

Managing land use change and Council's administered drainage areas



Statement - In December 2017 the reported drainage standards in Section 2.7.2 were corrected for the Waikato Central and Franklin Waikato drainage areas.

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Table of Contents

Executive summary	iii
1 Introduction	1
2 Land drainage areas	2
2.1 Background	2
2.2 Administrative structure	2
2.3 District council administered areas	4
2.4 Drainage objectives	4
2.5 Drainage area descriptions	5
2.5.1 Aka Aka/Otaua drainage area	5
2.5.2 Franklin Waikato drainage area	6
2.5.3 Waikato Central drainage areas	7
2.5.4 Thames Valley drainage area	9
2.6 Operational requirements	10
2.7 Design standards	10
2.7.1 Background	10
2.7.2 Drain, culvert and floodgate capacity	10
2.7.3 Drain, culvert invert levels	11
2.7.4 Pumpstation capacity	11
2.7.5 Key operation issues	12
2.8 Access	12
2.9 Funding	12
2.10 Review of land drainage areas	13
3 Land use change	14
3.1 Background	14
3.2 Hamilton urban growth	15
3.3 Rural residential land use change	19
3.4 Issues	19
3.5 Natural systems	20
4 Information requirements	22
4.1 Introduction	22
4.2 Scale of proposed development	22
4.2.1 Information requirements for small scale subdivision (Category 2)	23
4.2.2 Information requirements for larger scale development (Category 3)	24
4.3 Funding	24
4.4 Land ownership	25
4.5 Process	26
5 Conclusions	28
References	30
Appendix 1 Hamilton future growth	31
Appendix 2 Information requirements for small scale subdivision	32

Figures

Figure 1	Drainage subcommittee areas in the Waikato region	3
Figure 2	Location of Aka Aka/Otaua drainage area	6
Figure 3	Location of Franklin Waikato drainage area	7
Figure 4	Location of Waikato Central drainage areas	8
Figure 5	Location of Thames Valley drainage area	9
Figure 6	Future Proof Settlement Plan	15
Figure 7	Hamilton proposed urban growth and WRC administered drainage areas (Waikato Central)	17
Figure 8	Hamilton proposed urban growth and WRC administered drainage areas (Hamilton environs)	18
Figure 9	Process for land development proposals in proximity of WRC drainage areas	27

Tables

Table 1	Territorial authority managed drainage areas	4
Table 2	Hamilton urban growth interaction with drainage areas	16
Table 3	Information requirements	22

Executive summary

In the Waikato region there are vast rural areas that are very flat with limited natural drainage outlets. Over time, networks of drains have been developed within these areas to provide adequate land drainage and alleviate flooding to enable productive use of the land. Many of these areas have been formally constituted to be land drainage areas.

Waikato Regional Council is responsible for administering many of these drainage areas, and at the time of report preparation was responsible for managing and maintaining drainage networks within 92 separate areas in the region. These areas pay targeted rates to Waikato Regional Council to provide that service. Land that is outside of these areas and not managed by Waikato Regional Council as a land drainage area is administered by the relevant Territorial Authority (TA).

Levels of service have been agreed upon for the drainage areas that relate to their rural use and the drainage requirements that are necessary to ensure the land's productivity and accessibility without too greater financial burden on those that benefit from the drainage areas. The operational requirements are:

- Provision and maintenance of an effective land drainage network that allows landowners the ability to manage the water table on their properties.
- Provision of the land drainage service to an agreed level of service (to remove ponding from a 10% Annual Exceedance Probability (AEP) event within three days).
- Provision of one drainage outlet per property if required.
- Provision of a fair and equitable land drainage service to all ratepayers.
- Reduction of surface flooding resulting from rainfall events.
- Where gravity drainage allows, the clearance of water from the land to avoid damage to pasture.

Across the region there are areas where land use change is occurring. Of particular relevance to this report is the expansion of existing urban areas into rural land on the fringes of towns/cities where drainage areas exist, for example urban growth around Hamilton. Also of relevance is where the land use is changing from rural (large farms) to a more intensive land use (rural residential) within council administered land drainage areas.

The existing drains within the land drainage areas were not established or designed to cater for urban stormwater runoff. The drainage systems have evolved over time in response to the requirements of local rural land owners. The design criteria that has consequently been developed is suitable for the rural land use within the drainage area and has been developed with service delivery, low cost and equity across the drainage area in mind. If an urban area was to commence draining to a land drainage area there are a range of potential effects that may manifest including capacity issues, surface flooding, erosion and scour effects, issues relating to management of the groundwater levels, and operation and maintenance issues.

General best practise for urban stormwater management as outlined in documents such as Auckland Council's Technical Publication 10 (TP10) outlines the use of at-source management such as detention devices to manage potential effects of stormwater runoff. Whilst this approach would be suitable for natural watercourses, this approach is not ideal for drainage areas, as these networks are generally at or near capacity hence any additional flows can become challenging for the ongoing operation and performance of these drainage areas. With most of these systems being rural-based it is essential that potential inputs of urban stormwater don't create a significant impact, both physically and financially on the landowners and ratepayers.

The biggest issue associated with change to rural residential land use is the likely change in expectation on how the drainage systems should perform. Those with a small lifestyle block are unlikely to be pleased if a portion of their property is flooded for three days as opposed to a larger farm who see this as a normal part of farming life. Ease of maintaining continued access to undertake regular inspections and maintenance could also be an issue with land being divided up into smaller sections with more land owners to deal with.

The simplest approach to manage potential effects associated with land use change would be to keep land drainage areas separate from urban areas, with no urban areas being able to drain to drainage areas. However there are urban growth areas with limited options for stormwater management hence an approach needs to be developed to enable this development to occur in a manner that does not unfairly burden downstream rural landowners. The challenges are identified by both Waikato Regional Council and some TAs, in particular Hamilton City Council. Hamilton City Council is currently refining their Integrated Catchment Management Plan (ICMP) template to ensure this broader context of managing drainage areas is built into their ICMPs.

The level of potential effects on a land drainage area depends on the scale of the proposed development, hence the level of assessment that is required can vary. Three categories have been developed for the purposes of this report, and information requirements have been developed for each category. Information requirements range from Waikato Regional Council providing comment to the relevant TA to inform their process for small subdivisions/boundary adjustment (1 additional typical rural residential lot), through to the developer being required to prepare an assessment of effects for more than 10 additional lot subdivisions (or those needing a resource consent for a stormwater diversion or discharge activity) to inform the regional council's review process.

If an assessment of effects is required it is essential that the effects of the predicted increase in stormwater runoff are assessed on the drainage system to the point where it can be demonstrated that the predicted increase has no effect. The assessment would need to:

- Demonstrate that the drainage system could still meet the relevant design standard taking into account the increase in stormwater peak flows, velocities and volumes, including the tributaries of the drainage system.
- Consider potential effects of the proposal on groundwater levels, especially where the normal groundwater levels are naturally high.
- Consider ongoing operation and maintenance requirements.
- Include survey (topography and fall in drainage networks, especially in upper reaches) AND hydraulic modelling to inform the assessment.
- Consider peat settlement if relevant.

If the assessment demonstrated that there was a predicted effect on the drainage system from the proposal, and there were no alternative discharge points available or options to mitigate the effects, the drainage system could be upgraded to accommodate the increase in flows and to ensure the drainage standard could be maintained. The system would need to be upgraded to the point where it was demonstrated that there was no effect. The upgrade option would need to consider potential effects on groundwater and would need to demonstrate that the groundwater level regime was not negatively impacted. Greater capacity can be provided by widening channels but not deepening them in these circumstances, as long as there is adequate fall in the system. The cost to upgrade the system would need to be funded by the developer.

If a new urban area was to drain to a drainage area, to be equitable the funding system would need to change to ensure all those in the contributing catchment were being rated to cover the costs of managing the drainage area at an appropriate rate. An appropriate rate would need to be developed for the urban catchment taking into

account, the effects of the land use in this area and the number of contributing properties. Based on the assessment of effects discussed above, a contribution factor could be developed for the urban catchment that reflects its contribution in terms of drainage area capacity and ongoing operation and maintenance costs. This contribution would be assessed by the regional council, and an appropriate rate would be added to the relevant properties.

A process flowchart has been developed that maps out a recommended process to follow when progressing a development proposal that potentially interacts with a Waikato Regional Council administered land drainage area.

It is hoped that this report will enable the effects of urban stormwater on Waikato Regional Council administered land drainage areas to be managed in a coordinated and consistent manner.

1 Introduction

In the Waikato region there are many rural areas that are very flat and have limited natural drainage outlets. Over time, networks of drains have been developed within these areas to provide adequate land drainage to support pastoral farming and to alleviate flooding. Without these drainage networks, these areas of land would be unproductive and inaccessible. Many of these areas have been formalised to constitute land drainage areas.

Waikato Regional Council is responsible for administering many of these drainage areas, and at the time of report preparation was responsible for managing and maintaining drain networks within 92 separate areas in the region. Four drainage advisory subcommittees have been established to oversee the management of the drainage areas; Aka Aka/Otaua, Franklin Waikato, Waikato Central and Thames Valley. Areas that are not managed by Waikato Regional Council are administered by the relevant territorial authority (TA).

Levels of service have been agreed upon for the drainage areas that relate to their rural use and the drainage requirements that are necessary to ensure the land's productivity and accessibility without too greater financial burden on those that benefit from the drainage areas.

There are several drainage areas that are located in close proximity to Hamilton and proposed future urban growth within the city means that the extent of the urbanised area is encroaching closer to these drainage areas. The drainage systems in the drainage areas are designed for rural runoff and not for urban (residential and non-residential) runoff. Hence the interaction between urban drainage and the land drainage areas needs to be carefully managed by the TAs and Waikato Regional Council. Hamilton City Council is currently preparing Integrated Catchment Management Plans (ICMPs) for the new urban growth areas within the Hamilton City limits.

This report has been developed to provide background information about the Waikato Regional Council administered land drainage areas and to highlight the issues associated with land use change in close proximity to, and within, the land drainage areas. Discussion is provided about what assessment is required if a proposal is potentially impacting on a land drainage area and a process is mapped out on how to move projects forward in these circumstances.

The report includes the following sections:

- Land Drainage Areas - this section provides the background to the drainage areas, the administrative set up, the drainage objectives, a description of the areas themselves, the operational requirements, design standards, access requirements, funding and review of the drainage areas.
- Land use change – this section provides background on land use change, urban growth around Hamilton, rural residential land use change, issues relating to land use change and a brief discussion about land use change in catchments draining to natural receiving environments.
- Required assessment – this section provides discussion about the required assessment of effects of development proposals on drainage areas and the implication of land use change on funding requirements. This section also outlines a recommended process to follow when undertaking a proposed development in the vicinity of a drainage area.
- Conclusion – Summary of the outcomes of the findings report.

2 Land drainage areas

2.1 Background

Within the Waikato region there are numerous former land drainage areas, which allow landowners within the drainage area to manage the water table on their properties and reduce surface flooding resulting from rainfall events.

Waikato Regional Council is responsible for administering many of these drainage areas, and at the time of report preparation was responsible for managing and maintaining drain networks within 92 separate areas (some of these areas are grouped into single drainage areas) in the region. Four drainage advisory subcommittees have been established to oversee the management of the drainage areas (Aka Aka/Otaua, Franklin Waikato, Waikato Central and Thames Valley). The remaining areas that are not managed by Waikato Regional Council for drainage are administered by the relevant TA.

Each property within a drainage area pays a targeted rate towards the maintenance and upkeep of the relevant drainage network. Activities such as drain cleaning, erosion control, pump maintenance, stop bank maintenance and general drainage area upkeep are organised by the relevant management agency. Figure 1 illustrates the location of the drainage areas administered by Waikato Region Council.

2.2 Administrative structure

As part of the local authority restructuring in 1989, the nine autonomous land drainage boards within the Waikato region boundaries (Thames Valley, Taupiri, Eureka, Te Rapa, Aka Aka/Otaua, Fencourt, Hautapu, Rotomanuka and Ohaupo/Ngaroto drainage boards) became the responsibility of the Waikato Regional Council.

Waikato Regional Council established four subcommittees to oversee the management of the drainage areas (Thames Valley, Waikato North, Waikato South and Aka Aka/Otaua). Since 1989 the responsibility to manage additional drainage areas has been transferred to Waikato Regional Council from various TAs. For example in 2011 and 2012, 45 active drainage districts were transferred from Waikato District Council to the Waikato Regional Council.

As result of this, in 2011 the Franklin Waikato drainage advisory subcommittee was established and the Waikato North and Waikato South subcommittees were amalgamated to form the Waikato Central drainage advisory subcommittee. The following four subcommittees now oversee the management of the drainage areas (Thames Valley, Waikato Central, Franklin Waikato and Aka Aka/Otaua).

The service in the Thames Valley, Franklin Waikato, and most of Waikato Central is provided directly through Waikato Regional Council staff. In the Aka Aka/Otaua drainage area the administration and service is largely undertaken by the subcommittee, although Waikato Regional Council retains overall responsibility for the management of the drainage area. In parts of Waikato Central area (Rotomanuka and Ohaupo/Ngaroto) the respective drainage representatives, in consultation with Waikato Regional Council staff, carry out management of these two drainage areas. As with the Aka Aka/Otaua drainage area, the final responsibility of management of these two drainage areas lies with Waikato Regional Council.

Outside of the Waikato Regional Council administered land drainage areas, the relevant TA is responsible for managing the land drainage. The actual format that takes varies from Council to Council, but in general is more of an advisory role (Hauraki District being the exception).

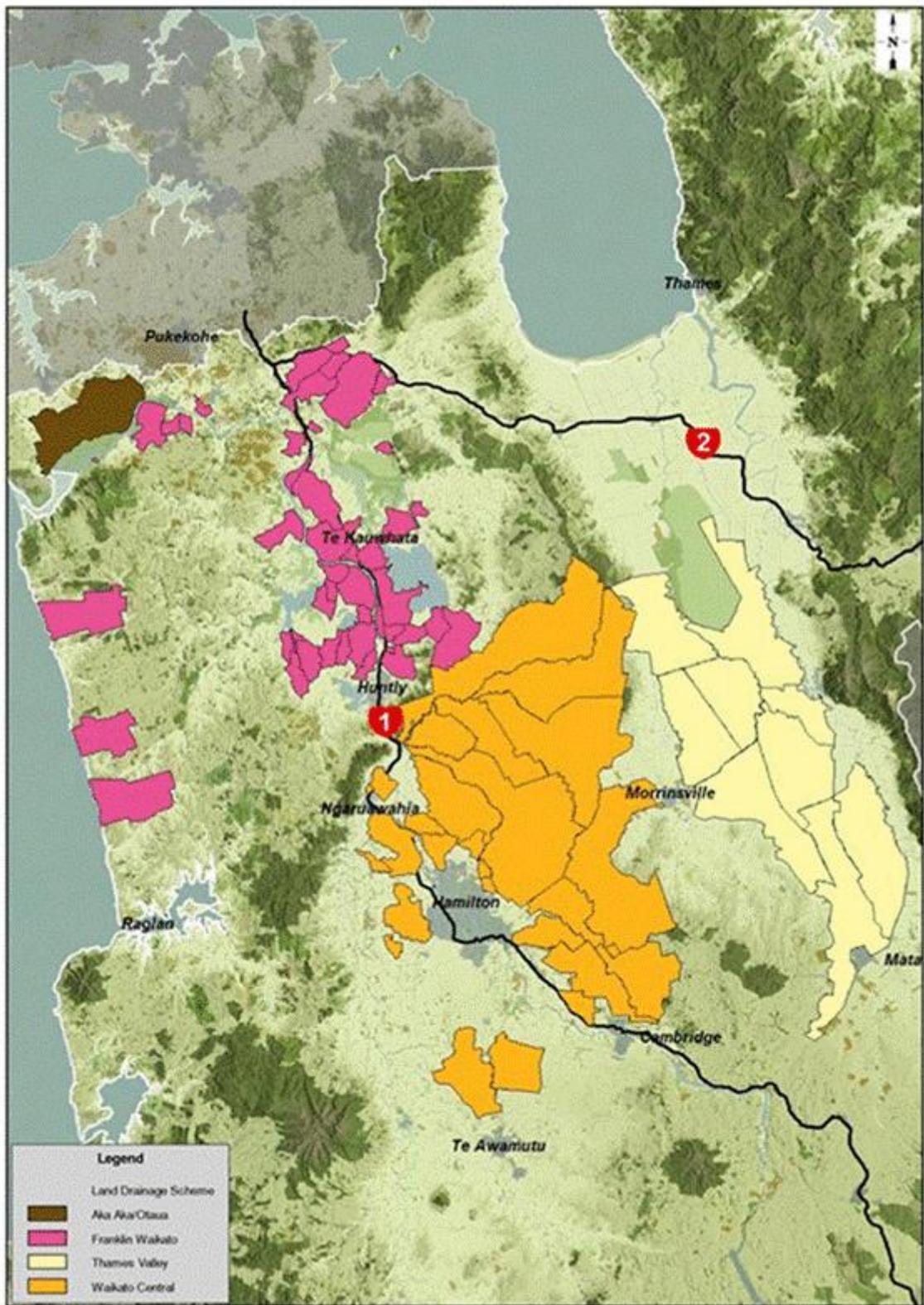


Figure 1 Drainage subcommittee areas in the Waikato region

2.3 District council administered areas

There are six TAs that have drainage areas within the Waikato region. Over time several TAs have chosen to transfer the responsibility for managing their drainage areas to Waikato Regional Council, such as Waikato District Council and Franklin District Council. The following table summarises the drainage areas in the Waikato region that are still administered by TAs.

Table 1 Territorial authority managed drainage areas

Territorial authority	Drainage area
Rotorua District Council	One drainage area based around several streams in the Reporoa area.
Waikato District Council	Tamahere, Travers Road. Also Whiskey flats, Horseshoe, Onewhero upstream and Punga Punga areas that have indicated to Waikato District Council that they wish to be privatised.
Waipa District Council	There are some 17 historical drainage areas within Waipa. However the whole of Waipa district has now been constituted as a drainage area.
Matamata Piako District Council	Manawaru
Hauraki District Council	Hauraki District Council has a significant drainage programme covering much of the Hauraki Plains and the Waitakaruru and Miranda areas. There are currently some 6 drainage areas in this district. This work is closely aligned with Waikato Regional Council's Piako and Waihou flood protection and river management works.
Thames Coromandel District Council	There are three drainage areas in this district located on the right bank of the Waihou River between Hikutaia and Kopu. These drainage areas are relatively small.

In accordance with Part 29 of the Local Government Act 1974, outside of the regional council administered drainage areas, land drainage and river clearance functions are the responsibility of the relevant TA.

2.4 Drainage objectives

The strategic intent of the land drainage activity is set out in Waikato Regional Council's Long Term Plan 2012 – 2022 as:

“To provide land drainage services to safeguard the economic wellbeing of the region.”

The level of service for the land drainage activity is defined as:

“To provide reliable water table management on land within drainage [areas] for the purpose of maintaining pastoral production.”

Effective land drainage is provided by maintaining a land drainage network that allows landowners the ability to manage water table on their properties, and that reduces surface flooding resulting from rainfall events.

The land drainage network is established to an agreed standard that is fair to all ratepayers, and where gravity drainage allows, clears water from the land to avoid damage to pasture.

2.5 Drainage area descriptions

The following section provides a brief overview of the drainage areas.

2.5.1 Aka Aka/Otaua drainage area

The Aka Aka/Otaua drainage area covers the flat land adjacent to the Waikato River southwest of Pukekohe (refer to Figure 2). The area is very low lying and generally below the level of the spring high tide. The area drains to the Waikato River through floodgates under Waikato River stopbanks.

The characteristics of the Aka Aka/Otaua drainage area are described in the Waikato Valley Authority Aka Aka/Otaua Drainage Study Report (WVA Technical Report Number 34, dated February 1986). The drainage area relies on flood protection from the Waikato River provided by stopbanks, floodgates and pumps funded by the Lower Waikato Scheme.

There are about 83 km of drains, 9 floodgates, 3 bridges and 13 culverts managed by the Aka Aka/Otaua drainage area. Grass carp are used for weed control in the Mangawhero pump feeder drain.

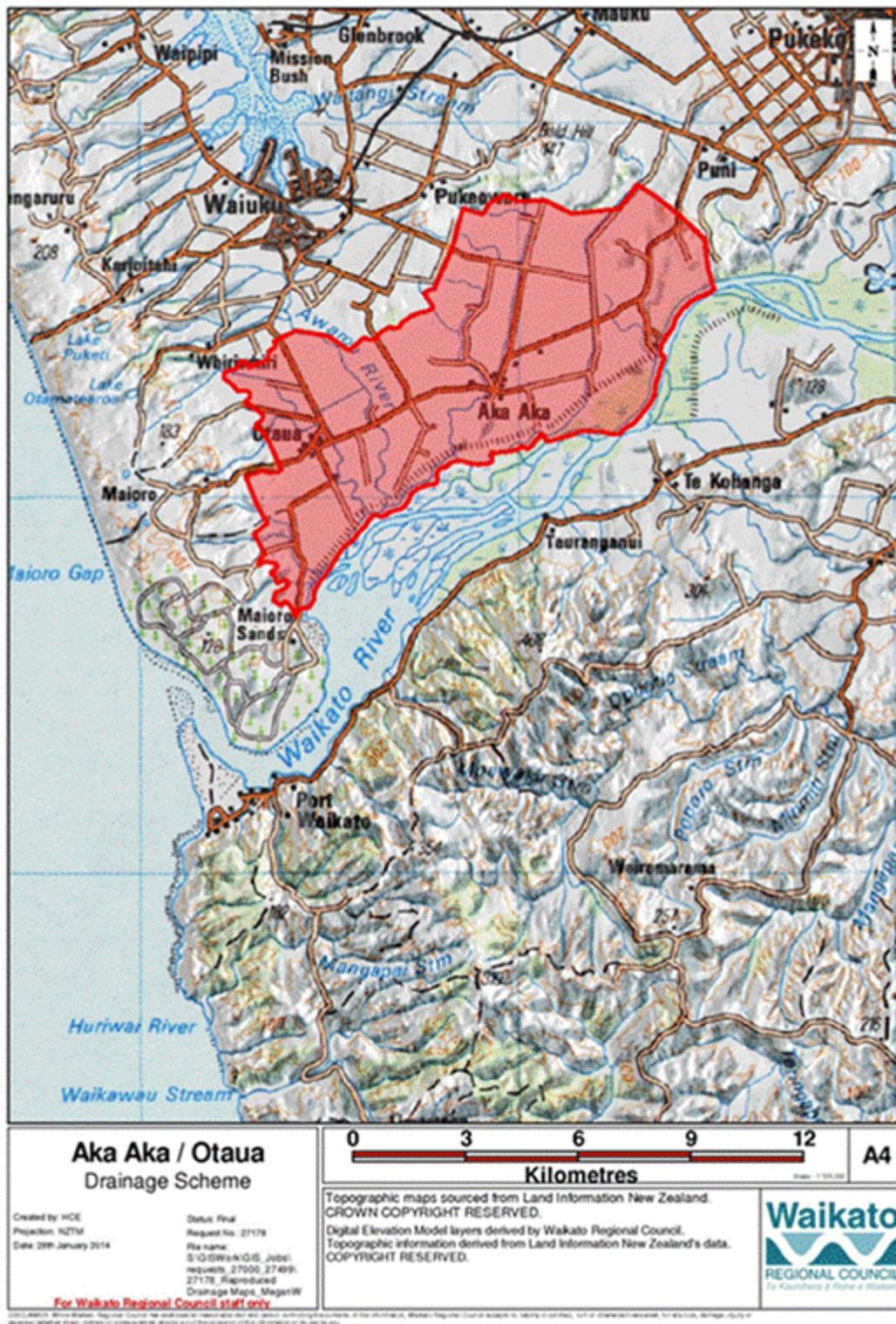


Figure 2 Location of Aka Aka/Otatau drainage area

2.5.2 Franklin Waikato drainage area

The Franklin Waikato drainage advisory subcommittee area includes all of the drainage areas within the Lower Waikato floodplain from Taupiri through to Port Waikato, excluding the Aka Aka Otatau area, refer to Figure 3 below. It also includes three drainage areas that have been constituted over the lower stream valleys that drain to the west coast between the Waikato River and Raglan (Whaingaroa) harbour. Many of the drainage areas are associated with and rely on the flood protection works provided within the Lower Waikato Scheme, some are free draining to lakes, streams or the west

coast. The Kaawa area that drains directly to the west coast has its own flood protection works associated with the Kaawa Stream.

All of these drainage areas were transferred to Waikato Regional Council from Waikato District Council and the former Franklin District Council in three stages from 2010 to 2012.

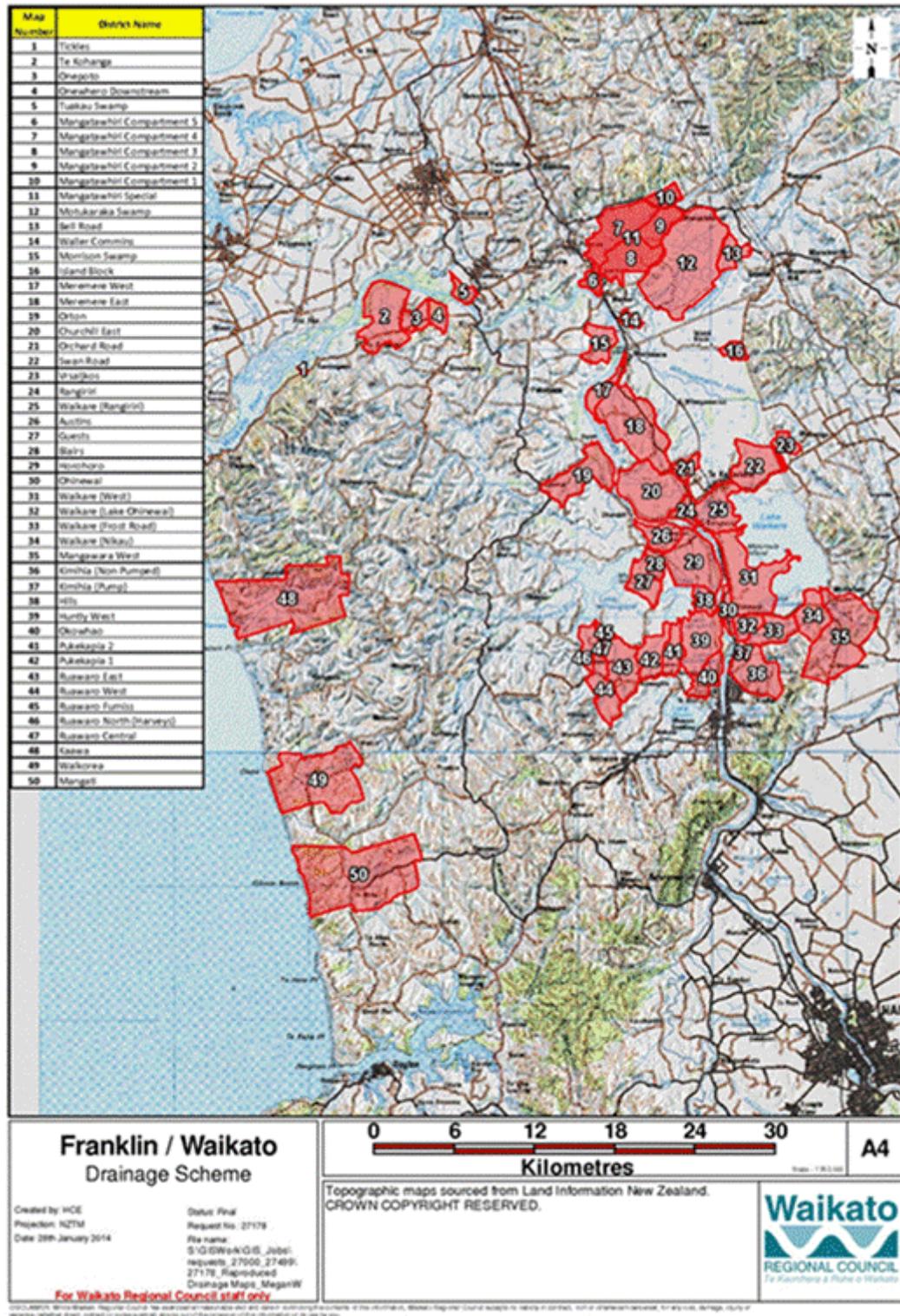


Figure 3 Location of Franklin Waikato drainage area

2.5.3 Waikato Central drainage areas

The Waikato Central drainage areas are predominantly located in an area known as the Hamilton basin, located around Hamilton that extends from Tahuna to Morrinsville,

Cambridge, Te Awamutu, Ngaruawahia and Taupiri. The Taupiri, Eureka and Te Rapa drainage areas are divided into a number of subdivisions, these subdivision boundaries are generally based on sub-catchment boundaries.

These drainage areas drain into the Waikato River or the Waipa River. The exception being the Waitakaruru subdivision of the Eureka area that drains into the Waitakaruru Stream which is a tributary of the Piako River.

Figure 4 below shows the drainage areas in Waikato Central.

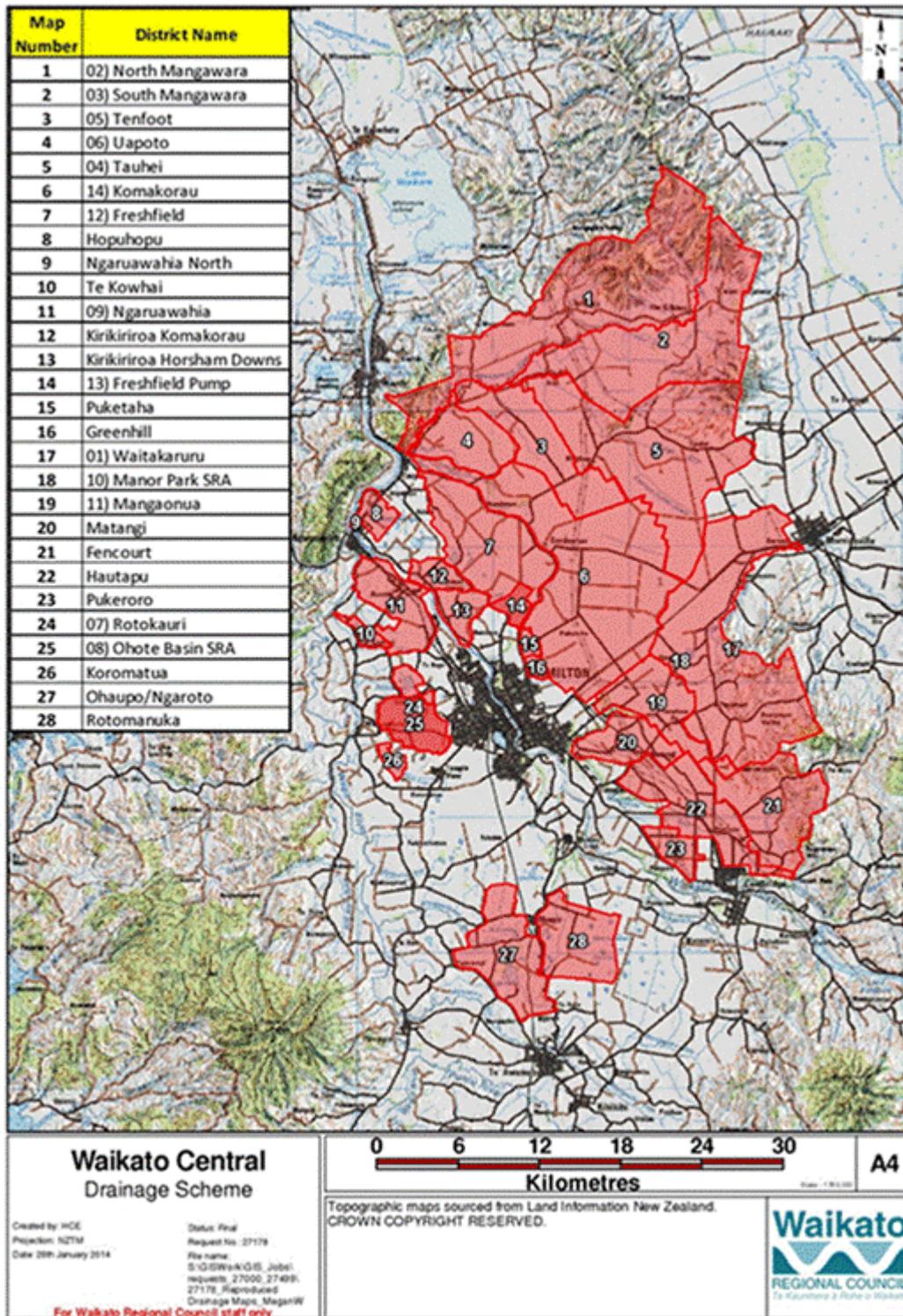


Figure 4 Location of Waikato Central drainage areas

2.5.4 Thames Valley drainage area

The Thames Valley drainage area covers an area from Tahuna and Tirohia in the north to Matamata in the south. The drainage area ultimately sheds water into three rivers; the Piako River, the Waitoa River (the major tributary of the Piako River), and the Waihou River. Refer to Figure 5 for the location of the Thames Valley drainage area.

The Thames Valley drainage areas are divided into a number of subdivisions. The subdivision boundaries are largely based on subcatchments but in the Thames Valley drainage area some of the subdivisions are based on 'communities of interest', rather than catchment boundaries.

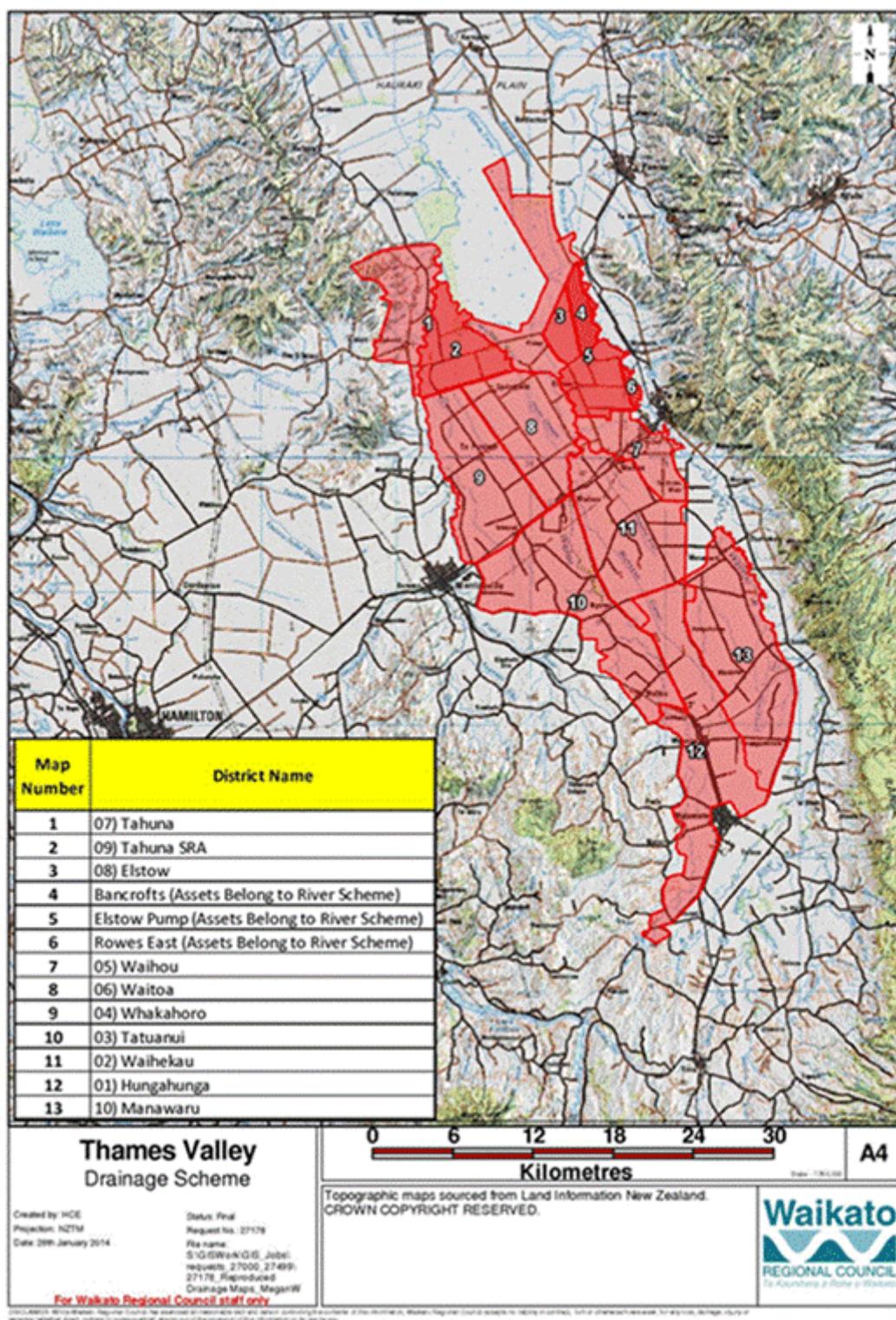


Figure 5 Location of Thames Valley drainage area

2.6 Operational requirements

The established drainage network is required to operate so that the drainage objectives can be achieved. The operational requirements are:

- Provision and maintenance of an effective land drainage network that allows landowners the ability to manage the water table on their properties.
- Provision of the land drainage service to an agreed level of service.
- Provision of a fair and equitable land drainage service to all ratepayers.
- Reduction of surface flooding resulting from rainfall events.
- Where gravity drainage allows, the clearance of water from the land to avoid damage to pasture.

Waikato Regional Council maintains the condition and capacity of existing drains within land drainage areas by using cleaning methods and best practice techniques as set out in council's 'Best Practise Environmental Guidelines – Land Drainage (TR2006/06R)'. Drains are maintained only if required and on average this involves spraying once or twice a year and mechanical clearance once every ten years on average (with the exception of peat drains which are cleaned more frequently). Mechanical clearing is undertaken in stages so that on average, approximately 10% of drain network is cleaned in any one year, reducing the chance for erosion and reducing the time it takes for the ecosystem within a drain network to recover. Fencing of drains is also encouraged as this prevents stock from pushing in the drain banks and adding sediment, nutrients and faecal material directly to the drain. Over time, this also results in a significant reduction in the need for mechanical clearance.

2.7 Design standards

2.7.1 Background

The design standards for the drainage systems have been developed over a number of years by a mixture of hydrological design and experience. The standards have been adopted as those that have been observed to meet the drainage objectives and operation requirements when applied. In some circumstances the nature of a subcatchment (catchment shape, porous sub-soils) is such that the objectives can be met with a different standard and in those circumstances, a different standard may be applied.

The adopted design standards for the different types of assets in the individual drainage areas are set out in the following sections. The standards are generally used for design purposes but where the objectives can be met by a different standard, the different standard may be applied after specific investigation.

2.7.2 Drain, culvert and floodgate capacity

The drainage system is designed to provide a consistent standard of drainage throughout the individual drainage areas. The drainage standard relates to removal of surface water only. The adopted standard has been observed to remove ponding from a storm with a 10% probability of occurring in any one year (the 10% Annual Exceedance Probability (AEP) event or '10 year storm') within three days. The intention of this standard is to prevent significant pasture damage.

Because of the different catchment and drainage characteristics of each drainage area, the **runoff** design standard for each drainage areas varies. The following **runoff** standards have been adopted for each drainage area (runoff to be cleared within 24 hours):

- Thames Valley: 38mm
- Franklin Waikato: 25mm
- Waikato Central:
 - Fencourt, Hautapu, Rotomanuka, Ohaupo/Ngaroto: 25mm
 - All others: 38 mm
- Aka Aka/Okaua 10mm

It is important that maintenance of the drainage system results in the same standard right throughout each respective system; as the intention is that ponding is shared equally throughout the system when runoff rates exceed the system capacity. A variation in standard would result in ponding clearing from land with the higher standard and accumulating on land with the lower standard.

2.7.3 Drain, culvert invert levels

The invert levels of the drains and associated culverts are dictated by the level that is required to manage local groundwater levels. Care needs to be taken not to over dig, and hence over drain the water table. If the invert levels are too high then the productivity of the adjacent land is compromised. In general the invert levels of the drainage systems have evolved over time, based on local knowledge and experience.

Waikato Regional Council's Best Practise Guidelines for Waterway Crossings (Speirs D, April 2006) specifies that the invert of culverts should be at a level that is below the existing waterway level, and that the distance between the invert of the culvert and the waterway bed level should be around 20% of the culvert diameter.

The presence of peat soils in the Waikato requires careful management with land drainage; the Waikato region containing about half of New Zealand's peatland. The indicative location of peat in the Waikato Central region is shown on Figure 7. The key to managing drainage in peat areas is managing the water table, hence setting the right invert level for the drains. The key steps to managing peat are to avoid deep drainage, maintain the water table in summer (this can be achieved by putting weirs or stop gates in drains), fence drains, spray weeds (helps maintain drain condition), and ensuring drains aren't deepened during maintenance.

2.7.4 Pumpstation capacity

Where insufficient gravity drainage can be achieved in a catchment due to the height of the stream or river that the drain discharges into, additional service through pumping may be provided. The pumping capacity that is provided is designed to augment the gravity drainage to such an extent as to clear the surface flooding from a 10% AEP event within three days.

There are some circumstances where a higher design standard is required, for example pumpstations located in more urbanised areas. The Manor Park pumpstation which is located in close proximity to a residential subdivision was designed to provide a semi-urban level of service due to its proximity to residential dwellings.

In the Thames Valley area, for example, a pumping capacity is generally provided to clear 19mm of rainfall over the catchment area within 24 hours. The reason that this standard is less than that of the drain and floodgate capacities is that it is assumed that a certain proportion of the runoff will pass through the floodgates before river levels rise sufficiently to close the floodgate.

Individual investigation is normally required for any proposed pumpstation, as specific standards have not been adopted in all drainage areas.

2.7.5 Key operation issues

The key operational issues for the various drainage system assets are as follows:

1. Drain channel capacity and stability
 - weed control
 - debris and sediment control
 - erosion control
2. Culvert hydraulic capacity
 - debris removal
3. Stopbank design height and security
4. Floodgate security
5. Pumpstation serviceability
6. Accessibility to assets for maintenance

2.8 Access

Rule 4.2.18.1 of the Waikato Regional Plan ensures that access to drains (that are part of a Waikato Regional Council or TA drainage areas) for maintenance purposes is not compromised; and that the effectiveness of the drainage area is not compromised by farm activities such as fencing and planting.

Rule 4.2.18.1 requires landowners who are within a Waikato Regional Council or TA drainage area to contact the regional council if they wish to do any of the following within 10 metres of a Council managed drain (except in the Hauraki District Council area and Aka Aka/Otaua area where a 15 metre distance shall apply,):

- Plant trees, shrubs and/or construct any structure
- Place fences perpendicular to a Council managed drain without a gate
- Place fences greater than 1,200mm high parallel to Council managed drains
- Place fences parallel to Council managed drains that prevents access for maintenance
- Place an artificial watercourse without a culvert perpendicular to a Council managed drain.

Many TAs have land drainage bylaws that control land drainage activities undertaken in drainage areas that are under their jurisdiction. Rules within land drainage bylaws are in addition to those in the Waikato Regional Plan.

2.9 Funding

Drainage management is currently funded by targeted drainage rates. Each drainage area or subdivision has its own rating system and the rates collected within each system provide the income for that area only. There can be small amounts of income from other sources such as interest on reserves and outwork, but in most areas these are not significant.

The existing rating systems have been established under current and historic legislation. The current legislation is the Local Government Rating Act 2001, and that details what must be taken into account when establishing a rating system. The historic rating systems and the newly established systems are similar and provide some continuity and consistency for the ratepayers who largely have accepted the present systems as fair.

Policy states that rating systems for funding land drainage work shall be applied on land area and shall be on a “differential” basis; unless Waikato Regional Council is satisfied that all areas receive equal benefit. The only rating systems that are not differential are the Aka Aka/Otaua and the Matangi systems as it was deemed that all land received equal benefit.

The existing rating systems provide differential benefit based rates, with seven rural groups of types of land (classes) labelled from A Group (highest rate) to G Group (unrated). The rating ratio of each of the classes varies slightly between rating systems, and can be found by referring to the individual rating system reports.

There is currently an Urban (U) category under the Land Drainage Rating Classification. Where a holding is an allotment with an area of less than 5 hectares then part or all of the holding is placed in a category of higher rating than is shown on the plans according to the following criteria:

Industrial or Commercial Use

0.2 hectares has been placed in the Urban Category for each average dwelling equivalent value of commercial or industrial development.

Residential Use

In an area where the underlying category is A, B, or C, 0.2 hectares is placed in the Urban Category for each dwelling on the holding.

In an area where the underlying category is D or E, 0.2 hectares is placed in the A class for each dwelling on the holding.

The Urban classification in rural residential properties recognises the additional runoff and work required to maintain drainage related to smaller lifestyle/residential type properties, and the high number of enquiries that come from these properties.

The rating systems require regular review to ensure the systems remain fair and adequate for their purpose.

2.10 Review of land drainage areas

Every so often, Waikato Regional Council reviews the effectiveness of the region's drainage network and makes adjustments as necessary. As a result of this process, existing private drains may be added to the council maintained network. For example, there may be a subdivision where newly created lots require drainage and the council drainage network needs extending to provide that service. Alternatively, the council maintained network may be reduced by the removal of drains or portions of drains. Such instances could include the amalgamation of properties where a current council maintained drain would end within a property and it would be appropriate to shorten the drain to the new property boundary.

When a subdivision of an existing block requires the existing network to be extended to service a new lot, the cost of the upgrade or formation of new drain falls on the subdivider/developer. Once completed to council standards, Council will include the new drain/s into the network and will assume future maintenance responsibilities for them.

3 Land use change

3.1 Background

Across the region there are areas where land use change is occurring. Of particular relevance to this report is the expansion of existing urban areas into rural land on the fringes of towns/cities where drainage areas exist, for example urban growth around Hamilton. Also of relevance is where the land use is changing from rural (farms) to a more intensive land use (rural residential) within council administered land drainage areas.

Future Proof is a growth strategy specific to the Hamilton, Waipa and Waikato sub-region and has been developed jointly by Hamilton City Council, Waikato Regional Council and Waipa and Waikato District Councils, as well as Tangata Whenua, New Zealand Transport Agency and Matamata-Piako District Council. The Future Proof growth strategy aims to manage growth in a collaborative way for the benefit of the Future Proof sub-region both from a community and a physical perspective. The growth strategy provides a framework for ongoing co-operation and implementation. This will ensure the costs and resources required to fund and manage infrastructure such as transport, wastewater, stormwater, recreation and cultural facilities are provided for.

Figure 6 illustrates the proposed Future Proof Settlement Plan for the Future Proof study area. This map shows where expected future growth in the Waikato region may interact with Waikato Regional Council administered drainage areas, including growth around Cambridge, Hamilton, Huntly and Pokeno.

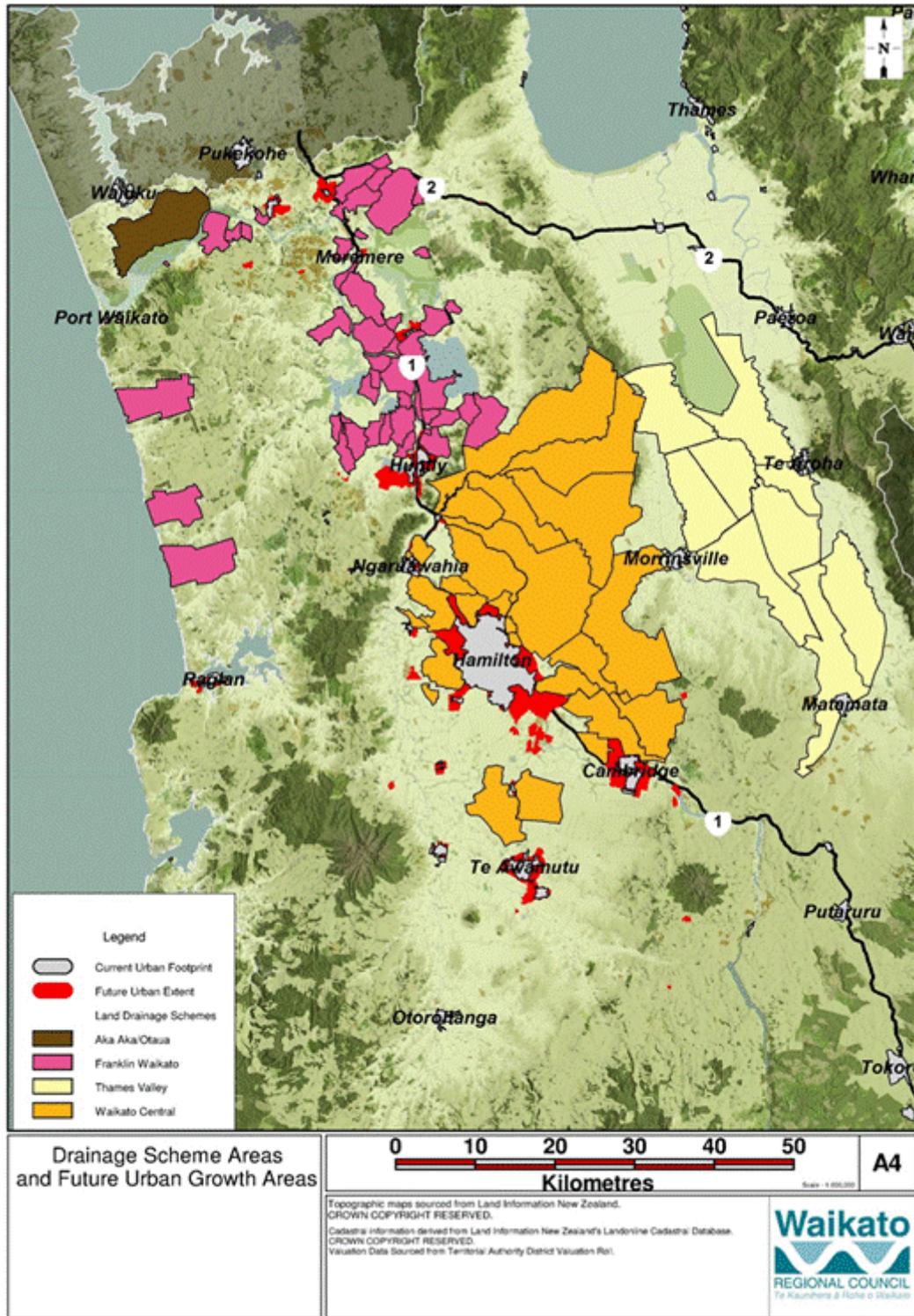


Figure 6 Future Proof Settlement Plan

The following sections focus on growth in the vicinity of Hamilton as this is where the majority of the urban growth planning is being undertaken at present.

3.2 Hamilton urban growth

Hamilton City Council is bounded by numerous drainage areas initially set up by Waikato District Council (or their predecessor) for the purpose of managing rural/agricultural drainage. Due to a lack of gradient in the existing networks, many of these areas provide marginal drainage at best. Waikato Regional Council now manages most of these drainage areas.

Figure 7 illustrates Hamilton City Council’s proposed urban growth areas for Hamilton with Waikato Regional Council’s administered drainage areas for Waikato Central also shown on this map (further detail is provide about the proposed Hamilton urban growth areas on the map in Appendix 1). Figure 8 shows the same as for Figure 7 however it zooms in on the Hamilton environs.

Figure 7 also demonstrates that a number of the urban growth areas are extending to either the boundary of, or into an existing drainage area. The following table summarises which drainage areas the various urban growth areas will potentially interact with depending on what is proposed for the urban growth areas.

Table 2 Hamilton urban growth interaction with drainage areas

Urban growth area	WRC administered drainage area
Rotokauri	Ngaruawahia Rotokauri
Te Rapa North	Ngarauwahia
Rototuna Stages 3 & 4	Kirikiroa Horsham Downs Freshfield pump
Horotiu	Kirikiroa Horsham Downs Kirikiroa Komakorau Ngaruawahia
Ruakura	Puketaha Greenhill Komakorau Mangaonua

The level of interaction and potential effects on the above listed drainage areas depends on how stormwater is proposed to be managed within the urban growth areas.

Figure 7 also illustrates the extensive footprint of some of the drainage areas in the vicinity of Hamilton, in particular the Komakorau drainage area which ultimately drains to the Mangawara River at Taupiri.

3.3 Rural residential land use change

Across the region there are areas that are seeing a trend in moving from traditional rural farms to rural residential lifestyle blocks. This is generally occurring in areas within proximity of an urban centre such as Hamilton, Cambridge or Matamata for example.

With a change in land use from rural to urban/rural residential there are altered hydrological regimes and associated potential effects that need to be managed. There are also changes in expectation about how drainage systems should perform that need to be managed.

Where this change in land use occurs within an existing land drainage area it results in more land owners with smaller land holdings utilising the established drainage system. Rural residential land owners can have different expectations of the use of their land compared to rural farmers. For example ponding occurring on land for three days may be acceptable to a farmer with a large farm, but not so acceptable to a rural land owner with a small lifestyle block.

3.4 Issues

Urban areas have a significantly different land use profile when compared with rural areas. The concentration of impervious areas, up to 100% imperviousness in some areas of Hamilton, results in a significant increase in stormwater runoff when compared to rural areas where some of the stormwater is able to infiltrate to ground. Hard stand areas and reticulated systems increase the speed of conveyance of stormwater runoff to the outlet point for the system. Overall urban areas result in stormwater runoff with higher peak flows and velocities, and larger volumes of runoff than rural areas, the effects of which need to be managed if draining into a rural area.

The different activities within urban areas including vehicle movements, urban and industrial land uses results in a different contaminant load profile. Rural areas contribute greater loadings of nutrients, whereas urban areas contribute litter, suspended solids, heavy metals and poly-aromatic hydrocarbons. Potential water quality effects of both rural and urban land uses should be addressed appropriately.

The existing drains within the land drainage area were not established or designed to cater for urban stormwater runoff. The drainage systems have evolved over time in response to the requirements of local rural land owners who want to manage the water table and farm their land. The design criteria that has been developed is suitable for the rural land use within the drainage area and has been developed with service delivery, low cost and equity across the drainage area in mind.

Proposed future urban growth of the city means that the extent of the urbanised area is encroaching closer to these drainage areas. The drainage systems in the drainage areas are designed for rural runoff and not for urban runoff hence the interaction between urban drainage and the land drainage areas needs to be carefully managed.

If urban areas were to commence draining to a land drainage area there is the potential for the following effects:

1. Capacity issues.
2. Increased ponding duration on adjacent land.
3. Erosion and scour effects.
4. Increased inspection and maintenance requirements.
5. Raising the water levels in drains creating a raising of the localised water table during wet periods.

General best practise for urban stormwater management to address the points above, generally involves attenuating the stormwater at-source via infiltration; and where this isn't possible due to ground conditions, stormwater would be detained in detention devices with flows released at a throttled rate so as not to cause downstream effects. Guideline documents such as Auckland Council's Technical Publication 10 "Stormwater management Device: Design Guidelines Manual" and Technical Publication 124 "Low Impact Design Manual for the Auckland Region" provide guidance on best management practise for stormwater management. Whilst this approach would be suitable for natural watercourses with adequate natural gradient, this approach is not ideal for rural drainage systems, as these networks are generally at or near capacity; hence any additional flows can become challenging for ongoing operation and performance of the drainage systems. With most of these systems being rural based it is essential that potential inputs of stormwater from urban catchments don't create a significant impact, both physically and financially on the landowners and ratepayers.

The change in land use to rural residential lifestyle blocks is likely to result in a slight increase in hard stand area, associated with more buildings and associated paving/drive etc. However depending on the scale of land use change, this is unlikely to have a measureable effect on the drainage systems. The biggest issue associated with change to rural residential land use is the likely change in expectation on how the drainage systems should perform and how it should be maintained. Those with a small lifestyle block are unlikely to be pleased if a portion of the property is flooded for three days, however depending on the proximity of their property to the drainage network this could be a reality. Ease of maintaining continued access to undertake regular inspections and maintenance could also be an issue with land being divided up into smaller sections with more land owners to deal with and their displeasure at having spray vehicles and diggers accessing through their properties and depositing drain cleanings on their land.

For urban growth areas in proximity of Hamilton City some are located in close proximity to drainage areas and have significant constraints in terms of identifying appropriate outfalls for stormwater. The very site conditions that have led to the drainage areas being developed in the first place, that is very flat land with minimal natural drainage, is in itself a significant constraint to land intensification.

The easiest approach to manage potential effects would be to keep land drainage areas separate from urban areas, with no urban areas being able to drain to drainage areas. However there are urban growth areas with limited options for stormwater management hence an approach needs to be developed to enable this development to occur in a manner that does not unfairly burden downstream rural landowners. The challenges are identified by both Waikato Regional Council and Hamilton City Council and currently Hamilton City Council is refining the ICMP template to ensure this broader context is built into the ICMPs.

The following section outlines the required assessment for urban growth areas that interact with drainage areas and the types of issues that need to be addressed for any proposal to progress. It is hoped that this report will enable the effects of urban stormwater on land drainage areas to be managed in a coordinated and consistent manner within existing planning frameworks.

3.5 Natural systems

The effects of land use intensification in catchments draining to natural receiving environments (streams, rivers, lakes, wetlands, coastal areas) have been well documented both in New Zealand and internationally.

There are many useful guidance documents on how to manage the effects of urban stormwater runoff that can be referred to when designing stormwater management systems that are draining to natural receiving environments, including the following:

- Auckland Council's Technical Publication 10 (TP10) Stormwater Management Devices: Design Guidelines Manual.
- Auckland Council's TP124 Low Impact Design Manual for the Auckland Region.

The focus of this report is Waikato Regional Council's administered land drainage areas.

4 Information requirements

4.1 Introduction

As discussed in Section 3.4, there are some significant issues associated with land use change adjacent to, or within, a Council managed land drainage area. It is important that an appropriate assessment is undertaken to quantify the predicted extent and magnitude of potential effects of the proposed activity.

The following section discusses the information requirements depending on the scale of the proposed development and the required scope of an assessment of effects if required. Discussion is also provided about potential rating implications depending on the outcome of the assessment of effects. A process flowchart is provided in this section that maps out a recommended process to follow when progressing a development proposal that potentially interacts with a Waikato Regional Council administered land drainage area.

4.2 Scale of proposed development

The level of potential effects on a land drainage area depends on the scale of the proposed development, hence the level of assessment that is required can vary.

The following categories and associated information requirements have been developed to help provide clarity about what information is required for different levels of development. Note that the categories outlined below do not relate to any planning documents and have been developed for the purposes of this report only to help inform the assessment process.

If you are proposing to undertake a subdivision/boundary adjustment that interacts with a Waikato Regional Council administered land drainage area, you will need to consider the following.

Table 3 Information requirements

Category	Activity	Information requirements	Comment
1	1 additional lot (typical rural residential)	WRC provides drainage comments to the relevant TA to inform their process	Generally negligible to minor perceived effects
2	2 – 10 additional lots	As above. Also requires a drainage plan and additional information in accordance with Section 4.2.1 below.	Potential effects range from generally minor to potentially significant
3	> 10 additional lots and/or Triggers non-compliance with Rule 3.5.11.4 Permitted Activity Rule – Discharge of Stormwater to Water ¹	As above but also requires an Assessment of Effects in accordance with Section 4.2.2 below.	Potential effects generally range from more than minor to potentially significant

NOTE:

- 1 Refer to the Waikato Regional Plan and to Waikato Regional Council's Resource Use Group for queries relating to the rules.

4.2.1 Information requirements for small scale subdivision (Category 2)

This process outlines the key details required to be submitted to Waikato Regional Council when seeking drainage comments to undertake small scale subdivision (Category 2) that drains to, or is located within, a Waikato Regional Council managed drainage area. This is repeated in Appendix 2 for ease of reference.

The minimum details required are:

1. Name and address of the Surveyor.
2. Name and address of the Landowner/Developer.
3. Email addresses and phone numbers of the above.
4. Address and legal description of the land being subdivided.
5. Rates/Roll assessment number if available.
6. Name of the Waikato Regional Council drainage area that the subdivision lies in.
7. Layout plan of the proposal showing:
 - a) Titles of the new lots.
 - b) Nearest Waikato Regional Council managed drain.
 - c) Proposed drainage route linking the subdivision to the Council drain.
 - d) Ground levels in proposed new titles including the lowest ground levels.
 - e) Existing drain invert levels. This needs to extend at least 200m downstream of the proposed connection point to the Council drain.
 - f) A long section of the proposed drain inverts.
 - g) The proposed size of the new or upgraded drain linking to the Council drain.
 - h) The proposed size of any culverts in the proposed new or upgraded link drain.
 - i) The size of the nearest existing culvert in the Council drain, downstream of the proposed connection point.

Note:

If there is / or will be a Waikato Regional Council drain within the lot, and the lot is under 5 hectare, then Waikato Regional Council require an easement in favour of Waikato Regional Council.

Within the area of subdivision:

- Access gates between lots, are required along Waikato Regional Council drains
- All hedging and trees are to be removed along Waikato Regional Council drains

4.2.2 Information requirements for larger scale development (Category 3)

For larger scale developments, those creating more than 10 additional lots, or those that trigger non-compliance with the Rule 3.5.11.4 Permitted Activity Rule – Discharge of Stormwater to Water, an assessment of effects is required to determine the potential effects of the activity and any proposed mitigation measures.

When preparing an assessment of effects for a proposed new discharge to a land drainage area, it is essential that the effects of the predicted increase in stormwater runoff are assessed on the drainage system to the point where it can be demonstrated that the predicted increase has no effect. This will generally be to the point where the drainage system exits into a natural system. Note that some drainage areas are extensive, such as the Komakorau, for this drainage area the assessment may need to extend to where the drainage system drains to the Mangawara River at Taupiri.

Currently developers are required to prepare stormwater management plans or catchment management plans for proposed developments as part of their resource consent/catchment planning requirements, however the scope of these assessments generally end at the city boundary or close to the point of discharge from the site. It is essential that if the proposed development is interacting with a land drainage area, that the assessment extends to the appropriate termination point. ICMP's now required by Hamilton City Council should take care of this issue if they are prepared well.

The assessment would need to:

- Demonstrate that the drainage system could still meet the relevant design standard taking into account the increase in stormwater peak flows, velocities and volumes, including the tributaries of the drainage system.
- Consider potential effects of the proposal on groundwater levels, especially where the normal groundwater levels are naturally high.
- Consider ongoing operation and maintenance requirements.
- Include survey (topography and fall in drainage networks, especially in upper reaches) AND hydraulic modelling to inform the assessment.

If the assessment demonstrated that there was a predicted effect on the drainage system from the proposal, and there were no alternative discharge points available or options to mitigate the effects, the drainage system could be upgraded to accommodate the increase in flows and to ensure the drainage standard could be maintained. The system would need to be upgraded to the point where it was demonstrated that there was no effect. The upgrade option would need to consider potential effects on groundwater and would need to demonstrate that the groundwater level regime was not negatively impacted. Greater capacity can be provided by widening channels but not deepening them in these circumstances, as long as there is adequate fall in the system.

Where the receiving catchment contains peat land the assessment should also include consideration of how the system will change over time with peat settlement and what future proposals would need to be implemented to manage the increased stormwater input as peat settlement occurs.

4.3 Funding

As discussed in Section 2.9, management of the drainage areas is currently funded by targeted drainage rates. There is no regional contribution to land drainage, with each respective area being self funding through the rating structure. Each drainage area or subdivision has its own rating system and the rates collected within each system provide the income for the maintenance of that area only.

This funding system is based on rural properties being rated to maintain rural drainage systems for rural land use. The land drainage network is established to an agreed standard that is fair to all ratepayers, and where gravity drainage allows, clears water from the land to avoid damage to pasture.

There is a mechanism to classify urban land as an 'Urban' category and to rate at a higher level for this land, as is currently applied to properties in several areas in the region including Eureka, Taupiri and Te Rapa drainage areas. The higher rating is uniform for the classification, hence does not necessarily reflect the true cost of the urban stormwater runoff input to the drainage network.

If a portion of an existing land drainage area becomes urban, then there will be a greater quantity of hard stand area, and hence higher volumes and peak flows and velocities of runoff will be generated within the catchment. This input into an existing rural drainage system could have the following potential effects:

1. Capacity issues.
2. Increased ponding duration on adjacent land.
3. Erosion and scour effects.
4. Increased inspection and maintenance requirements.
5. Raising the water levels in drains creating a raising of the localised water table during wet periods.

These potential effects could lead to an altered management and maintenance approach being required which is likely to be more costly. If the present funding system was unchanged, then the downstream rural land owners would be paying for the increased maintenance costs as a result of the upstream urban land use.

If a new urban area was to drain to a drainage area, to be equitable the funding system would need to change to ensure all those in the contributing catchment were being rated to cover the costs of managing the drainage area at an appropriate rate. An appropriate rate would need to be developed for the urban portion of the catchment taking into account the effects of this land use area and the number of contributing properties. Based on the assessment discussed in Section 4.2 above, a contribution factor could be developed for the urban catchment that reflects its contribution in terms of drainage area capacity and ongoing operation and maintenance costs. This contribution would be assessed by the regional council's rating team and the appropriate rate would be added to the relevant properties.

Where land use changes within a drainage area, from rural to rural/residential the same level of service is currently provided as for the rural land but more work is required to liaise with the landowners to obtain permission to undertake the work programmes. Many of the existing rating systems include an "urban" element to reflect the additional work required to organise and provide the service to the rural/residential properties. Where this land use results in higher expectations and a different level of service to be provided, a Special Rating Area (SRA) within a drainage area, and targeting the particular area of benefit, could be set up to enable a better separation and application of costs and classifications. Examples where this has occurred successfully include Manor Park, Waitakaruru and Matamata Urban.

Where the boundary of an existing drainage area is altered, for example by a portion of it becoming urban and draining to a different outlet, or with a catchment boundary being altered by the construction of a major arterial route, once again the rating assessment would need to be reviewed to ensure the funding mechanism was equitable.

4.4 Land ownership

While Council has responsibility for a drainage network, most (if not all) of the drains are located on private land. Hence any modifications to the existing drainage systems

to facilitate extra or increased flows would have to be arranged or funded by the developer. Consideration for gaining access and undertaking of works on any drains on private land would have to been taken into consideration by the developer.

4.5 Process

The following flowchart maps out a recommended process for land development proposals in proximity of Waikato Regional Council administered land drainage areas.

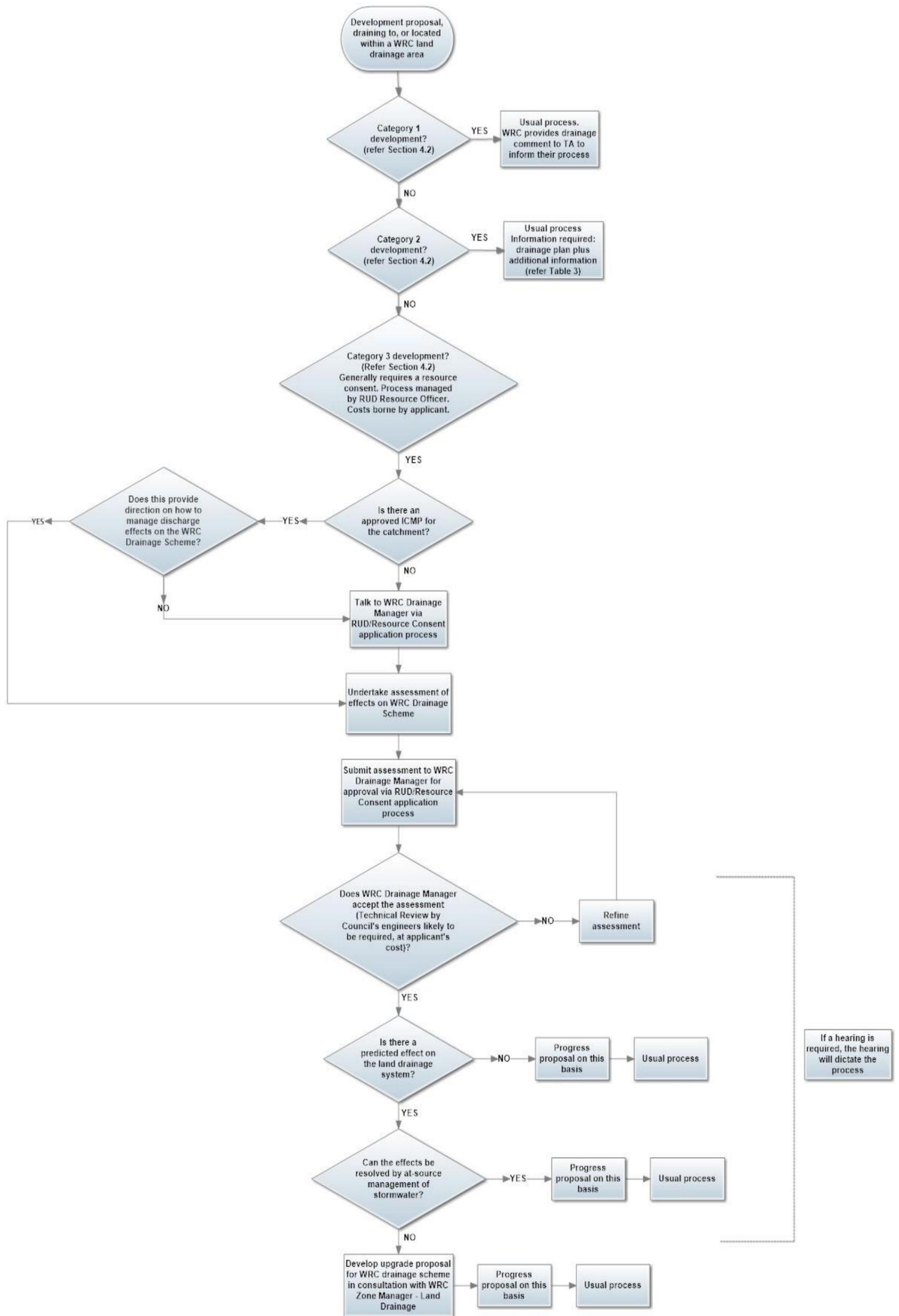


Figure 9 Process for land development proposals in proximity of WRC drainage areas

5 Conclusions

Waikato Regional Council is responsible for administering specific land drainage areas (flat rural areas with limited drainage) in the Waikato region. At the time of report preparation Council was responsible for managing and maintaining drainage networks within 92 separate areas in the region. All other areas that are not managed by Waikato Regional Council are administered by the relevant TA.

Across the region there are areas where land use change is occurring. Of particular relevance to this report is the expansion of existing urban areas into rural land on the fringes of towns/cities where drainage areas exist, for example urban growth around Hamilton. Also of relevance is where the land use is changing from rural (large farms) to a more intensive land use (rural residential) within council administered land drainage areas.

The existing drains within the land drainage areas were not established or designed to cater for urban stormwater runoff. The drainage systems have evolved over time in response to the requirements of local rural land owners. The design criteria that has been developed is suitable for the rural land use within the drainage area and has been developed with service delivery, low cost and equity across the drainage area in mind. If an urban area was to commence draining to a land drainage area there are a range of potential effects that may manifest including capacity issues, erosion and scour effects and operation and maintenance issues.

General best practise for urban stormwater management as outlined in documents such as Auckland Council's Technical Publication 10 (TP10) outlines the use of at-source management such as detention devices to manage potential effects of stormwater runoff. Whilst this approach would be suitable for natural watercourses, this approach is not ideal for drainage areas, as these networks are generally at or near capacity hence any additional flows can become challenging for the ongoing operation and performance of these drainage areas. With most of these systems being rural-based it is essential that potential inputs of urban stormwater don't create a significant impact, both physically and financially on the landowners and ratepayers.

The biggest issue associated with change to rural residential land use is the likely change in expectation on how the drainage systems should perform. Those with a small lifestyle block are unlikely to be pleased if a portion of the property is flooded for three days. Ease of maintaining continued access to undertake regular inspections and maintenance could also be an issue with land being divided up into smaller sections with more land owners to deal with.

There are urban growth areas with limited options for stormwater management hence an approach needs to be developed to enable this development to occur in a manner that does not unfairly burden downstream rural landowners. The challenges are identified by both Waikato Regional Council and Hamilton City Council and currently Hamilton City Council is refining the Integrated Catchment Management Plan (ICMP) template to ensure this broader context is built into the ICMPs.

The level of potential effects on a land drainage area depends on the scale of the proposed development, hence the level of assessment that is required can vary. Three categories have been developed for the purposes of this report, and information requirements have been developed for each category. Information requirements range from the regional council providing comment to the relevant TA to inform their process for small subdivisions/boundary adjustment (1 additional typical rural residential lot), to the developer being required to prepare an assessment of effects for more than 10 additional lot subdivisions (or those needing a resource consent for a stormwater diversion or discharge activity) to inform the regional council's review process.

If an assessment of effects is required is essential that the effects of the predicted increase in stormwater runoff are assessed on the drainage system to the point where it can be demonstrated that the predicted increase has no effect. The assessment would need to:

- Demonstrate that the drainage system could still meet the relevant design standard taking into account the increase in stormwater peak flows, velocities and volumes, including the tributaries of the drainage system.
- Consider potential effects of the proposal on groundwater levels, especially where the normal groundwater levels are naturally high.
- Consider ongoing operation and maintenance requirements.
- Include survey (topography and fall in drainage networks, especially in upper reaches) AND hydraulic modelling to inform the assessment.
- Consider peat settlement if relevant.

If the assessment demonstrated that there was a predicted effect on the drainage system from the proposal, and there were no alternative discharge points available or options to mitigate the effects, the drainage system could be upgraded to accommodate the increase in flows and to ensure the drainage standard could be maintained. The system would need to be upgraded to the point where it was demonstrated that there was no effect. The upgrade option would need to consider potential effects on groundwater and would need to demonstrate that the groundwater level regime was not negatively impacted. Greater capacity can be provided by widening channels but not deepening them in these circumstances, as long as there is adequate fall in the system. The cost of the upgrade of the system will need to be funded by the developer.

If a new urban area was to drain to a drainage area, to be equitable the funding system would need to be revised to ensure all those in the contributing catchment were being rated to cover the costs of managing the drainage area at an appropriate rate. Based on the assessment of effects discussed above, a contribution factor could be developed for the urban catchment that reflects its contribution in terms of the capacity of the drainage network and ongoing operation and maintenance costs. This contribution would be assessed by the regional council's rating team and the appropriate rate would be added to the relevant properties.

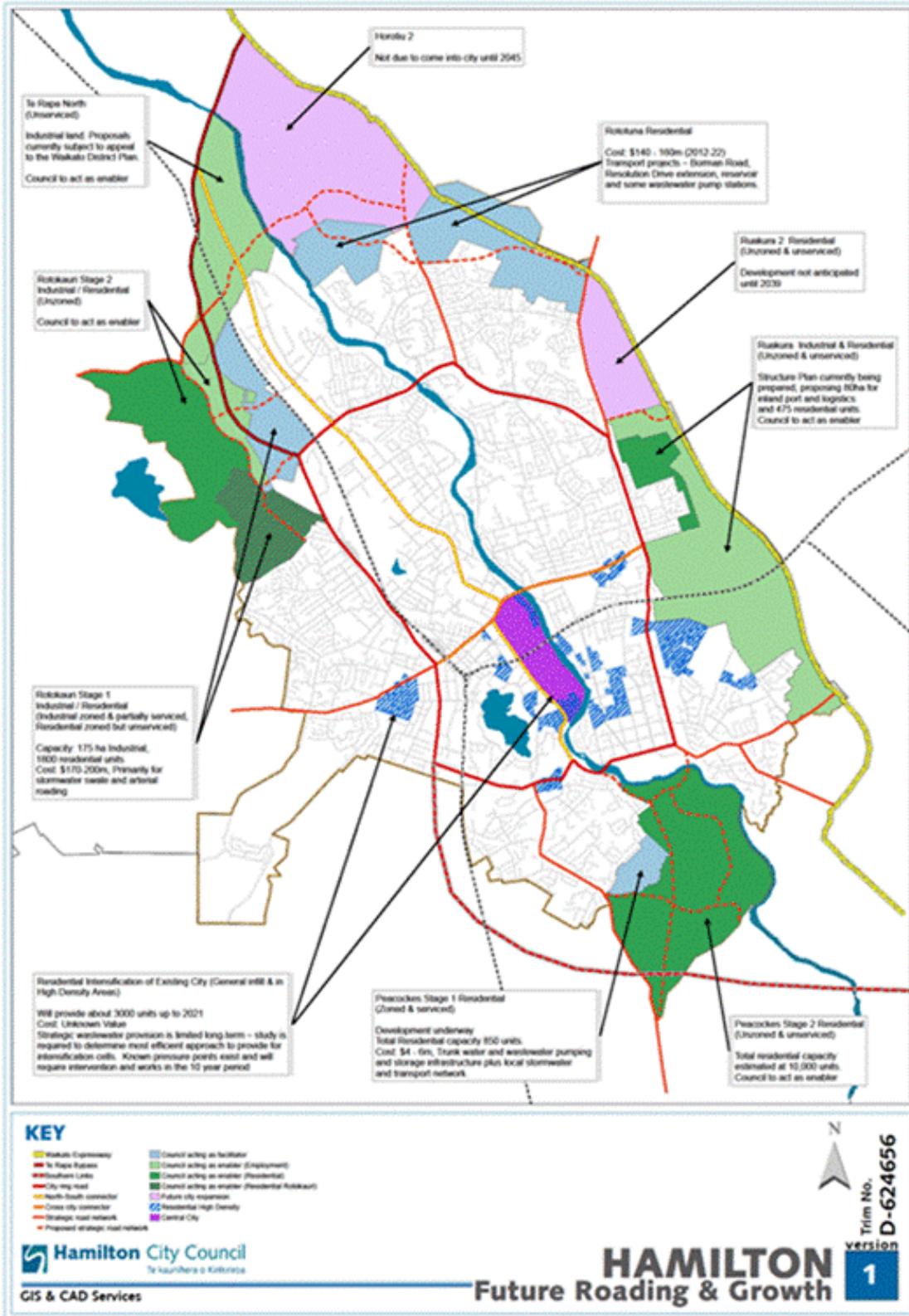
A process flowchart has been developed that maps out a recommended process to follow when progressing a development proposal that potentially interacts with a Waikato Regional Council administered land drainage area.

It is hoped that this report will enable the effects of urban stormwater on Waikato Regional Council administered land drainage areas to be managed in a coordinated and consistent manner.

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Appendix 1 Hamilton future growth



Appendix 2 Information requirements for small scale subdivision

This process outlines the key details required to be submitted to Waikato Regional Council when seeking drainage comments to undertake small scale subdivision (Category 2) that drains to, or is located within, a Waikato Regional Council managed drainage area. The minimum details required are:

1. Name and address of the Surveyor.
2. Name and address of the Landowner/Developer.
3. Email addresses and phone numbers of the above.
4. Address and legal description of the land being subdivided.
5. Rates/Roll assessment number if available.
6. Name of the Waikato Regional Council drainage area that the subdivision lies in.
7. Layout plan of the proposal showing:
 - a) Titles of the new lots.
 - b) Nearest Waikato Regional Council managed drain.
 - c) Proposed drainage route linking the subdivision to the Council drain.
 - d) Ground levels in proposed new titles including the lowest ground levels.
 - e) Existing drain invert levels. This needs to extend at least 200m downstream of the proposed connection point to the Council drain.
 - f) A long section of the proposed drain inverts.
 - g) The proposed size of the new or upgraded drain linking to the Council drain.
 - h) The proposed size of any culverts in the proposed new or upgraded link drain.
 - i) The size of the nearest existing culvert in the Council drain, downstream of the proposed connection point.

Note:

If there is / or will be a Waikato Regional Council drain within the lot, and the lot is under 5 hectare, then Waikato Regional Council require an easement in favour of Waikato Regional Council.

Within the area of subdivision:

- Access gates between lots, are required along Waikato Regional Council drains
- All hedging and trees are to be removed along Waikato Regional Council drains