary.

2. Identifying where systems are having adverse effects on ground water.

3. Investigating how the Australia/New Zealand Standard for the Management of On-Site Sewage Systems AS/NZ1547:2000 can be integrated in the rules.

4. Amending rules to address adverse effects in sensitive receiving environments or where existing systems are shown to be inadequate.

5. Developing processes in conjunction with territorial authorities to ensure sewage systems are upgraded where appropriate.

6. Record keeping and monitoring, including records of system location, design and maintenance history.

7. Monitoring and enforcing compliance with regional rules.

8. Cost recovery.

9. Links to responsibilities under other legislation especially the Health Act 1956 and Waste Management Plans prepared under the Local Government Act 1974.

## Appendix Three: Excerpts from Waikato Regional Council 2007 study to identify communities serviced by on-site wastewater systems where there could be adverse effects from these systems

| Waipa District | | |
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| Pirongia | | • Reticulated water supply but on site disposal for wastewater.<br>• There are some areas of poor soakage.<br>• This affects the soakage for wastewater discharge from the septic tanks as well as stormwater discharge.<br>• As these areas are known to Council, they prohibit development on these lots if there is no suitable area for soakage.<br>• There are no known problems with failure of septic tanks in this community.<br>• This township is not as old, relative to other Waipa towns and the septic tanks are therefore relatively modern and not likely to fail in the near future.<br>• WDC must ensure that the properties affected by poor soakage are marked on property files. This will ensure that this comes up in LIM reports and is also picked up for building consent applications.<br>• Due to the presence of the poor soakage areas, this community could benefit from education on the maintenance and use of their systems, more than areas.<br>• The highest risk for wastewater is contamination of groundwater. The most effective solution is community education as covered above.<br>• Average section size = 2000 m2.<br>• 25 – 75% of the systems were installed before 1982.<br>• There are about 20% of the disposal field in areas where the winter ground water level would be less than 1.5 metres below ground surface.<br>• Soil is slow to moderate draining. |
| Ohaupo | | • Reticulated water supply but on site disposal for wastewater.<br>• There are a small number of lots that have poor soakage and peat soils that will not be ideal for septic tank discharge.<br>• The installation of septic tanks on these sites will again be controlled through the building consent process.<br>• The area immediately adjacent to Ohaupo is a peat area. This means that drainage of discharges away from Ohaupo would be restricted.<br>• There have however been no reported problems with the septic tanks in Ohaupo and so with the current population this does not appear to be a problem.<br>• If the town was to grow significantly, (which is a possibility with its proximity to Hamilton), discharge from septic tanks may become an issue in the future.<br>• Of more concern to Ohaupo is the fact that most of the septic tanks were installed around the same time – about 50 years ago. There have been some isolated instances of failure which could become far more widespread as these tanks get older and reach the end of their design lives. Should many tanks fail at the same time a significant health and/or environmental problem may arise. It is therefore recommended that this situation be monitored to pick up |

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| | | negative trends as early as possible.<br>• The highest risk for wastewater is contamination of groundwater. The effective solution is community education and monitoring.<br>• Average section size is 1200 m2.<br>• About 75% of the systems were installed before 1982. |
| Kihikihi **(Reticulated since 2007 study)** | | • Reticulated water supply but on site disposal for wastewater.<br>• Work has commenced on a fully reticulated Council sewer system, to be completed by 2007.<br>• Although maps do not show any problems with poor soakage and peat soils. Kihikihi has a history of septic tank failures and associated health issues.<br>• Council are in the process of implementing a project to reticulate the township for wastewater to overcome this problem.<br>• The highest risk for wastewater is contamination of groundwater. The most effective solution is community education. |
| Ngahinapouri | | • There are no known issues with septic tank failures with in this community<br>• In some cases there are bore supplies for potable water to the site within this township. Care must then be taken that the bore water is not affected by the discharge from the septic tank. This is controlled through the building consent process. The discharge from the septic tank must be at least 30m from the borehole.<br>• This is a community with reasonably young infrastructure and so the assets are reasonably new.<br>• The nature of the housing is of life style properties and there could be a number of residents that have come from cities to live in this community. They may therefore not have full knowledge of the maintenance requirements for septic tanks. They could benefit from information brochures. |
| Rukuhia | | • There are no known issues with septic tank failures with in this community.<br>• Rukuhia does need to be monitored however.<br>• There was an isolated case of the failure of the septic tank for the restaurant, but this was mainly due to placing a significantly higher loading on the system than it was designed for. Of greater concern is the fat that these septic tanks are of a similar age to Ohaupo. There is therefore a similar risk of concurrent septic tank failures due to old age in the near future. As this community is far smaller than Ohaupo it will not be as serious but could still warrant monitoring.<br>• In some cases there are bore supplies for potable water to the site within this township. Care must then be taken that the bore water is not affected by the discharge from the septic tank. This is controlled through the building consent process. The discharge from the septic tank must be at least 30m from the borehole. |
| Maungakawa | | • There are no known issues with septic tank failures with in this community<br>• In some cases there are bore supplies for potable water to the site within this township. Care must then be taken that the bore water is not affected by the discharge from the septic tank. This is controlled through the building consent process. The discharge from the septic tank must be at least |

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| | | 30m from the borehole.<br>• This is a reasonably young community and so the assets are reasonably new.<br>• There is a possibility that this community could go onto a Council water scheme in the near future. This will possibly place additional loading on the septic tanks.<br>• The nature of the housing is of lifestyle properties and there could be a number of residents that have com from cities to live in this community. They may there fore not have full knowledge of the maintenance requirements for septic tanks. They could benefit from information brochures. |
| Leamington – Crowley Drive/Milton Street. | | • Average section size = 2500 m2.<br>• All systems installed after 1982.<br>• Soil is rapid draining. |
| Rukwhia – Just off SH3 | | • Average section size = 1500 m2.<br>• 75% of the systems installed before 1982.<br>• No wastewater disposal fields within 50m of the nearest surface water body.<br>• There are no disposal fields in areas where the winter groundwater level would be less than 1.5 metres below ground surface.<br>• There are a number of household who rely on domestic bores for water supply.<br>• The soil is poor draining. |
| **Waikato District** | | |
| Glen Afton | Dwellings = 48<br>Population = 140 | • All dwellings are serviced by septic tank & effluent disposal systems, most of which were installed in the 1960-70's<br>• % of systems installed before 1982 >75<br>• Average section size = 1012 $m^2$.<br>• 12 Wastewater disposal fields are within 50m of the Waiehuehu Stream.<br>• 19 of the 28 dwellings utilise a split type system with septic tank servicing toilet only and having separate grey water disposal.<br>• Some untreated grey water is entering groundwater, stormwater & stream<br>• Soil is poor draining – Heavy clay.<br>• Drainage health hazard exists due to limited section size & poor soakage characteristics<br>• District Council will undertake health & environmental impact assessment of these discharges in 2006/07 |
| Glen Massey | Dwellings = 55<br>Population = 165 | • All dwellings are serviced by septic tank & effluent disposal systems, most of which were installed in the 1960-70's. All are of single tank type construction with field tile effluent disposal installed under permit from council to the standards and practices or that time.<br>• 22 of the 55 dwellings utilise a split type system with septic tank servicing toilet only and having separate grey water disposal.<br>• 10 disposal systems along Wilton Collieries Road appear to be within 50m from the Firewood Creek which runs through the middle of the township and drains into the Waipa River. The stream is subject to flooding.<br>• Soil is poor draining – heavy clay.<br>• Average section size = 1012$m^2$<br>• % of systems installed before 1982 >75 |

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| | | • Untreated wastewater is currently entering groundwater and stormwater without any treatment<br>• Drainage health hazard exists due to limited section size & poor soakage characteristics<br>• District Council will undertake health & environmental impact assessment of these discharges in 2006/07 |
| Gordonton | | • Dwellings all serviced by septic tank & effluent disposal systems<br>• Lifestyle blocks are all newer and tend to have more advanced wastewater disposal systems<br>• Potential for general drainage health risk due to soil types, higher water table, poor soakage & maintenance performance of existing wastewater systems<br>• District Council will undertake detailed sanitary assessment in 2006/07 |
| Horsham Downs **(Reticulated since 2007 study)** | | • Primary school, church, hall & several dwelling<br>• All dwellings are serviced by septic tank & effluent disposal systems, with a variety of standards<br>• Lifestyle blocks are all newer and tend to have more advanced wastewater disposal systems<br>• Not considered to be any health risks associated with the systems |
| Huntly – Harris Street Extension **(Reticulated since 2007 study)** | | • 13 properties on septic tank disposal<br>• Properties protrude semi-swampy areas close to the river<br>• Septic tanks designed for limited water supply. Unlimited water supply is putting pressure on these systems<br>• WDC plans to extend the Huntly system to include these properties in 2005/06 |
| Huntly – Te Ohaaki Road Extension | | • 3 marae, 25 properties<br>• Currently serviced by septic tanks and onsite systems<br>• Area experiences problems with high water table<br>• It is likely that this community will be made part of the Huntly wastewater system eventually |
| Pukemiro | Dwellings = 68<br>Population = 200 | • All dwellings are serviced by septic tank & effluent disposal systems, most of which were installed in the 1960-70's<br>• % of systems installed before 1982 >75<br>• Average section size = 1012$m^2$.<br>• Field tile effluent disposal<br>• Soil drainage is slow to moderate<br>• No drainage field within 50m of Waiehuehu Stream<br>• No real health risks |
| Rangiriri **(Reticulated since 2007 study)** | | • Dwellings are serviced by septic tank and effluent disposal systems<br>• Village groundwater is high and there have been incidences of sewage seeping through lawns and into the stormwater system<br>• It is considered that this has produced a health hazard<br>• A wastewater system is to be installed by WDC |
| Renown | Dwellings = 16<br>Population = 50 | • All dwellings are serviced by septic tank & effluent disposal systems, most of which were installed in the 1960-70's<br>• % of systems installed before 1982 >75<br>• Average section size = 1012 $m^2$.<br>• Poor drainage – heavy clay<br>• No drainage field within 50m of Lake Whangape<br>• Septic tank effluent and grey water is considered to be entering the stream by stormwater runoff<br>• General health hazard exists due to poor soil soakage |

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| Rotokauri | | • Lifestyle blocks<br>• Range of older and new waste water systems<br>• No general health hazard in this area, as sections are large enough to cater for onsite wastewater management |
| Taupiri **(Reticulated since 2007 study)** | | • All properties serviced by septic tanks<br>• Have been many complaints and health hazard exists<br>• WDC is installing a reticulate wastewater system |
| Tauwhare Pa **(Reticulated since 2007 study)** | Properties = 42 | • 42 properties surrounding Tauwhare Marae<br>• All dwellings are serviced by septic tank & effluent disposal systems<br>• WDC has undertaken a detailed Sanitary Assessment, which has clearly identified problems, refer to Montgomery Watson & Harza Assessment details of findings<br>• A reticulate system and wastewater treatment and disposal system has been proposed by WDC |
| Te Akau South | Dwellings = 40 | • 40 properties, mainly batches, not permanent residents<br>• All dwellings are serviced by septic tank & effluent disposal systems<br>• Systems are underutilised due to the holiday home nature of the settlement<br>• It is considered that no health risks exist from onsite wastewater systems |
| Waikokowai | Dwellings = 22<br>Population = 65 | • All dwellings are serviced by septic tank & effluent disposal systems, most of which were installed in the 1960-70's<br>• % of systems installed before 1982 >75<br>• Average section size = 1012 $m^2$.<br>• Untreated grey water is considered to be entering groundwater and stormwater<br>• 3 of the 22 dwellings utilise a split type system with septic tank servicing toilet only and having separate grey water disposal.<br>• Poor drainage – heavy clay.<br>• General drainage health hazard exists due to poor soil soakage |
| Whale Bay | | • Developed batches & increased occupation<br>• WDC undertook an investigation into the effectiveness of the onsite wastewater systems in 2004. Survey found that a number of the systems had failed causing runoff into neighbouring properties and into the sea<br>• Ground conditions is largely impervious clay and rock<br>• Wastewater system needs to addressed, as health hazard exists due to failed systems<br>• Plans to put in a reticulate wastewater system |
| Whatawhata | Dwellings = 66<br>Population = 180 | • All dwellings are serviced by septic tank & effluent disposal systems, most of which were installed in the 1960-70's<br>• % of systems installed before 1982 >75<br>• Average section size = 1012 $m^2$.<br>• Waipa River runs adjacent to the town, which the stormwater runs into<br>• The soil is sandy clay which drains very well<br>• High water tables in the winter.<br>• Health risks are associated with the limited section size for effluent disposal |

# Appendix Four: Waikato Regional Plan methods 3.5.7.4, 3.5.7.5 and 3.5.7.6

### 3.5.7.4 Permitted Activity Rule – Discharge of Domestic Sewage from Existing On-Site Systems

The discharge of domestic sewage effluent (including grey water but not including stormwater) into land outside the Lake Taupo Catchment from an on-site domestic sewage treatment and disposal system that was lawfully established or authorised before the date of notification of this Plan (28 September 1998), is a **permitted activity** subject to the following conditions:

a. The volume of effluent to be discharged from any one system shall not exceed 1.3 cubic metres per day averaged over any one month period.

b. There shall be no direct discharge of effluent into water.

c. During times of normal wet winter groundwater level, there shall be at least 600 millimetres separation distance between the groundwater level and the bottom of the disposal trench.

d. The discharge shall not result in any objectionable effects from odour beyond the boundary of the subject property.

e. For discharges from systems installed after 11 July 1994, the effective disposal area* for any treatment and disposal system shall be no less than 2,500 square metres.

f. For discharge from properties which, at the date of authorisation of the systems exceeded 2,500 square metres, this Rule shall not apply where, subsequently, the effective disposal area* is reduced to less than 2,500 square metres.

g. For discharges from properties which, at the date of authorisation of the system, were less than 2,500 square metres, this Rule shall not apply where, subsequently, the effective disposal area is reduced.

h. The discharge shall not occur within 20 metres of a Significant Geothermal Feature.

i. Should the treatment and/or disposal system fail to the extent that either the treatment system or disposal system needs to be substantially replaced, and an effluent outlet filter is not part of the system, one should be fitted as part of the system reinstatement. If the property is less than 2,500 square metres and there are two or more on-site wastewater treatment systems (septic tanks) within 50 metres of the disposal field, the reinstated system shall meet the conditions of Rule 3.5.7.6.

**Advisory Notes:**

- The process for assessing odour is specified in Section 6.4.1.3 of the Plan.
- Discharges of contaminants into or onto land within 20 metres of a Significant Geothermal Feature are addressed by Rules 7.6.6.1 to 7.6.6.3 of this Plan. Significant Geothermal Features are defined in the Glossary, and in Development and Limited Development Geothermal Systems, identified on maps in Section 7.10 of this Plan.

- These existing systems will generally be adequate provided that land and soil conditions are suitable and that regular filter cleaning and desludging is undertaken.

- If discharges from an existing septic tank or number of septic tanks are resulting in water users or ecosystems being adversely affected, Council reserves the right to take enforcement action to require the owners of the systems to comply with their duties under s17 of the RMA.

- Discharges of domestic sewage within the Lake Taupo Catchment are to be managed by rule 3.10.6.1 to 3.10.6.4 or rule 3.5.7.7.

**3.5.7.5 Permitted Activity Rule – Discharge of Domestic Sewage from New On-Site Systems**

The discharge of domestic sewage effluent (including grey water but not stormwater) onto or into land outside the Lake Taupo Catchment from an on-site domestic sewage treatment and disposal system lawfully established or authorised after the date of notification of this Plan (28 September 1998), is a **permitted activity** subject to the following conditions:

a. The volume of effluent to be discharged from any one system shall not exceed 1.3 cubic metres per day averaged over any one month period.

b. The minimum total septic tank size shall be no less than 3,000 litres.

c. There shall be no direct discharge of effluent into water.

d. During times of normal wet winter groundwater level, there shall be at least 600 millimetres separation distance between the groundwater level and the bottom of the disposal trench.

e. The discharge shall not result in any objectionable odour beyond the boundary of the subject property.

f. The effective disposal area* for any one treatment and disposal system discharge shall be not less than 2,500 square metres. The discharge shall no longer comply with this Rule where the effective disposal area* is subsequently reduced to less than 2,500 square metres.

g. The sewage disposal system shall not be sited within 20 metres of a Natural State Water Body or Fisheries Class Water Body as specified in the Water Management Class Maps, and 10 metres from any other surface water body.

h. The sewage disposal system shall not be sited within 30 metres of any potable water supply well unless the well is drawing from a separate, confined aquifer.

i. The discharge shall not occur within 20 metres of a Significant Geothermal Feature.

j. The septic tank shall be fitted with an effluent outlet filter.

k. The wastewater system shall be designed and installed such that there will be no adverse change in groundwater quality as a result of the discharge, or in combination with other discharges.

**Advisory Notes:**

- The process for assessing odour is specified under Section 6.4.1.3 of the Plan.

- It is recommended that on-site systems are designed, constructed, operated and maintained in accordance with (Auckland Regional Council 2004 On-site

Wastewater Systems Design and Management Manual – Technical Publication Third Edition).

- Discharges of contaminants into or onto land within 20 metres of a Significant Geothermal Feature are addressed by Rules 7.6.6.1 to 7.6.6.3 of this Plan. Significant Geothermal Features are defined in the Glossary, and in Development and Limited Development Geothermal Systems, identified on maps in Section 7.10 of this Plan.

- Discharges of domestic sewage within the Lake Taupo Catchment are to be managed by rule 3.10.6.1 to 3.10.6.4 or rule 3.5.7.7.

**3.5.7.6 Permitted Activity Rule – Discharge of Sewage from Improved On-Site Domestic Sewage Treatment and Disposal Systems**

Except as provided for by Rule 3.5.7.5, the discharge of domestic sewage effluent (including grey water but not including stormwater) onto or into land outside the Lake Taupo Catchment from an on-site domestic sewage treatment and disposal system is a **permitted activity** subject to the following conditions:

a. The volume of effluent to be discharged shall not exceed three cubic metres per day averaged over any one month period.

b. The design, construction, operation and maintenance of the system shall meet the following standards:

   i. pre-treatment of effluent to a standard not to exceed concentrations of $20g/m^3$ of Biological Oxygen Demand and $30g/m^3$ of suspended solids

   ii. during times of normal wet winter groundwater level, there shall be at least 600 millimetres separation distance between the groundwater level and the bottom of the disposal trench or 300 millimetres between the groundwater level and dripper irrigation lines, where dripper irrigation lines are used and the design loading rate for effluent disposal is less than five millimetres/day.

   iii. there shall be no adverse change in groundwater quality as a result of the discharge, or in combination with other discharges

   iv. there shall be no adverse change in surface water quality as a result of the discharge, or in combination with other discharges

   v. there shall be no direct discharge of effluent into groundwater or surface water.

c. The discharge shall not result in any objectionable effects from odour beyond the boundary of the subject property.

d. The sewage disposal system shall not be sited within 30 metres of a Natural State Water Body or Fisheries Class Water Body as specified in the Water Management Class Maps, and 10 metres from any other surface water body.

e. Written proof of compliance with this Rule shall be provided to the Waikato Regional Council on require in the form of either:

   i. certification by a person who is qualified and experienced in the field of onsite sewage treatment and disposal that the system will consistently satisfy the above standards taking into account the relevant site constraints, or

   ii. documentation which demonstrates achievement of the standards.

f. The discharge shall not occur within 20 metres of a Significant Geothermal Feature.

**Advisory Notes:**

- The process for assessing odour is specified under Section 6.4.1.3 of the Plan.
- Discharges of contaminants into or onto land within 20 metres of a Significant Geothermal Feature are addressed by Rules 7.6.6.1 to 7.6.6.3 of this Plan. Significant Geothermal Features are defined in the Glossary, and in Development and Limited Development Geothermal Systems, identified on maps in Section 7.10 of this Plan.
- Discharges of domestic sewage within the Lake Taupo Catchment are to be managed by rule 3.10.6.1 to 3.10.6.4 or rule 3.5.7.7.