Three waters Infrastructure Options to Support Growth

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Three waters Infrastructure Options to Support Growth

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Quality Assurance Statement

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Executive Summary

The purpose of this report is to demonstrate realistic and appropriate three waters infrastructure options available to Tararua District Council (TDC) to service 30 years of urban growth in Tararua's four main towns, Dannevirke, Woodville, Pahiatua and Eketāhuna.

The Tararua District has grown from a population of 17,500 in 2013 to 19,000 in 2023, an increase of 8.6%[1]. The population is expected to increase by another 8.9% over the next 10 years, with sustained growth through the next 30 years increasing 17%, an estimated 22,356 people by 2023[2]. This growth is primarily made up from internal migration, relocation of population from larger cities, including to take advantage of more affordable housing and flexible working arrangements.

To prepare for this growth, Tararua District Council (TDC) developed the 2023 Urban Growth Strategy (Urban Growth Strategy) which recommends rezoning land to cater for 30 years of expected growth.[3]

This report (Three waters Infrastructure Options to Support Growth) presents the strategic options for three waters infrastructure (water supply, wastewater and stormwater) to support population growth in areas identified in the Urban Growth Strategy. The report covers the four major towns of Dannevirke, Woodville, Pahiatua and Eketāhuna, and provides high-level cost estimates, benefits and risks for each option.

It builds on the previous work undertaken in the Three Waters Masterplans 2022, which assessed the current and future challenges and opportunities for three waters service delivery in the district.[4] This report also considers the national, regional and local context for planning for growth, including legislative and policy framework, resource consent requirements, and community preferences and expectations.

The following document follows a multi-phased approach that has involved desktop analysis, site visits, workshops, and stakeholder engagement. The options development process was guided by the following criteria: achievability, capacity and capability, affordability, and wider benefits. The options were evaluated against these criteria and a preferred option was recommended for each town and each water service.

The preferred options for each town are summarised below:

Dannevirke

Three waters	Intervention Summary
Water Supply	Install a new trunk main along Adelaide Road to service the western growth areas and establish policy and technical requirements for new water supply to the new industrial areas.
Wastewater	Install a new trunk main sewer and pump station to divert flows from the western catchment and growth areas to the existing wastewater treatment plant (WWTP).
Stormwater	Establish two pump stations to divert stormwater from the northern areas to watercourses and establish policy and technical requirements for stormwater collection and attenuation systems in new growth areas.

1 Figure NZ Trust, Estimated population of the Tararua District New Zealand, 2024.
2 S, Bray, Tararua District Council, Urban Growth Strategy Framework, 2024
3 S, Bray, Tararua District Council, Urban Growth Strategy Framework, 2024
4 WSP, Water Mater Plan Report, 2022; WSP, Wastewater Masterplan Report, 2022; Woods Stormwater Masterplan Report, 2022

Woodville

Three waters	Intervention Summary
Water Supply	Install new trunk main water supply infrastructure around northern perimeter roads to enable growth areas, and establish policy and technical requirements for new water supply to new industrial areas
Wastewater	Install new trunk main sewer and pump stations to receive flows from growth areas to the existing WWTP.
Stormwater	Establish attenuation schemes within the main residential growth areas to facilitate stormwater management north of State Highway 2 and reduce flood risk on downstream properties.

Pahiatua

Three waters	Intervention Summary
Water Supply	Install new trunk main water supply infrastructure along Huxley Street to enable eastern growth areas.
Wastewater	Install new trunk main sewer and pump station to divert flows from growth areas to the existing WWTP.
Stormwater	In a phased approach, initially prioritise growth areas for which there is little impact on or from these areas due to stormwater. In the long term, to fully unlock growth potential on the eastern side of Pahiatua, reduce or eliminate the contribution of stormwater from southern rural areas using a major flow diversion scheme.

Eketāhuna

Three waters	Intervention Summary
Water Supply	No significant upgrades required; demand-side management recommended.
Wastewater	No alternative options explored, existing system upgrades and I&I reduction strategy underway.
Stormwater	Limited improvements required, mainly to service the western growth area.

The breakdown of the costs by town and service is shown in the table below:[5]

[5] Dollars are 2024 figures.

Town	Water Supply	Wastewater	Stormwater	Total
Dannevirke	\$3.1M - \$5.5M	\$6.2M - \$10.4M	\$20.1M - \$45.3M	**\$29.4M - \$61.2M**
Woodville	\$5.4M - \$9.6M	\$2.5M - \$15.5M	\$3.2M - \$6.5M	**\$11.1M - \$31.6M**
Pahiatua	\$2.2M - \$4.4M	\$4.9M - \$7.9M	\$0.1M - \$0.2M (short term) \$21.7M - \$48.5M (long term)	**\$7.2M - \$12.5M (short term)** **\$28.8M - \$60.8M (long term)**
Eketāhuna	\$0.1M - \$0.2M	\$0	\$0.1M - \$0.2M	**\$0.2M - \$0.4M**
Total	**\$10.8M - \$19.7M**	**\$13.6M - \$33.8M**	**\$23.5M - \$52.2M (short term)** **\$45.1M - \$100.5M (long term)**	**\$47.9M - \$105.4M (short term)** **\$69.5M - \$154M (long term)**

1. Overview

1.1 Purpose

The purpose of this report is to demonstrate realistic and appropriate three waters infrastructure options available to Tararua District Council (TDC) to service 30 years of urban growth in Tararua's four main towns, Dannevirke, Woodville, Pahiatua and Eketāhuna. The options are presented as high-level strategic options for water supply, wastewater and stormwater infrastructure, with a preferred solution warranting further planning and investigation recommended for each town.

The information in this report is intended to support a Section 32A analysis as a part of a District Plan Change in accordance with the Resource Management Act (RMA). As the nature and speed of growth is not yet known, more detailed analysis will be needed in the future planning stages of the growth area development.

An earlier, draft version of this report was produced and presented to Council in May. Upon review, opportunities to find alternative, less expensive options in Woodville and Pahiatua have been explored. This includes options to stage or defer infrastructure development; options to develop alternative areas; and alternative infrastructure schemes. This version of the report incorporates these changes.

1.2 Background

Tararua is experiencing growth, the district has grown from a population of 17,500 in 2013 to 19,000 in 2023, an increase of 8.6%[6]. The population is expected to increase by another 8.9% over the next 10 years, with sustained growth through the next 30 years increasing 17%, an estimated 22,356 people by 2023[7]. This growth is primarily made up from internal migration, relocation of population from larger cities, including to take advantage of more affordable housing and flexible working arrangements.

To prepare for this growth, TDC has developed the 2023 Urban Growth Strategy (Urban Growth Strategy) that recommends land rezoning to cater for 30 years of expected growth. The areas for future growth include 'residential', 'rural residential', 'industrial' and 'commercial' land uses across the four major towns. The designation of these areas will be undertaken via a District Plan Change, for which a Section 32 Analysis is required in accordance with the requirements of the RMA. As a part of a Section 32 Analysis, TDC must consider and plan for the three-water infrastructure required to service these growth areas.

Alongside growth, all four towns are facing significant challenges with one or more three waters services, relating to condition, resilience and/or capacity that impact the level of service provided to the current population. This influences TDCs ability to service new growth areas, which are typically located on the fringes of existing serviced areas, because of the additional capacity or resilience constraints that growth may present. Furthermore, some growth from infill is expected, which may also put pressure on existing infrastructure within existing serviced areas.

Rationale Ltd. has been engaged to support TDC's Section 32A analysis by developing options for three waters service delivery in the identified growth areas. This may include one or more of TDC-led infrastructure responses, developer-led infrastructure responses, and policy / guideline development. Transport infrastructure is also considered to the extent that it interfaces or overlaps with the strategic options.

1.3 Context

TDC is facing a substantial and increasing programme of works for three waters assets to address aging infrastructure, new regulatory requirements, population growth, and resilience to climate change and

[6] Estimated population of the Tararua District New Zealand, Figure NZ Trust, 2024.
[7] S, Bray, Tararua District Council, Urban Growth Strategy Framework, 2024

natural disasters. These challenges are not unique to TDC and are being experienced by councils across the country.

The process of urban planning for population growth is guided by national legislation but almost completely delegated to Local Territorial Authorities. Due to ongoing reform, there has recently been an increase in central government guidance with respect to the management and delivery of three waters infrastructure. This adds a layer of complexity when planning for three waters services to support growth.

This section describes the national, regional and local context. The legislative and policy context to be considered when planning for growth in a general sense is provided in detail in the Urban Growth Strategy.

1.3.1 National Context

Following the recent repeal of the previously proposed water reform, the Government has signalled its intention to reform the water sector through the implementation of its 'Local Water Done Well' policy, by progressing two further bills through Parliament in the next eighteen months. The current indication of the direction of this policy is that councils will need to define the three waters infrastructure that they intend to deliver over the next 10 – 30 years. This will need to consider growth.

TDCs' approach to planning three waters services aligns to the current government direction. However, the strategic options laid out in this report represent the best value solution to communities within the four towns and are agnostic to how and when water reform is implemented.

While the repeal of some previous water reform legislation is underway at the time of writing, the following water reform legislation will stay in place for the foreseeable future:

- **Taumata Arowai – the Water Services Regulator Act 2020**[8] establishes Taumata Arowai as the Crown entity to regulate drinking water. Taumata Arowai also has a role of monitoring and reporting in relation to environmental performance of wastewater and stormwater networks. Current indication from Government is that Taumata Arowai will remain as the drinking water regulator.
- **Water Services Act 2021**[9] is regulated by Taumata Arowai and establishes drinking water standards to regulate all persons and organisations that supply drinking water (including Council). It provides Taumata Arowai with the regulatory tools to enforce consequences on water suppliers who do not satisfy their duty to provide safe drinking water. The regulations came into effect under the Water Services Drinking Standards Regulations 2022.
- **National Policy Statement for Freshwater Management 2020**[10] (NPS-FM) provides local authorities with updated direction on how to manage freshwater under the RMA. It places emphasis on Te Mana o te Wai –working with mana whenua and prioritising the health and wellbeing of water bodies over the use of water bodies. While the NPS-FM is not currently being repealed, as of when this document is published the Government have removed the requirement for councils to implement a freshwater plan by the end of 2024 and signalled that the NPS-FM will be replaced in the next 18 to 24 months.

In mid-2024 further legislation is expected that will require councils to put forward a Water Services Delivery Plan that sets out what they intend to deliver over 10-30 years and identify a financially sustainable approach to three waters investment.

There are several legislative documents that define how local authorities should plan for growth more generally, these documents are discussed in detail in TDC's Urban Growth Strategy.[11]

1.3.2 Regional Context

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[8] Taumata Arowai Water Service regulator Act 2020, No 52, Version; 17 February 2024

[9] Water Services Act 2021, No 36, Version: 17 February 2024

[10] Ministry for the Environment, Nationals Policy Statement for Freshwater Management 2020, January 20204

[11] TDC, Urban Growth Strategy, (TDC, 2023)

Horizons Regional Council (HRC) is the regulatory authority into which Tararua District falls under and sets strategic direction for the Manawatū and Wanganui districts. HRC achieves this through **One Plan**, which is the overarching strategy document for the region that defines how the natural and physical resources will be cared for and managed.[12] Three of the One Plan's 'big four issues' directly relate to water:

- **Surface water quality degradation**, being the run-off nutrients, sediment, and bacteria from farms. It impacts the quality of waterways making them risky to swim in or gather food.
- **Increasing water demand,** notes that at certain times of the year, public water supply and irrigation demand exceeds what some water bodies in the region can supply.
- **Unsustainable hill country land use,** highlights the challenges with pasture-based farming practices on the regions steeper hill country, accelerating erosion and reducing water quality.[13]

The Urban Growth Strategy has been developed within the context of the One Plan and consequently the growth areas discussed in this analysis have considered the big four issues and strategic direction of the One Plan.

The One Plan details the rules that allow, regulate, or prohibit resource use activities Strategic options outlined in this document consider the guidance of the One Plan and service delivery of these options must comply with the rules outlined in the One Plan.

1.3.3 Local Context

TDC is in the process of updating the **District Plan** through a formal District Plan Change (for which this analysis will support). The Plan change has four key objectives that centre around improving outcomes, protecting the natural environment, strengthening relationships with mana whenua, and preparing for the future. The Urban Growth Strategy was prepared to support this district plan change and therefore the growth areas discussed in this document are aligned with what is proposed in the District Plan Change.

Under the provisions of the Local Government Act 2002, Council must always have a **Long-Term Plan** (LTP)[14]. The LTP sets out the planned activities for Council over the next 10 years and the outcomes these activities hope to achieve. The strategic options recommended in this document will provide guidance for the development of the next LTP and will be managed within the LTP's constraints and requirements.

Council has developed a **2024 - 2034 Infrastructure Strategy** that sets out the strategic direction for delivering key services and the infrastructure that supports them, over the next 30 years.[15] The strategy is still in its draft stages but has been considered throughout this document. It includes four infrastructure objectives, of which three relate to water service delivery, including:

- Ensure a reliable supply of safe drinking water to communities.
- Ensure efficient and reliable wastewater treatment that meets environmental outcomes.
- Ensure efficient stormwater network capacity that protects from flood events.

The Infrastructure Strategy identifies five key challenges for the region when delivering infrastructure, district growth being one of them. The Infrastructure Strategy does not propose any changes to the existing levels of service. The strategy sits above this document and acts as a high-level strategic direction. The strategic case laid out in this document is for three waters only and goes the next level deeper to lay out the problems, identify the benefits the district is seeking, and understand the trade-offs that will occur.

[12] Horizons District Council, One Plan, 2024
[13] Horizons District Council, One Plan, 2024
[14] Tararua District Council, Long Term Plan 2024-2034, 2024
[15] Tararua District Council, Rautaki Tuahanga Draft Infrastructure Strategy, 2024

1.4 Approach

The analysis laid out in this report was undertaken in five phases between February and May 2024. The phases included a combination of desktop analysis, discussions with TDC staff, workshops, and site investigations. to ensure realistic and appropriate solutions.

Table 1-1 below describes the activities undertaken during each phase at a high level.

Table 1-1: High level approach to developing options for growth.

Phase	Description
Phase 1: Desktop Analysis	Desktop analysis of the Three Waters Master Plans and a range of other technical documents relating to three waters infrastructure solutions. Documents were overlayed with the Urban Growth Strategy to assess information viability and fit for purpose.
Phase 2: Draft Strategic Option and Site Visits	High level schematics (strategic options) for three waters solutions in each town were developed based the information uncovered in Phase 1. Four site trips were undertaken (one to each town) alongside Tararua Alliance members to identify constraints and dependencies and assess the achievability of the strategic options.
Phase 3: Presenting Options	A workshop was held on 26/02/2024 to present and confirm the strategic options and recommended preferred option. The workshop included key members from TDC and the Tararua Alliance.
Phase 4: Attributing Costs	High level costs indicative costs have been developed using a combination of conversations with Tararua Alliance members, Rationale's internal unit rate database, and technical expertise.
Phase 5: Report Writing	This report was developed to present the analysis, preferred options, cost estimates, associated risks, and further investigations required.
Phase 6: TDC Review	The options described in this report were presented to Council. Council requested that alternative options be explored that would enable significant infrastructure investment to be deferred or even potentially avoided. These options have been explored and incorporated into this report.

1.5 Scope

The scope of the analysis is to build on previous work undertaken to identify the preferred option to address expected growth within the four major towns, as identified in the Urban Growth Strategy. While the focus is primarily on growth, renewal and level of service challenges within the three waters network will be addressed where there is inextricable links to supporting growth. This document will present the following:

- The location and nature of the proposed growth areas, and how these differ from what was previously assumed in the Master Plans.
- An overview of existing three waters services, and key challenges identified for each service.
- Strategic options to service water, wastewater and stormwater to each area.
- A high-level evaluation of the options to determine a preferred strategic option for three waters delivery to the new growth areas.

Note that this process has identified strategic options to service growth areas. Further technical analysis will be required to size and precisely locate the proposed infrastructure, as and when planning is undertaken for each growth area.

2. Previous Work Undertaken

There has been significant planning work undertaken to date to address renewal, level of service and growth challenges in the four towns, including master plans for each of the three waters, flood modelling, technical reports and design options. The following documents were provided to Rationale and have been used to develop and assess the strategic options:

Table 2-1: Technical reports completed for Tararua Three waters

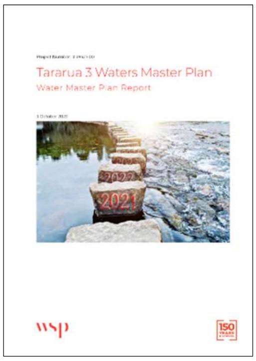
Three waters	Report
Water	• Tararua Water Masterplan, WSP, 2022. • Water Model Build and Calibration Report, WSP, 2022. • Dannevirke Water Treatment Plant Stream 3 Alternative Water Sources, GHD, 2023. • Water Build and Calibration Report, WSP, 2022 (for all four towns). • Dannevirke Turbidity and River Flow Summary, GHD, 2023. • Dannevirke Water Storage Feasibility Memorandum, GHD, 2023. • Freezing Works Groundwater Report, Aquatel Technologies, 2024. • Review of Investigations – Dannevirke Water Storage, WSP, 2024.
Wastewater	• Tararua Wastewater Masterplan, Woods, 2022. • Tararua Wastewater Treatment Plant Strategy, WSP, 2022. • Tararua District Wastewater Overview, The Wastewater Specialists, 2024.
Stormwater	• Tararua Stormwater Masterplan, Woods, 2022.

2.1 Three waters Masterplans

In 2022, technical consultants developed Three Waters Masterplans ('the masterplans') for water supply, wastewater and stormwater across the district. The masterplans included a comprehensive analysis of regulatory requirements, renewals to address asset condition, improvements to levels of service and growth. While the masterplans included some provisions for growth, they are not fit for purpose to support a Section 32A analysis due to inconsistencies in population projections and growth areas with the Urban Growth Strategy.

As a part of this analysis, Rationale undertook a gap analysis between the Urban Growth Strategy and the masterplans to determine what information can be used to support planning for growth and where there are information gaps. The findings of this gap analysis were presented to TDC and Tararua Alliance representatives at a workshop on 24/01/2024.

This report should be read in conjunction with, and as an addendum to, the masterplans.



3. Options Development Process

A multi-phased approach has been taken to identifying potential options to support new growth areas. The process adopted included:

- A review of available technical reports and a desktop analysis of the existing three waters infrastructure, together with engagement with TDC's three waters team, to identify existing challenges with three waters infrastructure that might impact future growth.
- Site visits were undertaken to understand how geographic constraints (such as topography, location of existing waterways, existing structures etc) might impact three waters infrastructure. These had a significant bearing on potentially viable options.
- A potential long list of options was then identified that considered:
  - How connections could be made into existing infrastructure where appropriate, and what constraints this might present.
  - How a developer-led approach might be taken, and whether this were appropriate, depending on the nature of the growth area and the required infrastructure.
  - Whether alternative means of serving growth areas were appropriate (for example, segregated wastewater collection and treatment systems).
- Where options were identified as not technically viable, they were not taken forward for further consideration. For any remaining options, a high-level concept of the infrastructure required at a scheme level was developed. This considered an integrated approach whereby roading corridors and services corridors could be established to support growth in each area.

In some instances, only one viable option has been identified. In other cases, where more than one viable option presents itself, a brief assessment of the benefits and disbenefits of the option has been undertaken based on:

- Achievability, including:
  - Ability of the option to meet legislative or regulatory requirements.
  - Technical viability.
- Capacity and capability, including:
  - The operational complexity of the new infrastructure, which has a bearing on operational cost and the ability of TDC to service the new infrastructure.
- Affordability, including:
  - Relative cost.
  - Ability for the community (based on size and scale) to be able to afford the initial and ongoing costs of the infrastructure.
- Wider benefits, such as:
  - Improving resilience to other parts of the network.

Each of these criteria has been assessed for each option on a scale of 1 (negligible or very low benefit / does not achieve the criteria) to 5 (very high benefit / highly achieves the criteria).

4. Dannevirke

4.1 Overview of Growth Areas

The Urban Growth Strategy has identified 57.8ha of new residential to the west of the town, and 7.8ha of new industrial to the south of the town where existing industrial areas are located.

Figure 4-1 provides an overview of the proposed growth areas identified in the Urban Growth Strategy. The key areas of residential growth are to the west of existing development, zoned as residential to the southwest and rural residential to the northwest. A small pocket of industrial area growth is provided adjacent to State Highway 2 on the southern side of Dannevirke. Additional commercial development is indicated around the existing CBD and although not indicated, infill may also be expected within the existing residential areas.

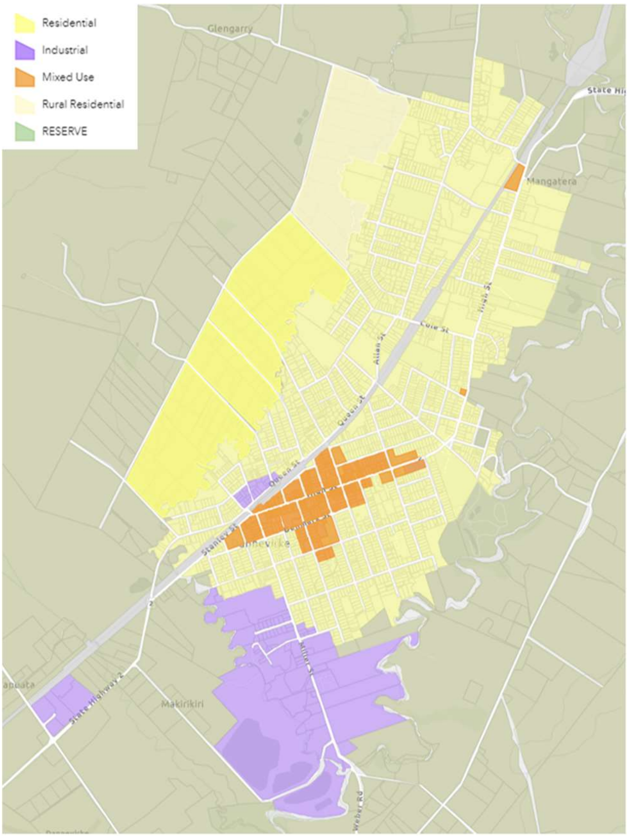


Figure 4-1 Proposed growth areas for Dannevirke by land use type

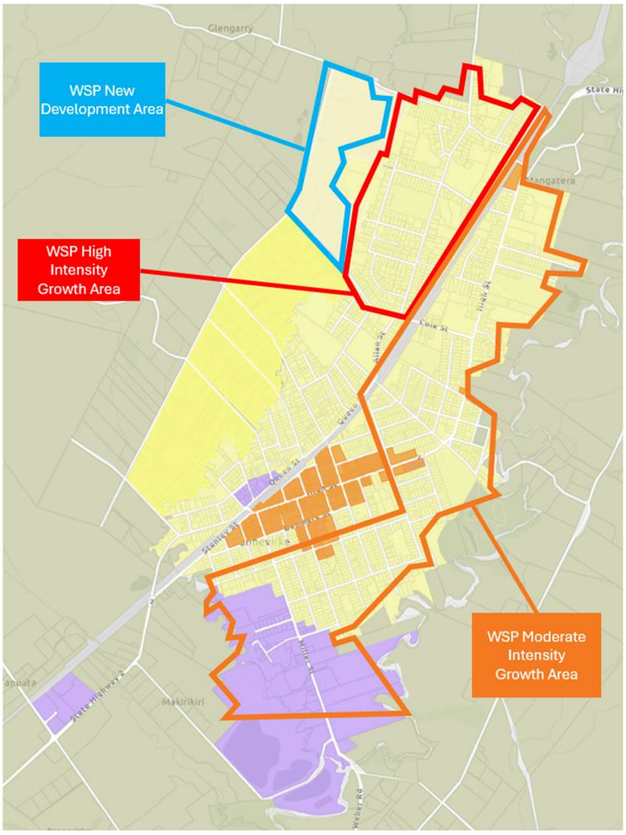


Figure 4-2 Overlay of growth areas as report in the masterplans.

This varies significantly from previously assumed growth areas as reported in the masterplans upon which infrastructure upgrades were assumed. An overlay of the assumed growth areas and those designated in the Urban Growth Strategy is provided in Figure 4-2, the key differences are:

- Of the western residential and rural residential areas identified in the Urban Growth Strategy, only a small portion was designated as a new development area in the masterplans.
- The masterplans assumed moderate to high growth, presumably from infill, within existing zones. No specific projections for infill have been made within the Draft Urban Growth Strategy. For the purposes of this study, Rationale have assumed that some infill will occur within these areas, generally at the rates set out in the masterplans.
- No industrial land growth areas were identified in the masterplans.

In essence, this means that any infrastructure upgrade recommendations from the masterplan, other than those for infill, are unlikely to be relevant to servicing the new growth areas.

The residential and rural residential growth areas to the west can be described as undulating, containing modified and natural open water courses, generally draining south and eastwards to the Tapuata Stream (which ultimately drains to the Manawatū River, via other streams). The highest points of this area are along Adelaide Road, which is the boundary of the proposed growth areas to the west.

Several residential and rural residential roads pass through the existing growth area in the east-west direction. Existing dwellings and limited commercial premises are generally concentrated along these roadways, with rural residential (lifestyle) type properties spread between these roadways. The brownfields nature of the area is likely to lend development to pockets of infill, possibly of multiple dwellings from small feeder roads, rather than large scale mass development.

4.2 Water Supply and Distribution

4.2.1 Existing System and challenges

Raw water for the Dannevirke water supply is extracted via an infiltration gallery from the Tamaki River, and gravitates to an impounded water storage reservoir (covered dam). From there, water is treated and pumped to two treated water reservoirs to the west of the town. Treated water is supplied by via dual trunk mains to the west of Dannevirke at Adelaide Road (which forms the western boundary of the new residential and rural residential growth areas). Each trunk main supplies a different pressure zone. The lower section is fed by gravity. The upper section is fed from a single booster pump to provide sufficient pressure to the northeastern part of the town.

Based on previous investigations for water supply master planning, and subsequent discussion with TDC's three waters team, the following key issues have been identified. A brief assessment has been made of how growth may impact these challenges, which has to some degree informed options development to serve new population growth, as reported later.

Table 4-1: Summary of Identified Key Issues for Dannevirke Water Supply, and Distribution Scheme.

Key Issue / Challenge	How Growth May Impact this Issue
The existing impounded raw water storage may require remedial works or advanced monitoring to address current structural challenges. The storage is being operated at a lower level until the risks and/or remedial works are better understood. This creates challenges if river turbidity is high, when raw water storage is required to provide adequate water quality until river turbidity improves again.	Unlikely to have impact, as remedial works are likely to be undertaken well in advance of expected growth.
There are resilience challenges in the trunk main system, for example to high pressure zone relies on one pump and a trunk main traversing through private property.	Given that the trunk main system is on the western side of the town, where growth areas have been identified, there is potential to service new growth and address resilience issues concurrently.
The water age is high to very high, owing to low reservoir turnover and dead-end mains across the network.	This issue may improve with higher demand / turnover of water.
Of the ~70km of distribution pipelines, approximately 35% of those in Dannevirke are 100 years old. 30 km of pipe length require replacement due to insufficient pipe capacity.	Additional water demand increases risk of failure or causing low pressures / flows.

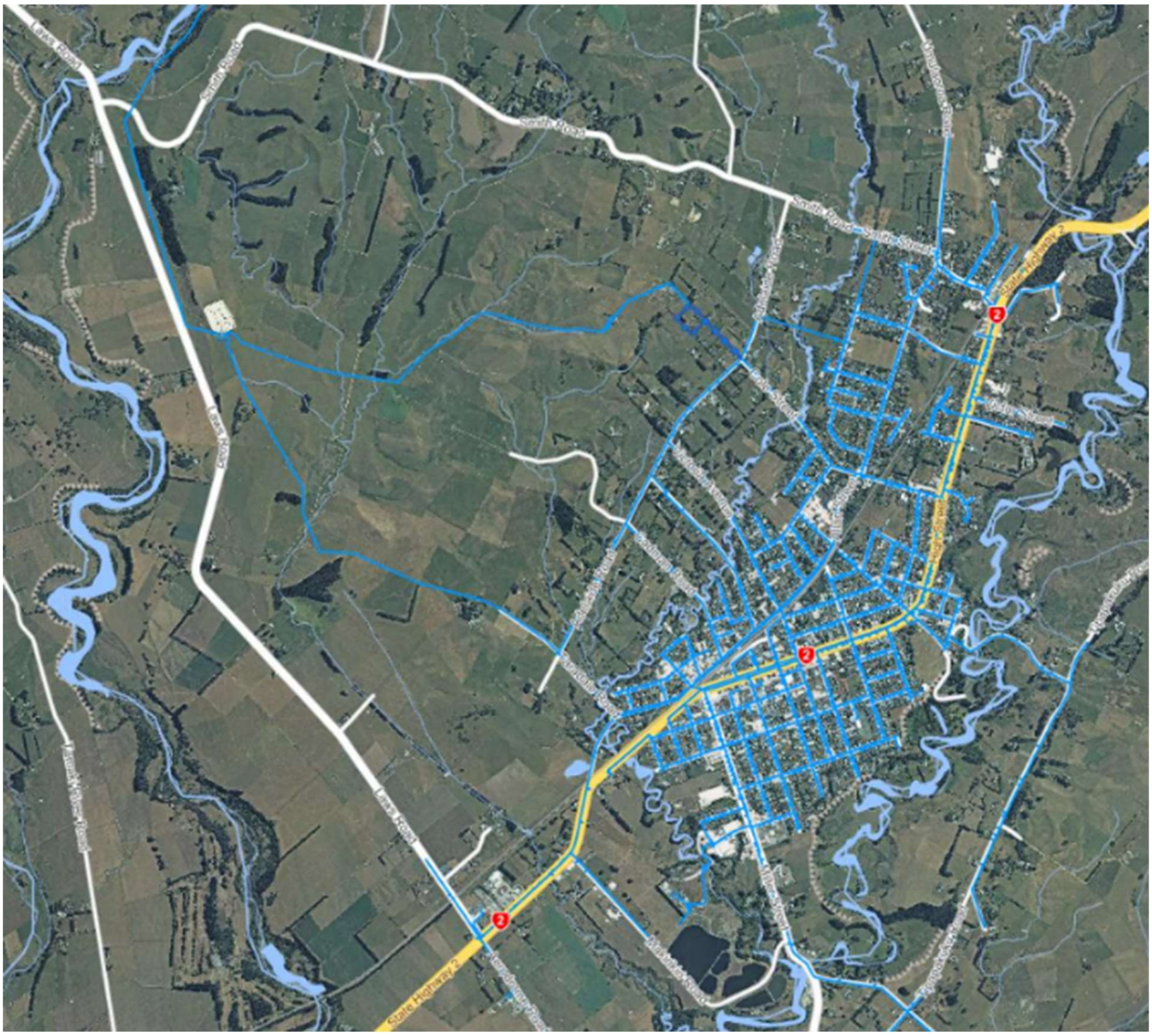


Figure 4-3: Overview of Dannevirke water supply and distribution scheme, Tararua GIS, 2024

4.2.2 Water Supply and Distribution Options

SOURCE WATER SUPPLY

TDC are currently undertaking a strategic review of options for water sources for Dannevirke owing to constraints on supply from the Tamaki River, particularly when the river is in low flow conditions. In connection with this, the future of the impounded water storage system is also being assessed owing to the extent of remedial works that may be required to maintain its operation. The options under consideration include:

- **Demand side management** – this involves the implementation of universal water metering and working with specific high users (for example, the Alliance meatworks) to reduce overall water demand in a way that allows capacity for growth and may avoid the need for a new source.
- **Alternative or supplementary source** – preliminary investigations have been undertaken to identify potential bore water source locations.
- **Additional storage** – as either raw water or treated water storage, to manage dry weather periods.

While the outcomes of this are not yet determined, they will incorporate the requirements for growth in water demand. TDC has currently indicated a preference for demand side management via universal water metering to reduce the need for further water supply infrastructure.

WATER RETICULATION

New Growth Areas

There are several factors to consider when identifying options to supply water to the new growth areas, which are predominantly in the area west of the existing township. These factors include:

- One of the key advantages of the location of the key growth areas for Dannevirke, on the western side of the existing town, is that they are close to existing service mains. This creates the opportunity to develop new water supply zones at the growth areas fed directly from the trunk main infrastructure without the need to construct costly new trunk mains to reach them.
- The existing reticulation is directly adjacent to the town and east of the growth areas is a small bore that already has some service challenges (such as low pressure). Connection to these service mains is unlikely to be viable, and in fact service to these areas could be enhanced if it was provided from the west, via any new service mains servicing the new growth areas.
- There is substantial opportunity to create a ring main around the existing growth areas along existing transport corridors (Adelaide Road) to supply the new growth areas and enhance resilience of the wider network.

Based on this analysis, and as indicated in the schematic below, the only identified viable option at this stage is to:

- Install a new trunk main along Adelaide Road that is connected to the existing trunk main from the main supply reservoir.
- From the new Adelaide Road trunk main, service mains would be provided along existing and new road corridors into developments within the proposed growth areas. The service mains may be connected through to existing reticulation east of the existing growth areas to enhance the general resilience of the western water supply zones of Dannevirke.
- A booster pump would be required on the Adelaide Road trunk main as indicated to replace an existing booster pump and trunk main to the east. This will alleviate current resilience challenges in this part of the network and enable supply to the full growth areas.

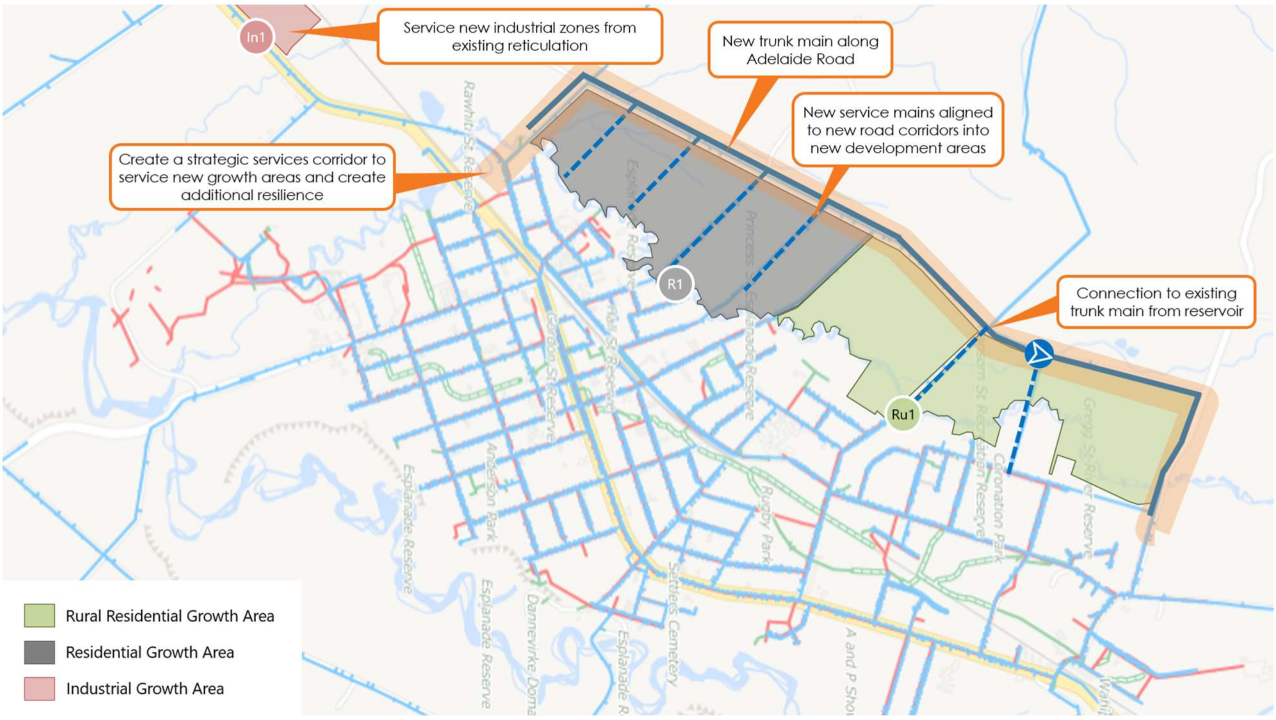


Figure 4-4: Preferred option for water supply to new growth areas in Dannevirke.

For the industrial growth area proposed to the south of the town, there is existing reticulation in the vicinity. Any need for upgrade to this reticulation will depend on the nature of the industry located there, which will dictate potable, commercial and fire water requirements. At this stage of scheme development, and given this uncertainty, the most prudent option is to require that future industrial development include for either:

- Storage that can be 'trickle fed' from the water supply network so that it does not create a need for upgrades to the network based on capacity; or
- Develop its own water source (for example, a new bore) which may be appropriate if a 'wet' industry is to be located there.

INFILL

Assuming that any new commercial growth at the CBD is similar to existing land use, the indicated additional growth is unlikely to create significant additional demand, especially where it is displacing existing residential areas.

While no indication of the extent of residential infill growth has been provided, it is nonetheless expected. Previous water modelling in the masterplan identifies moderate to high intensity growth within existing residential areas, so to some degree this has been accounted for in previous analysis, and informs future renewals and upgrades programmes provided in the masterplan.

It is recommended that TDC adopt a process for evaluating development proposals with respect to their impact on existing water supply zones by:

- Utilising available existing modelling, create a map of current 'at risk' water supply zones owing to current level of service challenges (for example, low pressure zones). This can be used to guide early decision making on infill development by identifying extreme risk areas where infill would create significant risk.
- Evaluate all infill proposals based on a water model analysis of additional flow through to supply the new development.

4.3 Wastewater Collection and Treatment

4.3.1 Existing System and Challenges

The wastewater collection system for Dannevirke comprises of an entirely gravity sewer network generally falling from north to south. It is naturally separated by the railway line which essentially dissects Dannevirke into west and east catchments. Wastewater flows from the western area to the easter area via seven gravity mains underneath the railway corridor.

The network ultimately converges at a single manhole within the industrial zone at Easton Street at the location of the now disused sewage storage tanks. From here, the wastewater normally discharges via an inverted siphon before discharging by gravity into the Dannevirke Wastewater Treatment Plant (WWTP). A bypass with limited capacity is also provided, which is designed to provide relief capacity to the main siphon in high flow events.

The Dannevirke WWTP consists of a preliminary treatment (screens), dissolved air flotation (DAF) and a pond system. Treated effluent discharges to the Mangatera Stream (which is a tributary to the Manawatū River).

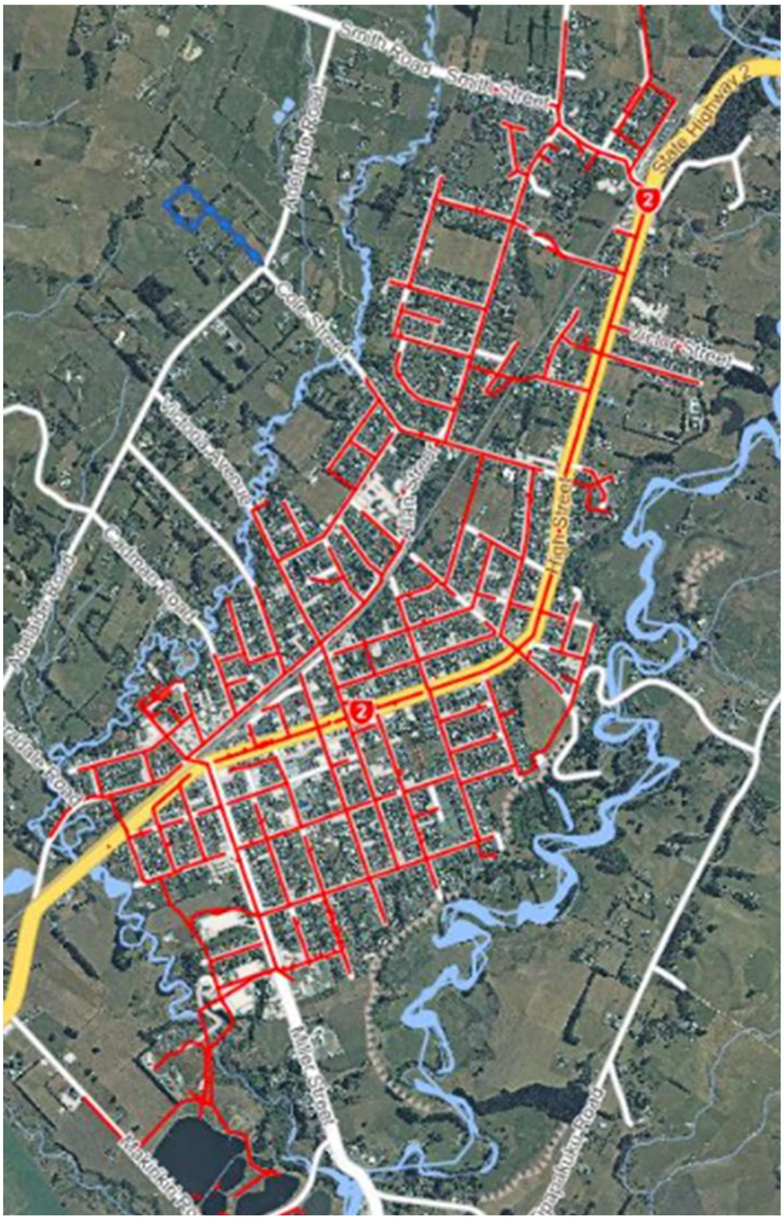


Figure 4-5: Overview of the Dannevirke sewerage system, Tararua GIS 2024

Based on previous investigations for wastewater master planning, and subsequent discussion with TDC's three waters team, the following key issues have been identified. A brief assessment has been made of how growth may impact these challenges, which has to some degree informed options development to serve new population growth, as reported later.

Table 4-2: Summary of key identified issues for Dannevirke water supply and distribution scheme

Key Issue / Challenge	How Growth May Impact this Issue
Inflow (ingress of stormwater via rooftops, private drains and via manholes) significantly increases wastewater inflows during and after storm events.	Growth itself may not impact this, provided that new sewer reticulation is constructed to a high standard and avoids further ingress of stormwater, including via private connections.
The capacity of the trunk main sewer siphon to the WWTP is capacity constrained. This causes surcharging of the sewer system at Easton Street, leading to overflows and industrial property flooding events.	Additional flows will make this worse.

Key Issue / Challenge	How Growth May Impact this Issue
The capacity of some parts of the treatment plant is reached during extreme wet weather events, leading to controlled but unconsented bypasses of some parts of the treatment plant.	Additional flows will make this worse.
It is likely that land disposal of treated effluent will be required in the future. The cost of doing so may be exacerbated by high inflow & infiltration (I&I) volumes.	Additional flows will increase treatment and land disposal costs further.

4.3.2 Wastewater Collection and Treatment Improvement Options

NEW GROWTH AREAS

Three options have been identified for the development of scheme level (rather than within development) sewerage system upgrades to support the significant new residential and rural residential areas to the west of Dannevirke. These are:

- **Option 1 – expansion of existing system:** to connect new sewerage systems to existing reticulation and undertake specific upgrades to sewer mains within the reticulation to provide the new capacity. This would assume that all wastewater goes to the existing Dannevirke WWTP.
- **Option 2 – diversion of new and some existing flows:** as previously mentioned, the sewerage reticulation is currently dissected by the railway line running north-south adjacent to State Highway 2 through the town, with few gravity sewer mains under the railway line to drain wastewater from the western area to the east and down to the WWTP. With new development in the west, there is an opportunity to 'cut off' wastewater collection west of the railway line and divert the catchment to a new pump station. This pump station could also receive a new trunk main collecting wastewater from the new western residential growth zones, and potentially the southern industrial area. The pump station would then have a rising main, entirely independent of the existing sewerage reticulation, which would transfer wastewater to the WWTP.
- **Option 3 – de-centralised treatment:** entirely segregate and treat wastewater from the new growth areas. This would require developers to establish 'package' wastewater treatment plants which would require new resource consents to discharge treated wastewater to land or existing surface water bodies. Obtaining these consents in addition to existing discharges to waterways may be very challenging.

An assessment of the options is provided in the table below, based on the criteria previously described above.

Table 4-3: Evaluation of options for wastewater system upgrades to support growth areas in Dannevirke.

Evaluation Criteria	Option 1 – expansion of existing system	Option 2 – flow diversion to existing WWTP	Option 3 – de-centralisation
Achievability	5 – Very low barriers to achieving	4 – Low barriers to achieving	2 – High legislative barriers to achieving
Capacity and capability	5 – no material added complexity	4 – Low / some added complexity	2 – High added complexity
Affordability	1 – Potentially very high cost	2 – High cost	3 – Moderate cost
Added benefit	3 – Moderate added benefit	5 – Very high added benefit (resilience)	2 – Low added benefit
Overall ranking of options	2nd	1st	3rd

In summary, the assessment of these options has identified that:

- While Option 2 may have a relatively high cost, it creates significant additional benefit because it relieves 'pressure' on the existing network by diverting some existing flows. This may avoid upgrades to existing sewerage upgrades based on capacity alone in the eastern catchments of

Dannevirke. Of particular note, this may avoid upgrades to the existing sewer siphon that feeds wastewater to the WWTP.

- Option 3, to create a decentralised system, would provide little benefit and create additional complexity of operating more than one WWTP in the township. It is questionable whether discharge consents could be obtained for treating wastewater from new WWTPs.
- Option 1 is likely to be very expensive, in order to upgrade existing gravity sewers for capacity alone.

On this basis, the preferred option is to create a flow diversion scheme (Option 2). As indicated the concept schematic in Figure 4-6 this would involve:

- Installing a new trunk sewer main along Adelaide Road, as part of a strategic services corridor to support the western growth areas. Based on the topography of these growth areas and existing waterways, this is the most appropriate corridor for the trunk main.
- The new trunk main would discharge to a new pump station located at the southern end of the catchment, adjacent to State Highway 2.
- Existing sewer mains under the railway line (which transfer wastewater flows from the west to east catchment) would be cut off, and minor changes made to the existing western catchment to divert to the new pump station.
- A new rising main would be provided along State Highway 2 and Makirikiri Road to transfer diverted flows to the WWTP.

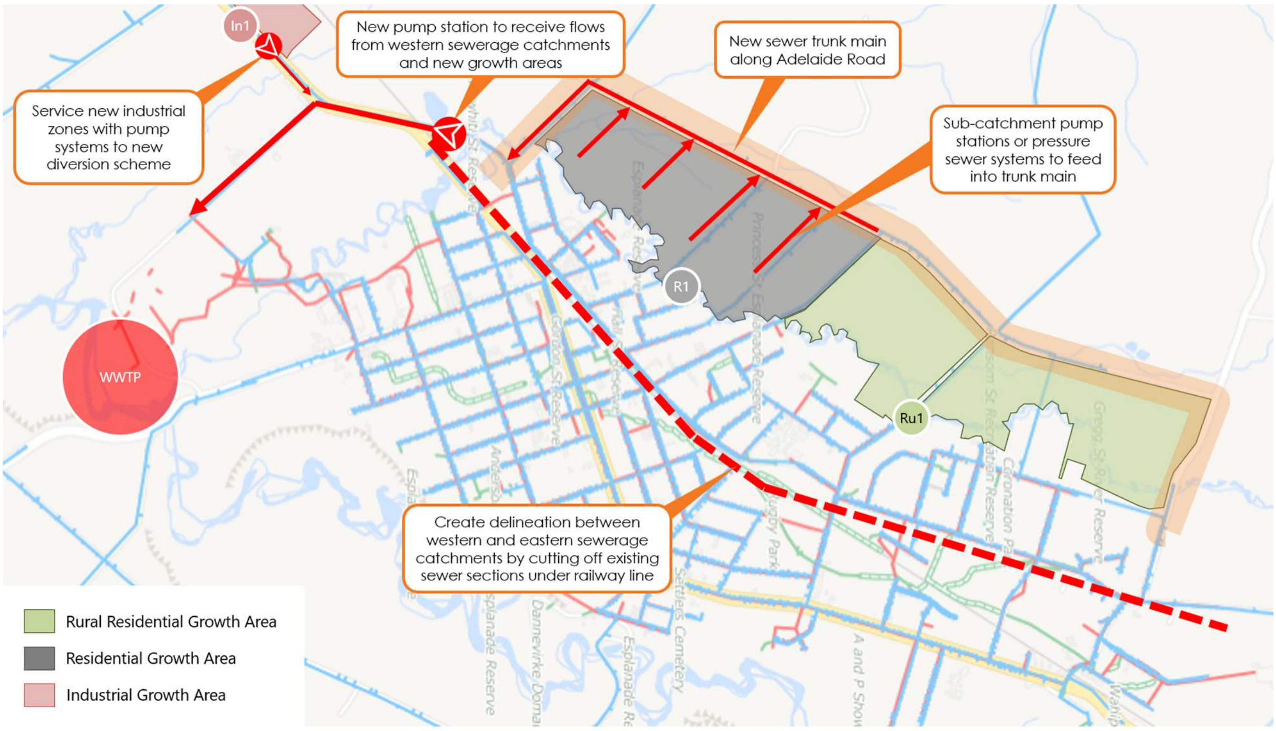


Figure 4-6: Preferred option for wastewater collection to service new growth areas in Dannevirke.

Adelaide Road is located at a higher elevation than the new western growth zones, and the land within the growth zones is undulating and dissected by several open water courses. This lends itself to the installation of gravity sub-catchments with dedicated pump stations, or pressure seer systems, which would in turn discharge to the new Adelaide Road sewer main.

INFILL

Any significant infill is likely to present challenges to the existing network, especially for the existing sewer siphon, and particularly prior to the diversion scheme noted above. For that reason, temporary solutions may need to be explored to enable more flow through the existing sewer siphon main and/or at the

WWTP to improve system capacity. Localised capacity issues within the catchment will need to be assessed on a case-by-case basis using modelling analysis (noting that a hydraulic model has been developed for the catchment). For significant infill (multiple dwelling schemes), it may be appropriate to consider the installation of sub-catchment pump stations to collect the new flows and divert them to a place in the network with sufficient gravity flow capacity.

4.4 Stormwater Management

4.4.1 Existing System and Challenges

Stormwater within Dannevirke is generally managed by overland flow via street infrastructure with limited pipe networks and the use of open channels and ditches to divert stormwater towards natural water courses. Pipe systems tend to be confined to localized areas particularly within the commercial central business district area and immediately surrounding residential zones.

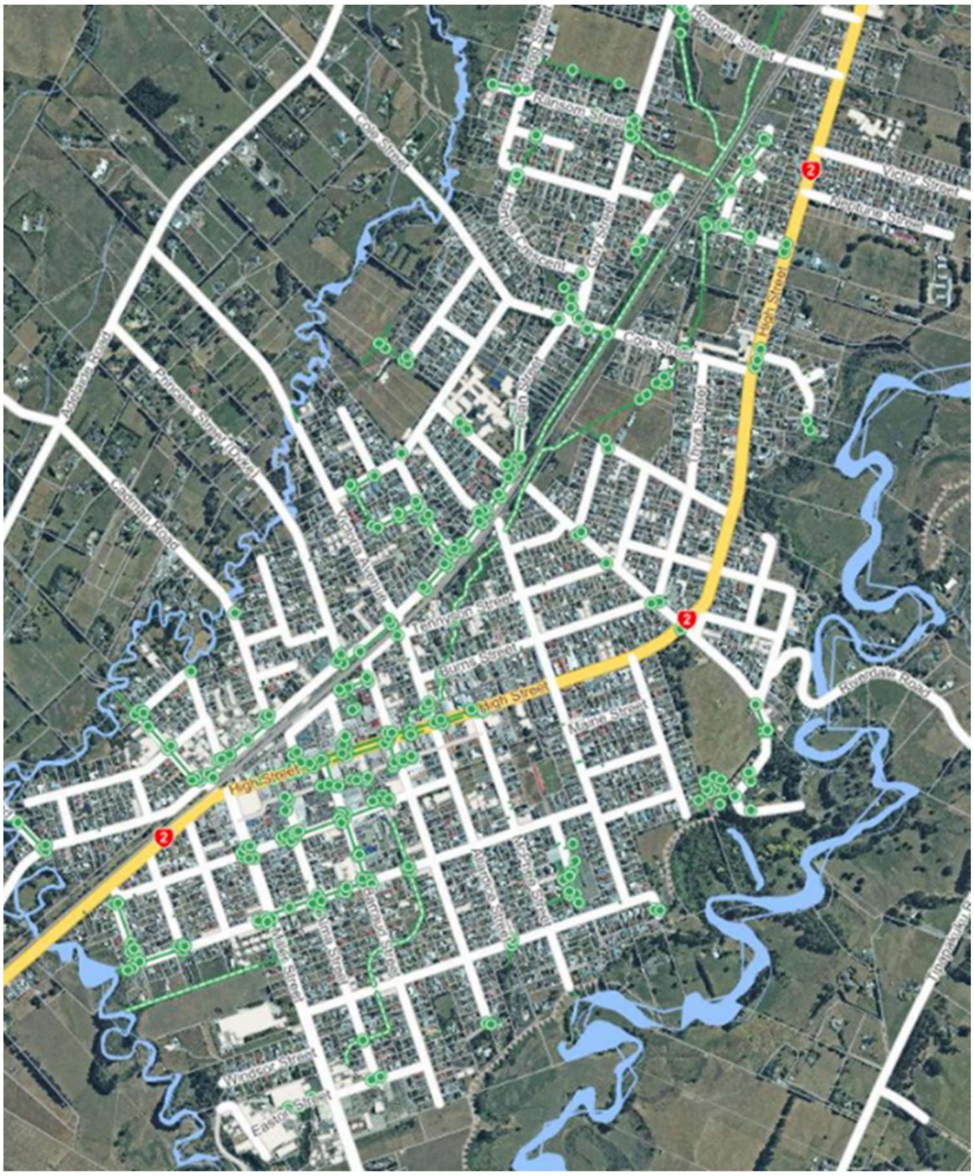


Figure 4-7: Stormwater Systems in Dannevirke, Tararua GIS 2024.

Stormwater modelling was undertaken in 2022 for the existing and future land use scenarios, finding:

- For a 10-year Average Recurrence Interval (ARI) rainfall event, in the existing scenario 66% of the network is predicted to surcharge due to either backwater conditions or limited capacity, rising to 79% for the future scenario.

- For a 2-year ARI rainfall event, a significant portion of the network is also predicted to be surcharged, with 39% in the existing scenario rising to 50% in the future scenario.
- The number of buildings within the 100-year future land use flood extend with a depth greater than 50mm is 1,245, and this is 30% more than in the existing land use scenario (952 buildings).
- The increase of affected buildings (inside a 50mm flood depth) between the 10-year and 100-year ARI rainfall events is 447 for the existing and 489 for the future land use scenarios.

Stormwater modelling undertaken in 2022 indicates that surface flooding in commercial and residential zones, generally along the alignment of trunk stormwater mains and channels east of the railway corridor, can be expected. This is likely to be caused by restrictions to flow in open water courses (such as culverts at road/driveway crossings) and pipe capacity issues. An example of the extent of potential surface flooding is provided in Figure 4-8, for a 100-year ARI rainfall event from maximum likely development within the catchment in 30 years' time.

Based on previous investigations for stormwater master planning, and subsequent discussion with TDC's three waters team, the following key issues have been identified. A brief assessment has been made of how growth may impact these challenges, which has to some degree informed options development to serve new population growth, as reported later.

Table 4-4: Summary of Identified Key Issues for Dannevirke Stormwater Collection.

Key Issue / Challenge	How Growth May Impact this Issue
Future stormwater flooding due to climate change and ion-catchment development (as reported above)	Tapping into existing networks to manage stormwater run-off from new growth areas will exacerbate surface flooding risk for existing areas.
Stormwater pipes and culverts passing under buildings and private property makes them difficult to maintain or upgrade	Unlikely to make this challenge worse, however increased pressure on existing stormwater systems may accelerate need to undertake upgrades, including infrastructure in private property.
It is unlikely that uncontrolled discharges to natural water courses will be consented in the future, owing to increasing restrictions on freshwater management.	Additional infrastructure may be required to manage stormwater collection, especially where new areas are developed to include more impermeable surfaces.

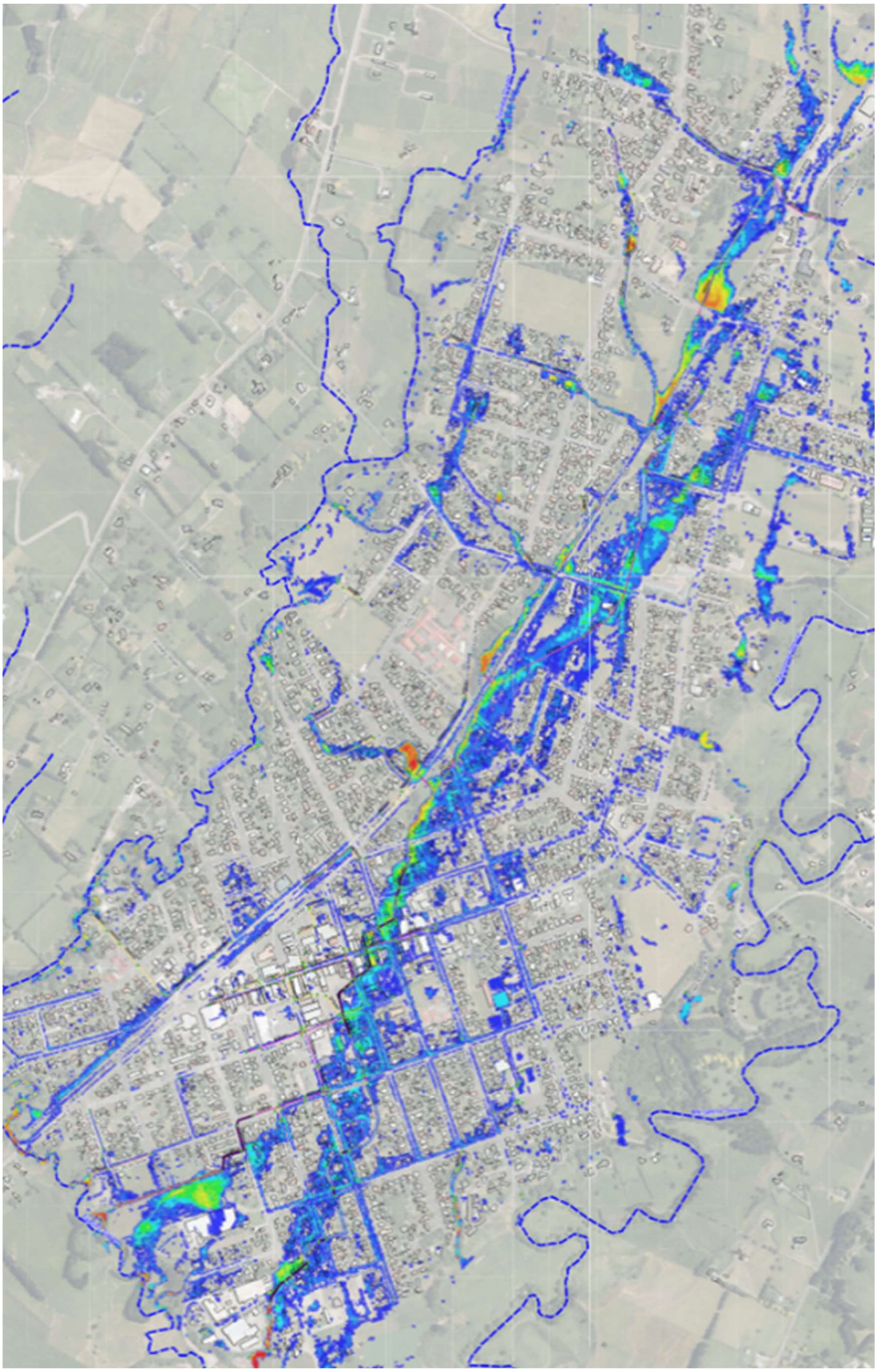


Figure 4-8: Overview of Flood Modelling in Dannevirke (100yr), Woods, 2022.

4.4.2 Stormwater Management Options

NEW GROWTH AREAS

Owing to likely restrictions on uncontrolled stormwater discharges to waterways from new developments (known as 'hydraulic neutrality'), attenuation will be required within new growth areas to retain stormwater during peak rainfall events, and allow its discharge after these events. Two approaches to attenuation are commonly adopted:

- Use of storage ponds or lagoons which may form part of an open water course system to collect and retain stormwater, using a controlled outlet.
- Use of tanks or other similar structures.

These options can be incorporated with 'green' stormwater solutions, such as swales, to reduce stormwater collection or collection for stormwater for reuse.

The proposed western residential and rural residential growth areas are naturally suited to the use of storage ponds and lagoons owing to the natural landform and existing open water courses. The industrial growth area may be more suited to 'hard infrastructure' solutions such as tanks. In any case, it would be appropriate that these are developer led responses to suit the specific development proposed within each growth area. This would require TDC to adopt policy and guidance for developer led approaches.

INFILL

As previously noted, there are already substantial flood risks in the Dannevirke catchment, especially to the east of the State Highway. Infill is likely to exacerbate these challenges. TDC's currently considering strategic responses to future stormwater management which will incorporate growth.

4.5 Commentary on Phasing of Infrastructure Development

Subsequent to the development of the first draft of this report, TDC requested Rationale to explore options for phasing of infrastructure across the four towns to determine any ways to defer significant infrastructure investment.

For Dannevirke, the unique challenge this presents is that all of the substantial new growth areas are in one zone to the west. While growth within these zones may occur in a piecemeal fashion (owing to different land ownership and placement of existing dwellings), the core infrastructure required to enable growth in these areas (as presented in this report) needs to be developed in one stage in order to become functional. Therefore, phasing of growth areas in Dannevirke, at least from an infrastructure investment perspective, is not possible.

4.6 Summary of Preferred Options and Costs

The following table provides a summary of the preferred options to support new growth areas and provides a rough order estimate of cost of the proposed portion of infrastructure that would be provided by TDC as previously described.

Costs have been developed based on feasibility level sizing of the infrastructure required for each option, and utilising historic rates from similar projects. The estimates are provided for feasibility purposes only and should not be relied upon for detailed project planning. The estimated accuracy of the estimates provided is +/- 50%.

Table 4-5: Summary of preferred options and high-level cost estimate for Dannevirke

Water Service	Preferred Option	Estimated cost, excl. GST
Water Supply	Install new trunk main water supply infrastructure along Adelaide Road to enable western growth areas, including new booster station	$3.1 - $5.5M
	Establish policy and technical requirements for new water supply to new industrial areas	$0.1 – 0.2M

Water Service	Preferred Option	Estimated cost, excl. GST
Wastewater Collection	Install new trunk main sewer and pump station to divert flows from western catchment and growth areas to WWTP	$6.2 – 10.4M
	Install new pump station at industrial area	Not costed (assumed developer-led response)
Stormwater management	Establish policy and technical requirements for stormwater collection and attenuation systems in new growth areas	$0.1 – 0.2M

5. Woodville

5.1 Overview of Growth Areas

The key area of residential growth proposed by TDC in the draft urban growth strategy is to the north of the town in the area bounded by Pinfold and Sowry Roads, and to the south-east as indicated in Figure 5-1. Rural residential development growth is proposed to the north-east, transitioning into the rural zone.

There is a desire to retain the compact commercial centre, however recognising that some buildings require earthquake strengthening to meet standards, opportunities for rezoning nearby land (e.g. sports grounds) have been considered. Industrial growth is proposed via expansion of the existing area eastward (in the south-east of the town), with potential for a future satellite hub adjacent to the new Ta Ahu a Turanga roundabout.

This varies significantly from previously assumed growth areas as reported in the masterplans, upon which infrastructure upgrades were assumed. An overlay of the assumed growth areas and those designated in the Urban Growth Strategy is provided in . The key differences are:

- The masterplans did not envisage new residential and rural residential development to the north-east of the town.
- The Water Master Plan presumably assumed residential growth to be met by infill in existing areas. No specific projections for infill have been made within the Urban Growth Strategy. For the purposes of this study, Rationale have assumed that some infill will occur within these areas, generally at the rates set out in the masterplans.
- The new western industrial development area proposed by the Urban Growth Strategy was not designated as new development areas in the masterplans.

In essence, this means that any infrastructure upgrade recommendations from the masterplans, other than those for infill, are unlikely to be relevant to servicing the new growth areas in the Urban Growth Strategy.

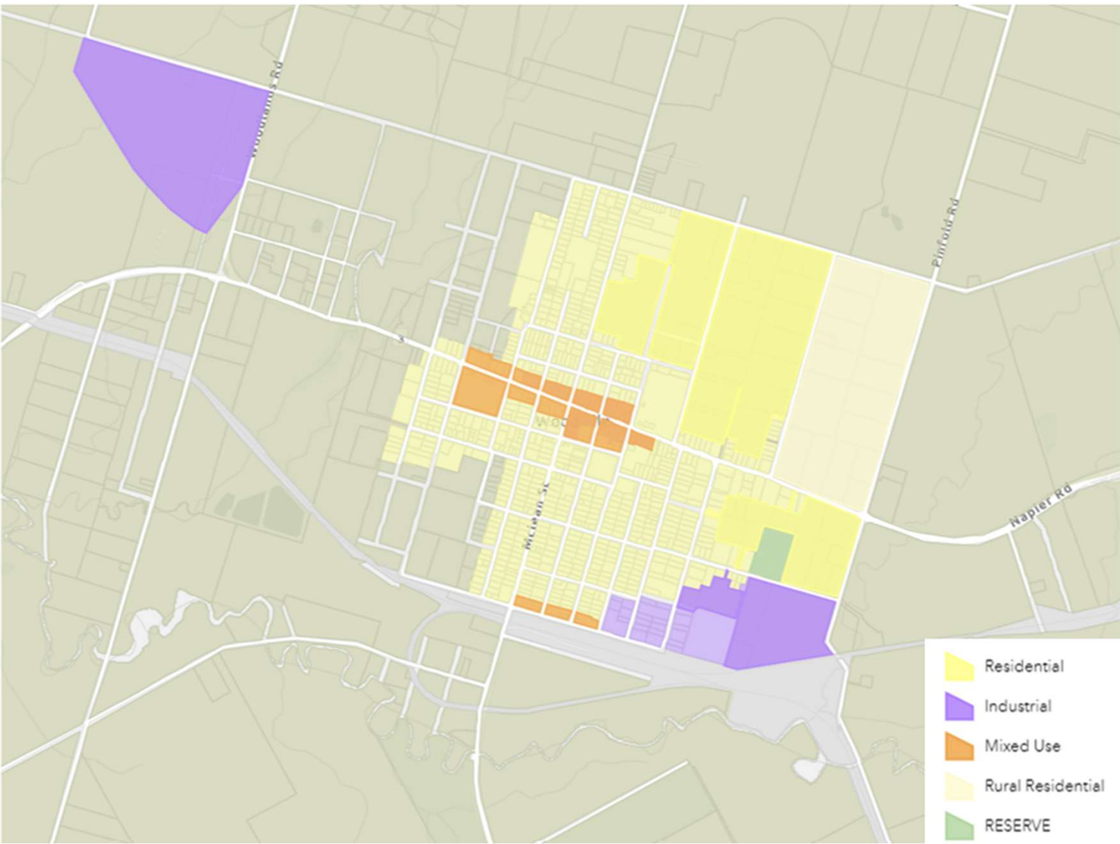


Figure 5-1: Proposed growth areas for Woodville.

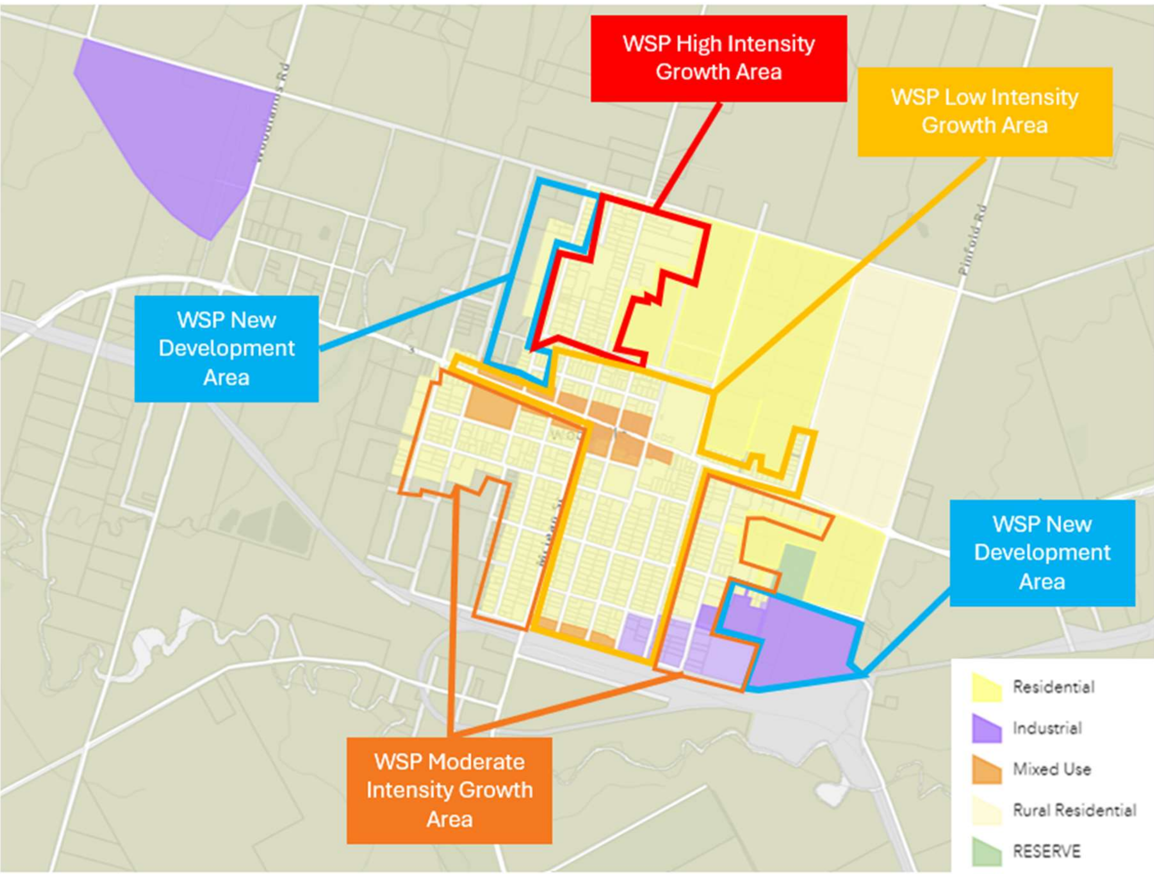


Figure 5-2: Overlay of masterplan growth areas.

The residential and rural residential growth areas to the north-east gently slope up toward Sowry and Pinfold Roads, draining back toward the main town. State Highway 2, running east west, acts as a natural high point to the south of this area which creates some challenges for drainage.

Several residential and rural residential roads pass through the existing growth area in the east-west direction. Existing dwellings are generally concentrated along these roadways, with rural residential (lifestyle) type properties spread between these roadways. The brownfields nature of the area is likely to lend development to pockets of infill, possibly of multiple dwellings from small feeder roads, rather than large scale mass development.

5.1.1 Land Drainage Capacity and Impact on Growth Zone Areas

As described later in this section, one of the key challenges for development in Woodville is stormwater management, which has heavily influenced the infrastructure response and prioritisation of growth areas.

The initial analysis of infrastructure response options has identified the need to put in place a significant stormwater diversion scheme to enable overland flow to from the north / north east of the town to be readily managed, thereby enabling growth in the areas identified north of State Highway 2. Owing to the cost of this infrastructure, alternative growth areas were then explored. A second key consideration when doing so is the drainage capacity of the soils, as it is known that there are areas of highly saturated soil in Woodville.

Based on anecdotal evidence, areas of generally better draining land and poorer draining land areas on the northern side of Woodville have been identified, as indicated in Figure 5-3. Further investigations would be required to confirm actual soil properties and boundaries between areas of differing soil draining capacity, however it provides a useful guide for prioritising residential growth in Woodville.

Figure 5-3: Comparison of Soil Drainage Capability and Identified Growth Areas in Woodville. Further investigations would be required to confirm actual soil properties and boundaries between areas of differing soil draining capacity.

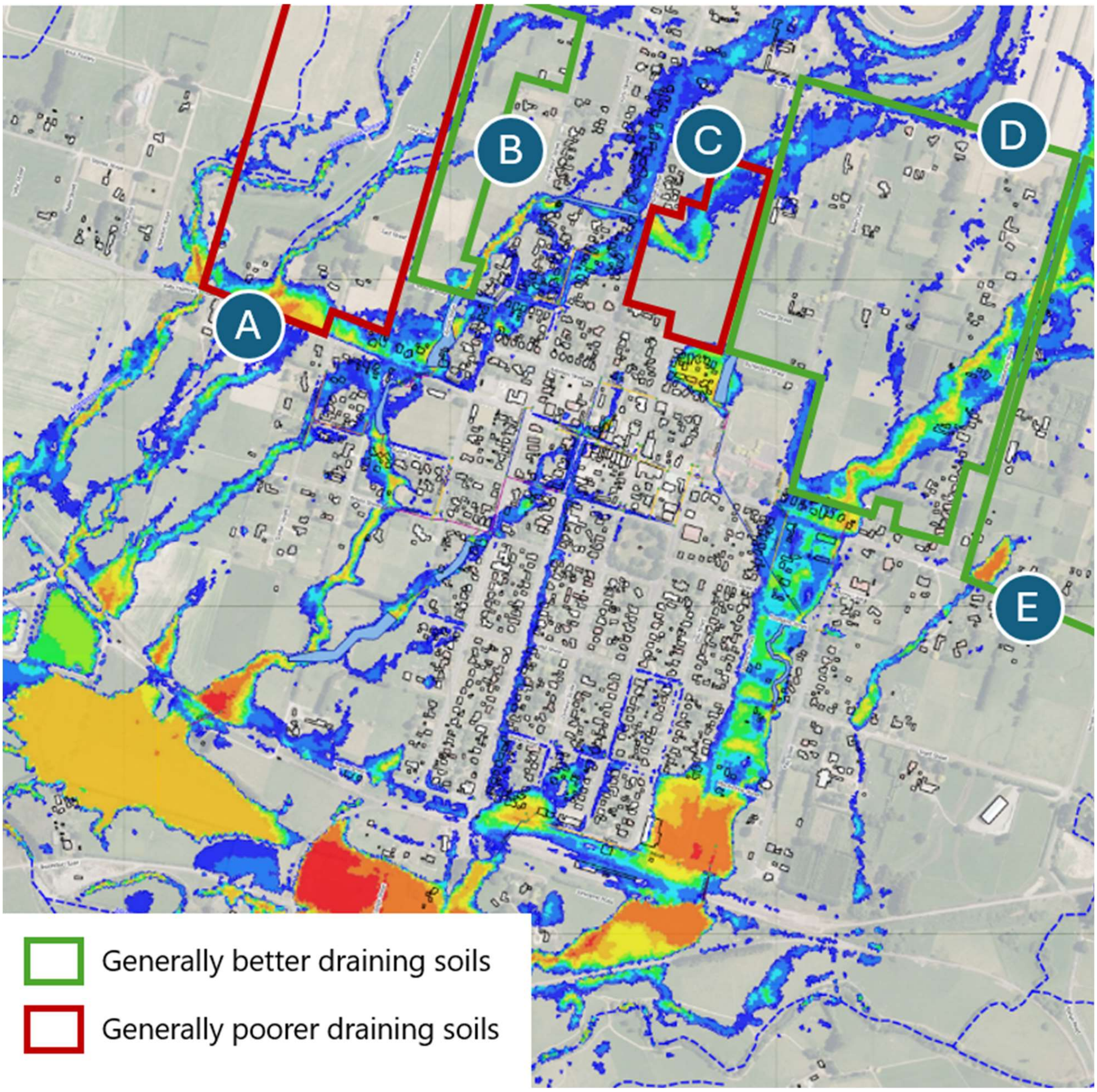


Figure 5-4: Overlay of Indicative Soil Draining Capacity on Flood Modelling in Woodville (100yr, Woods, 2022).

Utilising these maps, the areas that provide the best options for growth while managing drainage conditions are areas B, D, and E noting that the southeast corner of area D and northwest corner of area E may not be suitable due to existing, major overland flow paths.

As indicated in Figure 5-5, the areas north of State Highway 2 that should be given priority for growth are those marked with ‘1’. Owing to potential soil drainage issues, which do not make development insurmountable but will create additional challenges, the area to the northwest has been designated Priority 2. Owing to high soil saturation and a significant flow path, the area marked ‘3’ should not be designated for growth.

Adopting these recommendations would require some adjustments to the areas designated for residential and rural residential growth in the draft Urban Growth Strategy, as follows:

- The boundary lines for the current growth area bounded by ‘D’ (Figure 5-3) would need to be modified to the area shown in Figure 5-5. This reduces the area for residential growth. As indicated later in this section, the southeast corner of this area should be retained for stormwater attenuation in lieu of housing development.

- One option to address the reduced area for residential growth is to add the additional area 'B' (Figure 5-3).
- The rural residential growth area bounded by 'E' in Figure 5-3 will need to be modified to account for overland flow paths.
- There is potential to add Area 'A' (Figure 5-3) to the north-west of the town for long term future growth if required, however doing so will require special consideration of land drainage.
- Area 'C' (Figure 5-3), known as 'Clay Hill' should not be considered for residential growth, owing to the saturation of the soils, thought to be due to a large number of underground springs in the area.

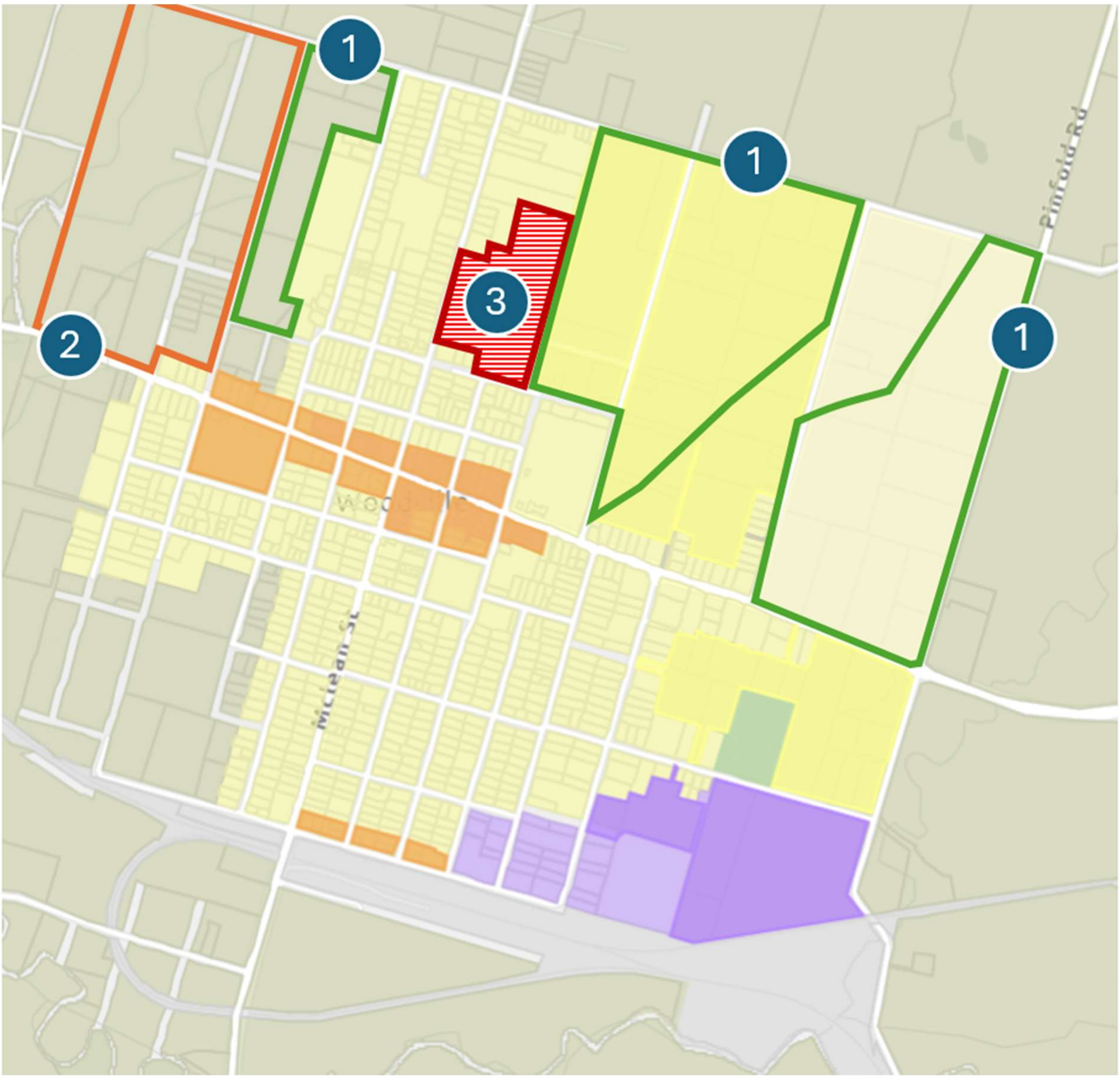


Figure 5-5: Priority Areas for Residential and Rural Residential Areas to the North of State Highway 2, Taking into Account Land Drainage Risk.

The development of infrastructure responses described in this section is based on the adoption of these recommendations.

5.2 Water Supply and Distribution

5.2.1 Existing System and Challenges

Raw water for the Woodville water supply is extracted from the Mangapapa Stream, off Foley Road. The water supply is subject to a resource consent which permits maximum extraction rates under various river flow scenarios. With aspirational growth, projected water demand will exceed the low to very low river extraction limits, which may necessitate investment in storage or greater demand management into the future.

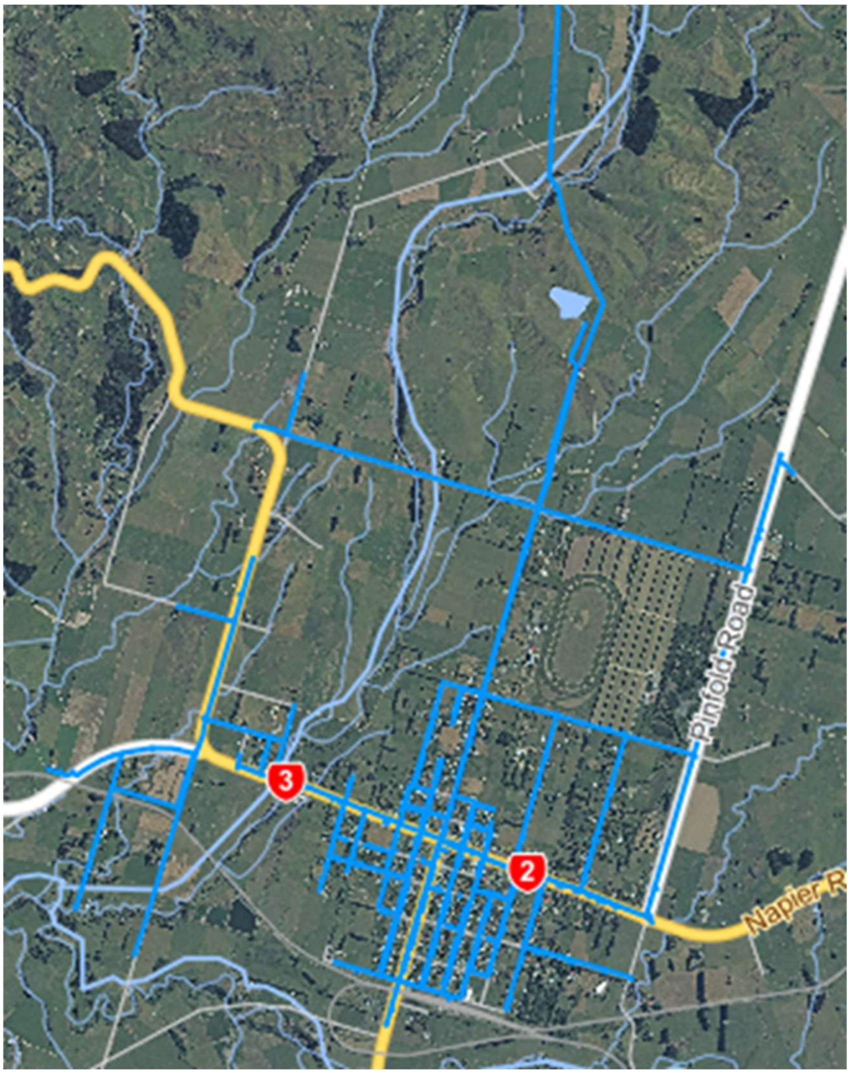


Figure 5-6: Overview of Woodville water supply, Tararua GIS 2024.

The raw water gravitates from hill country to a raw water storage facility, from which it is treated, to the north of the town. The water supply then gravitates to the township via a trunk main.

The existing network appears to have been sized for urban development much larger than has occurred, which generally means that capacity is not a major issue. However, the pipe network is approximately 100 years old, meaning that age-related issues with its ongoing operation may necessitate substantially greater renewals into the future.

Based on previous investigations for water supply master planing, and subsequent discussion with TDC's three waters team, the following key issues have been identified. A brief assessment has been made of how growth may impact these challenges, which has to some degree informed options development to serve new population growth, as reported later.

Table 5-1: Summary of identified key issues for Woodville Water Supply, and Distribution Scheme.

Key Issue / Challenge	How Growth May Impact this Issue
Raw water supply needs to be supplemented with additional take during low river flows, new groundwater sources are needed to achieve this.	May worsen as demand further increases.
Analysis shows there is a moderate percentage of non-revenue water (29%) in the distribution network.	New connections should be accounted for and billed, so the percentage of non-revenue water is likely to decrease. However, given the investment needed to upgrade the scheme the TDC needs to reduce non-revenue water by minimizing leaks, and ensuring all users who should be billed are.
30km of pipe length requires replacement due to end-of-life criteria (16km) and insufficient pipe capacity (14km).	Growth places additional demand on ageing and undersized pipes which are unable to meet desired flow capacity and have increased risk of faults.
There are isolated pockets of low-pressure areas associated with locations at high elevations and the whole network fails to meet FW2 and FW3 fire flow requirements.	May further exacerbate this issue as demand on the system increases, further reducing pressure and available flow for firefighting.
Reservoirs have daily turnover rates of less than 10%, lower than the required standard of 70% to maintain good water quality.	May improve this issue owing to higher demand / turnover of water.
Water age issues at dead end mains and where there is flow equilibrium within the network, i.e., where flow from both directions meet and so form a stagnant area.	May improve this issue owing to higher demand / turnover of water.

5.2.2 Water Supply and Distribution Options

SOURCE WATER SUPPLY

Previous investigations have been undertaken to identify alternative or supplementary bore water sources for Woodville. It is recommended that alternative sources are considered in a wider review of options, including but not limited to:

- **Demand side management** – this involves the implementation of universal water metering to reduce overall water demand in a way that allows capacity for growth and may avoid the need for a new source.
- **Additional storage** – as either raw water or treated water storage, to manage dry weather periods.

These options should be considered as part of TDC's wider strategic planning process where demand side versus supply side options are to be considered. These will consider growth as this is a requirement of the Water Service Delivery Plan expected to be delivered by TDC in the coming year.

WATER RETICULATION

New Growth Areas

The new growth areas are predominantly located at extremities of the existing town where water networks do not currently exist, or where they do, are either undersized or very old, meaning that they are unlikely to be fit for purpose.

Based on the analysis undertaken, and Rationale's understanding of the existing challenges, the only viable option identified is to install new trunk mains around the perimeter of the existing town that support new growth areas. A schematic of this is shown in Figure 5-7. This would involve:

- A new trunk main connected to and heading the east of the existing main supply main, and then tracking along existing road corridors around the east / north of the town, to service residential, rural residential and industrial growth along the eastern side of the town. It would connect into the existing network at State Highway 2 to form a ring main from the east to service new and existing water supplies.

- A trunk main connected to and heading the west of the existing main supply main and then tracking south past the proposed new industrial growth zone to the west of town. It would connect into the existing network at State Highway 2 to form a ring main from the west to increase resilience.

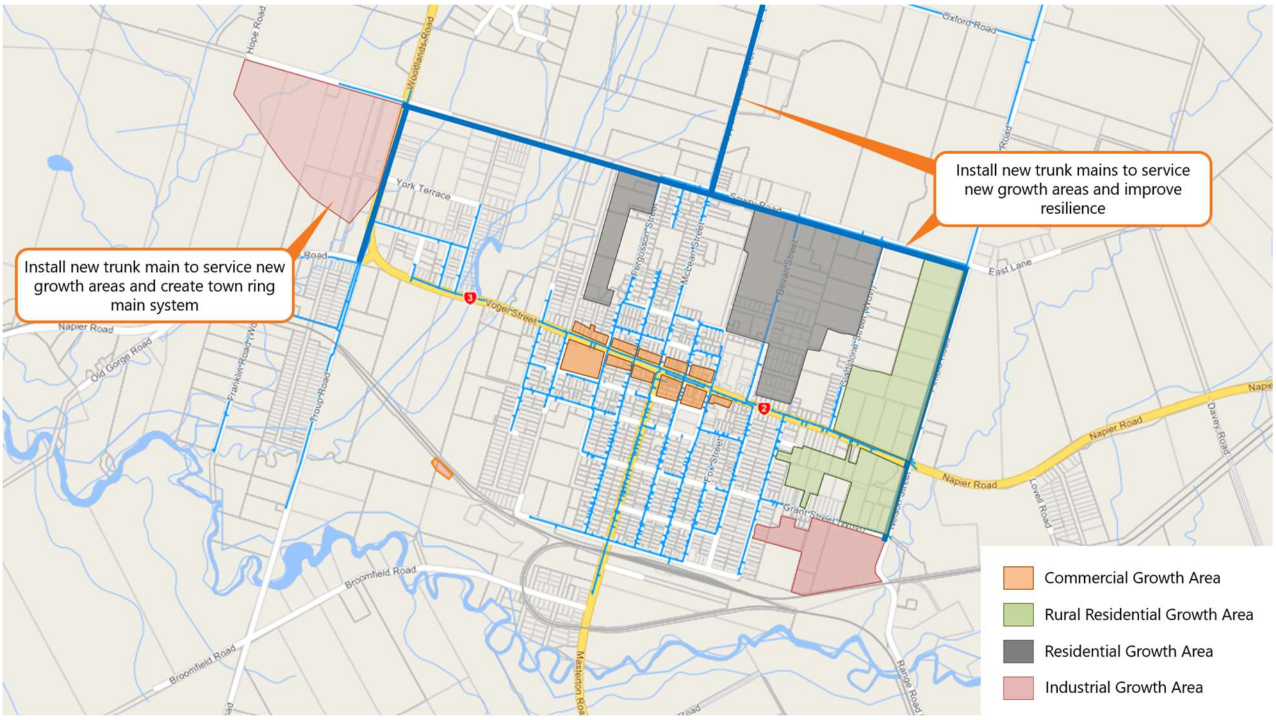


Figure 5-7: Proposed new water supply trunk mains to serve new growth areas in Woodville.

INFILL

While no indication of the extent of residential infill growth has been provided, it is nonetheless expected. Previous water supply modelling in the masterplan identifies moderate to high intensity growth within existing residential areas, so to some degree this has been accounted for in previous analysis, and informs future renewals and upgrades programmes provided in the masterplan.

We recommend that TDC adopt a process for evaluating development proposals with respect to their impact on existing water supply zones by:

- Utilising available existing modelling, create a map of current 'at risk' eater supply zones owing to current level of service challenges (for example, low pressure zones). This can be used to guide early decision making on infill development by identifying extreme risk areas where infill would create significant risk.
- Evaluate all infill proposals based on a water model analysis of additional flow through to supply the new development.

5.3 Wastewater Collection and Treatment

5.3.1 Existing System and Challenges

The wastewater collection system for Woodville was first established in 1905, and at present 50% of the network was constructed prior to 1920s and comprises earthenware pipes. The system entirely relies on gravity to drain flows from the north-east to the south-west, where the current two-stage oxidation pond system is located.

Owing to the relatively flat grade of the town compared to the grades required for effective sewerage reticulation, many of the sewers in the southeastern area, including the trunk mains leading to the WWTP, are very deep. In order to prevent surcharging of the network, a pump station was established at the head of the WWTP to enable flows to be lifted so that the WWTP pond levels do not impact the upstream network. This has not been operating and is due to be refurbished and restarted to alleviate these surcharging issues.

The network is susceptible to very high I&I, particularly in winter. Approximately 20% of the reticulation has been relined to reduce this however I&I remains a high contributor both from the public and private network. In winter, groundwater infiltration is estimated to make up more than 60% of dry weather flow due to high groundwater levels relative to sewer depth.

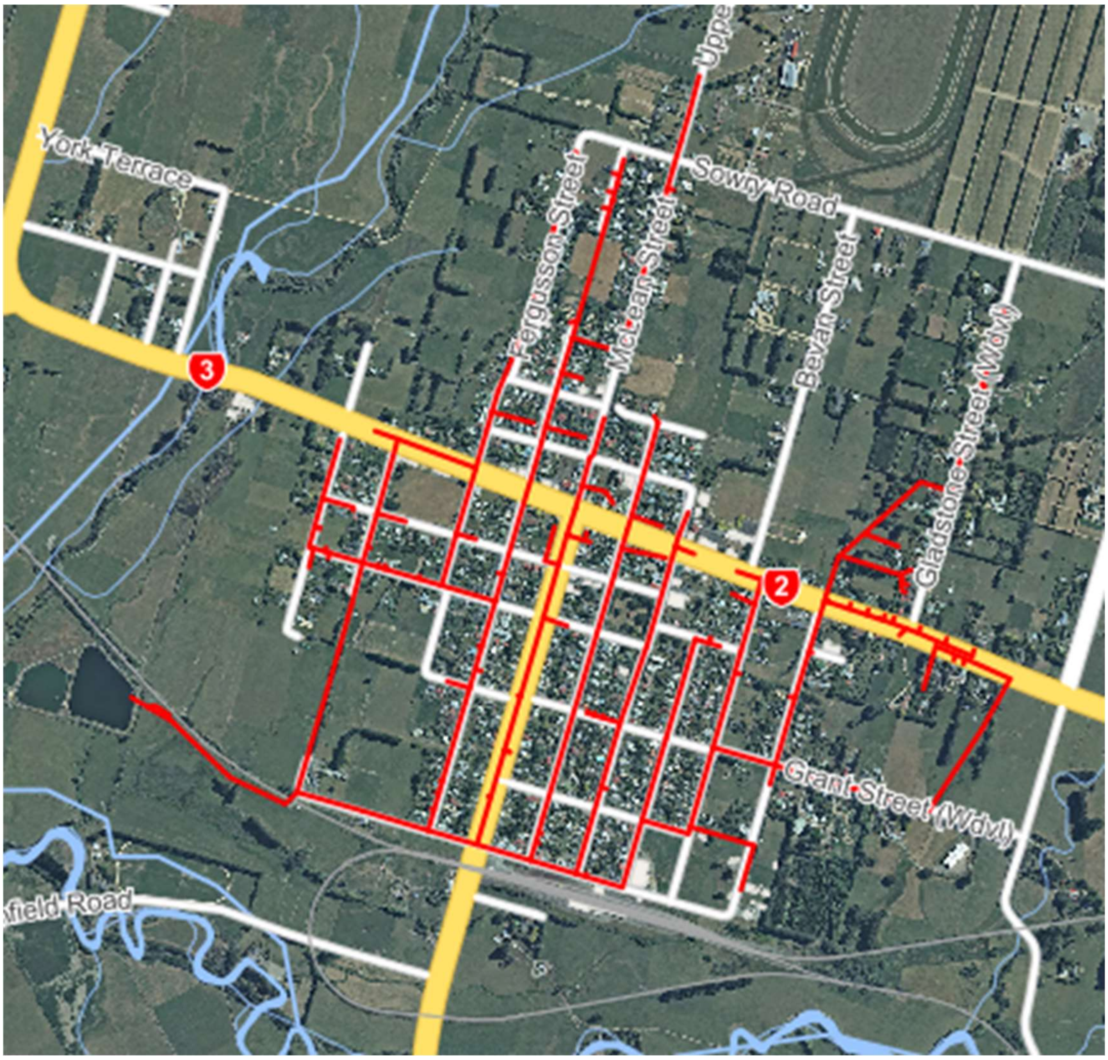


Figure 5-8: Overview of the Woodville Sewerage System, Tararua GIS 2024.

Options need to be investigated to upgrade the WWTP so that it is fully compliant with current conditions. Future consent conditions are likely to require further upgrades, particularly to meet tightening ammonia / nitrogen limits.

Based on previous investigations for wastewater master planning, and subsequent discussion with TDC's three waters team, the following key issues have been identified. A brief assessment has been made of how growth may impact these challenges, which has to some degree informed options development to serve future population growth, as reported later.

Table 5-2: Summary of identified key issues for Woodville wastewater collection, treatment and discharge.

Key Issue / Challenge	How Growth May Impact this Issue
I&I (ingress of stormwater via rooftops, private drains and via manholes) increases wastewater inflows during and after storm events.	Potential for additional flows due to growth to worsen the issue.
Ageing reticulation, particularly earthenware pipes, is a limiting factor in the ability for the network to accommodate additional growth.	Growth places additional demand on ageing pipes which are unable to meet desired capacity and have increased risk of faults.
Overflows during rainfall events from sewer main upstream of the headworks due to shallow cover and grade and backwater from the WWTP.	Potential for additional flows due to growth to worsen the issue.
It is likely that land disposal of treated effluent will be required in the future or more stringent requirements will be put on a surface water discharge. The cost of doing so may be exacerbated by high inflow & infiltration (I&I) volumes.	Additional flows will increase treatment and land disposal costs further.

5.3.2 Wastewater Collection and Treatment Improvement Options

NEW GROWTH AREAS

Based on the location of the new residential growth areas at the extremities of the existing town, two key options have been identified for wastewater collection and treatment. These are:

- **Option 1 – centralised wastewater collection and treatment:** maintain the existing WWTP as the centralised WWTP and connect all new residential growth areas to this via extension of or new networks.

  As previously noted, a critical challenge for the existing sewerage network is to reduce I&I flows so that future WWTP upgrades are limited in scope and cost. There is an opportunity when planning new networks to consider how to future-proof new networks from causing additional I&I, while also taking opportunities to upgrade existing networks to reduce I&I.

  One of the dominant sources of I&I is thought to be groundwater intrusion, likely caused by poorly joined pipes and cracked pipe sections, especially in areas with very high groundwater levels which create a driving head for groundwater to enter the sewerage network. While newly constructed sewerage infrastructure will naturally perform better, in time increases in I&I can be expected due to environmental factors such as ground movement and tree root invasion. The best way to manage this is to utilise shallow sewerage networks that are at or above groundwater level, thereby reducing the risk of groundwater intrusion. This can be achieved by:

  - Installing localised gravity networks with relatively short pipe runs that remain shallow and discharge to sub-catchment pump stations. The pump stations then discharge to the gravity sewer mains to the WWTP.
  - Installing pressure sewer systems whereby individual properties (or clusters of properties) are fitted with dedicated pump stations to collect wastewater. The feeder pipes from each pump station that discharge to centralised collector pipes can then be very shallow.

  Installing pressure sewer systems also provides two additional advantages. Firstly, when used to connect existing properties, it enables any inflow from cross connections (for example, roof rainwater connections) to be removed from the system, thereby reducing the inflow component of I&I. Secondly, it could enable the existing gravity system to be re-purposed as a stormwater drainage system. Following recent relining of part of Woodville's sewerage network, localised surface flooding in the vicinity was identified to be exacerbated, presumably because the sewers were previously acting to drain away groundwater.

On that basis, it is recommended that a strategy be adopted to:

- Require all new developments within new growth areas to adopt a pressure sewer system approach for which TDC would need to develop guidelines and for which the infrastructure costs would be borne by the developer. As part of this, TDC would need to identify specific sewer trunk mains to which the pressure sewer systems would discharge. Addressing I&I within these trunk mains and/or replacing the existing trunk mains can be considered as part of an overall sewer renewals programme by TDC.
- Convert converting existing sub-catchments to pressure sewer systems. The approach taken will depend on how TDC would appropriate cost for these new systems. If a phased approach is undertaken, the most prudent approach is to likely migrate existing residential areas close to new developments to pressure sewer systems first, and progressively work outwards to capture all existing residential areas.

* **Option 2 – de-centralised collection and treatment.** This would involve creating new networks (pressure sewer networks, as described above) within each local area which discharge to localised (package type) WWTPs. These in turn would require their own treated wastewater discharges to either surface water or land-based disposal systems (if achievable).

An assessment of the options is provided in the table below, based on the criteria previously described above.

Table 5-3: Evaluation of options for wastewater system upgrades to support growth areas in Dannevirke.

Evaluation Criteria	Option 1 – maintain centralized system with new pressure sewer systems	Option 2 – de-centralized wastewater schemes
Achievability	4 – Relatively low barriers to achieving	2 – High barriers to achieving
Capacity and capability	4 – Relatively low barriers to achieving	2 – High barriers to achieving
Affordability	1 – Potentially very high cost	2 – High cost
Added benefit	5 – Very high added benefit	5 – Moderate
Overall Assessment (ranking of options):	1st	2nd

In summary, the assessment of these options has identified that while Option 1 will likely create the highest cost burden (depending on how the infrastructure is funded) and it is likely to be most achievable because new resource consents would not be required for the activity (it is questionable whether new treated wastewater discharge consents could be achieved for Option 2). Further, Option 1 would resolve current I&I challenges which would bring significant long-term benefit in terms of appropriately managing wastewater treatment and discharge from the existing sewerage network. On that basis, Option 1 is preferred.

NEW RURAL RESIDENTIAL GROWTH AREAS

New rural residential growth areas, which are assumed to be developed as lifestyle blocks, may be more amenable to decentralised systems whereby individual properties install on site wastewater treatment and disposal systems. A key factor here may be the high groundwater and whether or not the soils are suitable for this activity. Alternatively, these properties could be connected to the centralised system via pressure sewer systems, as for new residential areas as described above. Without substantial investigations to determine the proposed option, it is assumed that rural residential properties would be connected to the centralised system as described above.

INDUSTRIAL GROWTH AREAS

The extent of new sewerage infrastructure required to support industrial growth areas will depend on the type of industries located at each site. Wet industries are likely to require more substantial wastewater treatment facilities. In any case, the proposed new industrial area west of Woodville will require a dedicated sewerage collection system owing to its relatively long distance from the existing network. It is assumed that this would be then connected to the existing WWTP (rather than construct a decentralised WWTP, owing to the reasons outlined above). Given the significant scale of the proposed new development, it is assumed that as part of development, any new wastewater collection and transfer systems required would be a developer-led cost. A similar approach can be taken for the industrial areas located at the south-eastern side of the town.

COMMERCIAL GROWTH AREAS

It is assumed that commercial growth will connect into the existing sewerage network given its proximity to the network for existing commercial and residential areas.

Figure 5-9 provides a summary overview of the preferred scheme for wastewater collection and treatment for Woodville, based on the analysis described above.

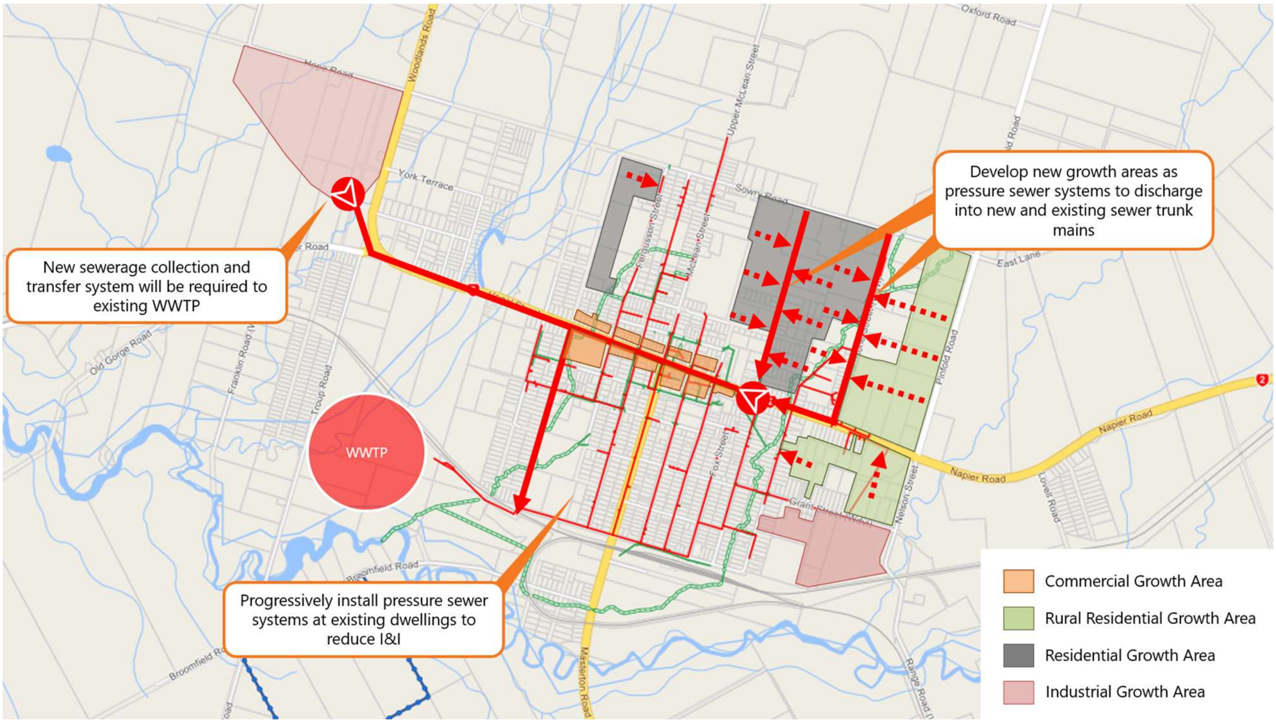


Figure 5-9: Proposed option for wastewater collection and treatment to service new growth and existing developments in Woodville.

5.4 Stormwater Management

5.4.1 Existing System and Challenges

Stormwater within Woodville is generally managed by overland flow via street infrastructure with limited pipe networks and the use of open channels / ditches to divert stormwater towards natural water courses. Pipe systems tend to be confined to localized areas particularly within the commercial central business district area and immediately surrounding residential zones. There are two main drainage channels servicing Woodville, both generally run from the north-east to the south-west, located in the western and eastern areas of the township as shown below.

One of the key features of stormwater management in Woodville is that the drainage systems flowing generally north-east to south-west are dissected by State Highway 2 and the railway line, both running in the general east-west direction. Culverts are located under each to allow stormwater to pass, however the size of these culverts is likely to be a key contributor to flooding risk. In effect, the highway and railway line, at elevation, act as surface water cut-offs and drainage under them is restricted. This has been evidenced by localised flooding north of both the railway liner and State Highway 2.

Stormwater modelling was undertaken in 2022 for the existing and future land use scenarios, finding:

- For a 10-year ARI rainfall event, in the existing scenario 65% of the network is predicted to surcharge due to either backwater conditions or limited capacity, rising to 74% for the future scenario.
- For a 2-year ARI rainfall event, in the existing scenario stormwater flow is predicted to be contained within the primary network (no surcharge or manhole overflows), however for the future scenario 65% of the network is predicted to surcharge due to either backwater conditions or limited capacity.
- The number of buildings within the 100-year future land use flood extend with a depth greater than 50mm is 484, and this is 22% more than in the existing land use scenario (396 buildings).
- The increase of affected buildings (inside a 50mm flood depth) between the 10-year and 100-year ARI rainfall events is 91 for the existing and 133 for the future land use scenarios.

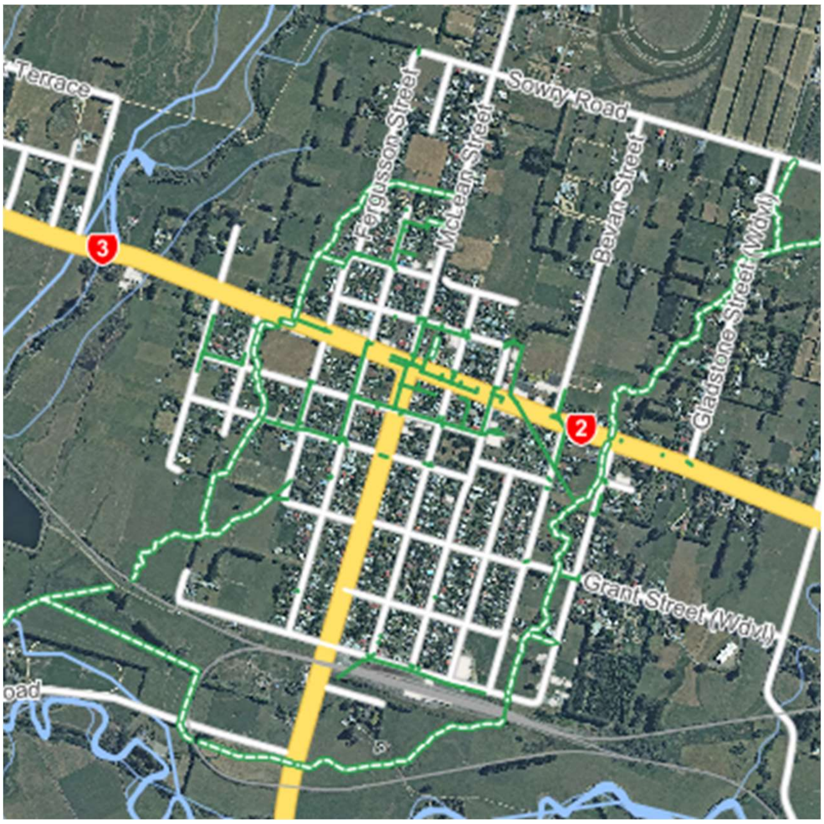


Figure 5-10: Overview of stormwater systems in Woodville, Tararua GIS 2024.

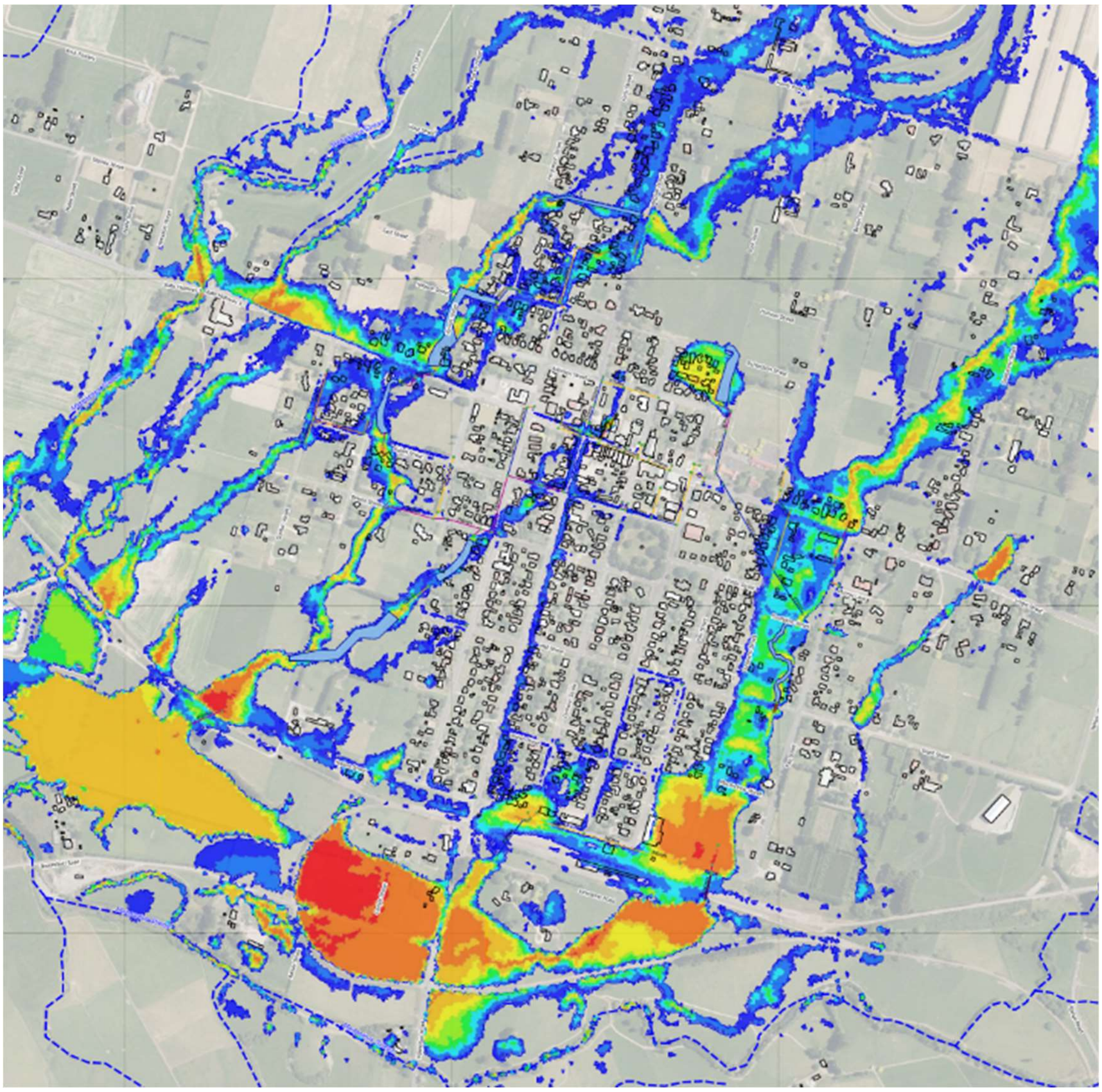


Figure 5-11: Overview of Flood Modelling in Woodville(100yr), Woods, 2022.

Based on previous investigations for stormwater master planning, and subsequent discussion with TDC's three waters team, the following key issues have been identified. A brief assessment has been made of how growth may impact these challenges, which has to some degree informed options development to serve new population growth, as reported later.

Table 5-4: Summary of Identified Key Issues for Woodville Stormwater Collection.

Key Issue / Challenge	How Growth May Impact this Issue
Existing stormwater flooding risk and future increase in risk due to climate change and land use development.	Tapping into existing networks to manage stormwater run-off from new growth areas will exacerbate surface flooding risk for existing areas.
Open drains passing through private property makes them difficult to maintain or improve.	Unlikely to make this challenge worse, however increased pressure on existing stormwater systems may accelerate need to undertake upgrades, including infrastructure in private property.
It is unlikely that additional uncontrolled discharges to natural water courses will be consented in the future, owing to increasing restrictions on freshwater management.	Additional infrastructure may be required to manage stormwater collection, especially where undeveloped areas are developed to include more impermeable surfaces.

5.4.2 Stormwater Management Options

RESIDENTIAL AND RURAL RESIDENTIAL GROWTH AREAS

As previously noted, stormwater management / drainage plays a significant role in where and how to develop growth areas in Woodville. The overarching philosophy is to 'make way for stormwater', by enabling growth in areas with lower flood risk, and creating suitable corridors for stormwater conveyance, thereby avoiding significant infrastructure costs where possible.

The key concern for stormwater management is the residential and rural residential areas north of State Highway 2, owing to the significant stormwater flow paths identified from modelling. Further, development to the north of State Highway 2 has the potential to impact existing residential areas at elevated flood risk, such as between Burgoyne and Tay Streets.

Based on desktop and site assessments, three strategic options have been identified to manage flood risk in these areas through intervention:

- **Option 1 – enhance stormwater capacity.** Under this option, stormwater infrastructure would be built to enable the enhanced discharge of stormwater from the eastern areas north of the State Highway and railway line to discharge at the south side of the township ultimately at the Manawatū River. This option was explored to some degree in the 2022 masterplans, and would involve:
    - Enlarging culverts under both State Highway 2 and the railway line, and/or installing attenuation near these culverts to reduce flooding risk in populated areas.
    - Installing large diameter stormwater mains to directly transfer stormwater from the northern areas (north of State Highway 2) down to below the railway line so that the northern areas can more freely drain without impacts on, or impacts from, the areas south of State Highway 2.
- **Option 2 – diversion of flows.** Cut off stormwater contributions from north of State Highway 2 to alleviate flooding risk south of the State Highway. Owing to topography and the location of nearby waterways to discharge the stormwater to, this is likely to involve the installation of pump station(s)to collect stormwater and lift it to the waterways to the east and west. Attenuation of flows may be required to support 'hydraulic neutrality'. This scheme would capture stormwater contributions from new growth areas.
- **Option 3 – significant attenuation scheme.** Create a significant amount of storage north of State Highway 2 and the railway line to hold back and control the discharge of stormwater under State Highway 2 and the railway line.

An assessment of the options is provided in the table below, based on the criteria previously described above.

Table 5-5: Evaluation of options for stormwater management to reduce current and future (growth contributed) flood risk in the eastern parts of Woodville.

Evaluation Criteria	Option 1 – Enhance Existing Capacity	Option 2 – Diversion of Flows	Option 3 – Significant Attenuation Scheme
Achievability	2 – Questionable technical viability	3 – Potential barriers to achieving	4 – Potential but relatively low barriers to achieving
Capacity and capability	5 – no material added complexity	3 – Moderate level of added complexity	4 – Some added complexity
Affordability	1 – Potentially very high cost	1 – Potentially very high cost	3 – Moderate cost
Added benefit	2 – Low added benefit	4 – High added benefit	3 – Moderate added benefit
Overall ranking of options	3rd	2nd	1st

On the basis of this preliminary assessment, the proposed option is option 3, to incorporate attenuation into future growth areas so that the impact of stormwater run-off from these areas, when added to existing risks, can be managed.

As indicated in , this would involve the establishment of large attenuation areas as part of future development in the residential and rural residential areas to the northwest of the town. These would be connected to a stormwater main to discharge stormwater below the railway lines, potentially utilising the existing culvert.

In other areas, stormwater attenuation should be incorporated into development plans to enable the controlled discharge of stormwater into existing drains and water courses. To improve stormwater management further, it is suggested that improvements be made to stormwater management on the western side of the CBD, including:

- Enlarging culverts to enable more effective drainage form the north side to the south side of SH2, at the existing Woodville Recreation Ground.
- Installation of new stormwater pipes underneath the Woodville Recreation Ground, to divert stormwater away from the open channel along the western side of the grounds.

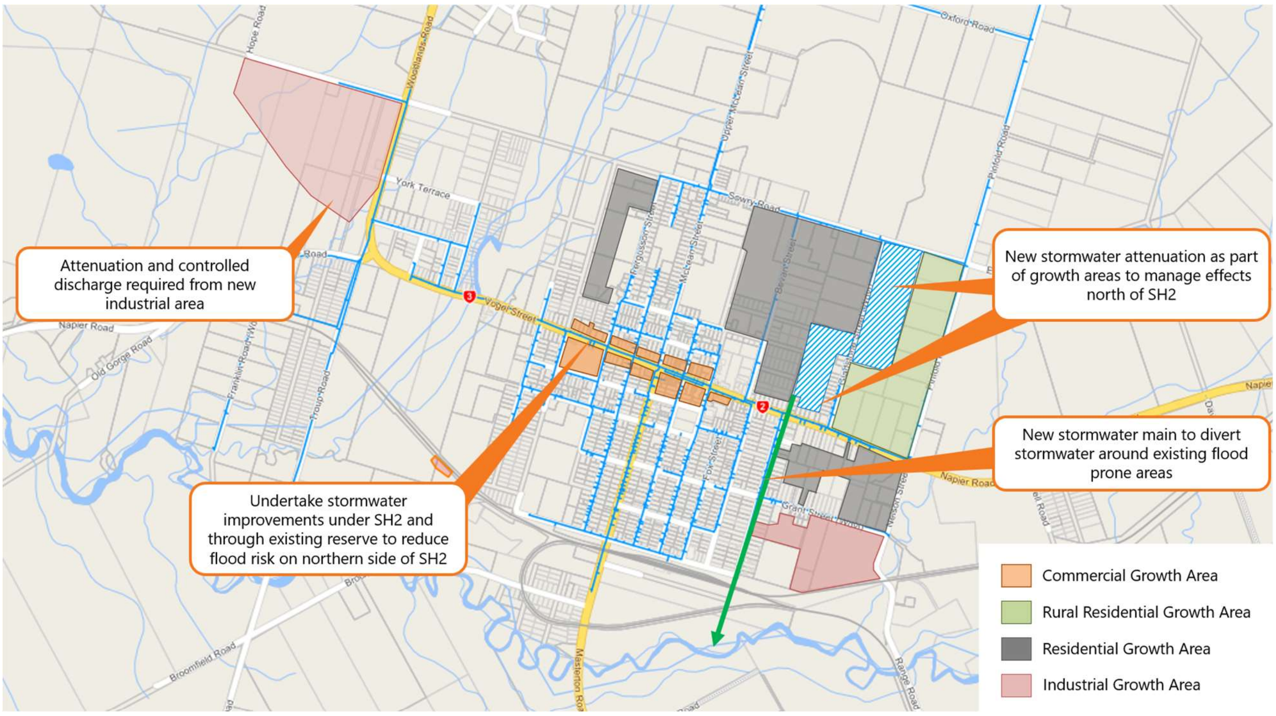


Figure 5-12: Preferred strategy for stormwater management to support new growth areas in Woodville.

WESTERN INDUSTRIAL GROWTH AREA

The western industrial growth area is located a considerable distance from any existing stormwater infrastructure, which lends itself to the establishment of a dedicated stormwater management scheme, which would likely include attenuation, potentially treatment (depending on the nature of industry) and local discharge. TDC would need to establish a policy to provide guidance on specific requirements.

SOUTH-EASTERN INDUSTRIAL GROWTH AREA

Overlaying of flood risk maps on the proposed growth areas indicates that the industrial areas located in the south-east area are entirely or partially prone to flooding to significant depths. The most south-easterly of these areas is understood to flood frequently along the southern boundary. As a minimum, attenuation and a set back from flood risk sones will be required. The remaining areas would require considerable infrastructure which is very unlikely to be economically or technically viable. In all cases a developer-led response would be required, because TDC's infrastructure would be unsuitable to support these areas (owing to topography and the technical challenges of draining these areas). On that basis, it is recommended that TDC re-consider the appropriateness of these areas for development, or as a minimum develop a policy for future development.

SUMMARY OF PROPOSED OPTIONS AND COSTS

The following table provides a summary of the proposed options to support new growth areas and provides a rough order estimate of cost of the proposed portion of infrastructure that would be provided by TDC as previously described.

Costs have been developed based on feasibility level sizing of the infrastructure required for each option, and utilising historic rates from similar projects. The estimates are provided for feasibility purposes only and should not be relied upon for detailed project planning. The estimated accuracy of the estimates provided is +/- 50%.

Table 5-6: Summary of proposed options and high level cost estimates for three waters infrastructure growth responses in Dannevirke – New Growth Areas Only.

Water Service	Proposed Option	Estimated cost, excl. GST
Water Supply	Install new trunk main water supply infrastructure around northern perimeter roads to enable growth areas	$5.4 - $9.6M
	Establish policy and technical requirements for new water supply to new industrial areas	$0.1 – $0.2M
Wastewater Collection	Install new trunk main sewer and pump stations to receive flows from growth areas to WWTP	$2.5 – $15.5M
Stormwater Management	Establish new stormwater main along Tay St, and general stormwater improvements (excludes attenuation as considered to be part of development)	$3.2 – $6.5M

6. Pahiatua

6.1 Overview of Growth Areas

The key areas of residential growth of Pahiatua are mostly to the east of State Highway 2, with residential growth areas prioritised to the north, and rural residential to hills east of town. Infill may also be expected within the existing residential area extents.

Commercial growth is planned for the existing town centre, there appears to be available buildings to allow expansion here without the need to develop new sites. A pocket of industrial is zoned for in the south-east, adjacent to the existing industrial area.

This varies significantly from previously assumed growth areas as reported in the masterplans, upon which infrastructure upgrades were assumed. An overlay of the assumed growth areas and those designated in the Urban Growth Strategy is provided in . The key differences are:

- Only a small portion of the new residential / rural residential areas identified in the Urban Growth Strategy was designated as a new development area in the masterplans.
- The masterplans presumably assumed growth would occur via infill within existing zones. No specific projections for infill have been made within the Urban Growth Strategy. For the purposes of this study, it is assumed that some infill will occur within these areas.
- No industrial land growth areas were identified in the masterplans.

In essence, this means that any infrastructure upgrade recommendations from the masterplans, other than those for infill, are unlikely to be relevant to servicing the new growth areas.

The residential growth area to the north is relatively flat, containing modified and natural open water courses, generally draining south and westwards toward the Mangatainoka River (which ultimately drains to the Manawatū River). The rural residential growth area is more undulating extending into the foothills east of town.

The greenfield nature of the residential and rural residential growth areas means there is little existing road infrastructure within these two new growth areas, though there are some rural residential (lifestyle) type properties spread through the area. The location of these areas adjacent to existing development is likely to lend itself to a staged approach progressively expanding out of town.

An industrial area has also been identified in the west of the town, at the site of the existing Fonterra facility. Discussions with TDC confirm that this will not be included for consideration in terms of further infrastructure support in this report.

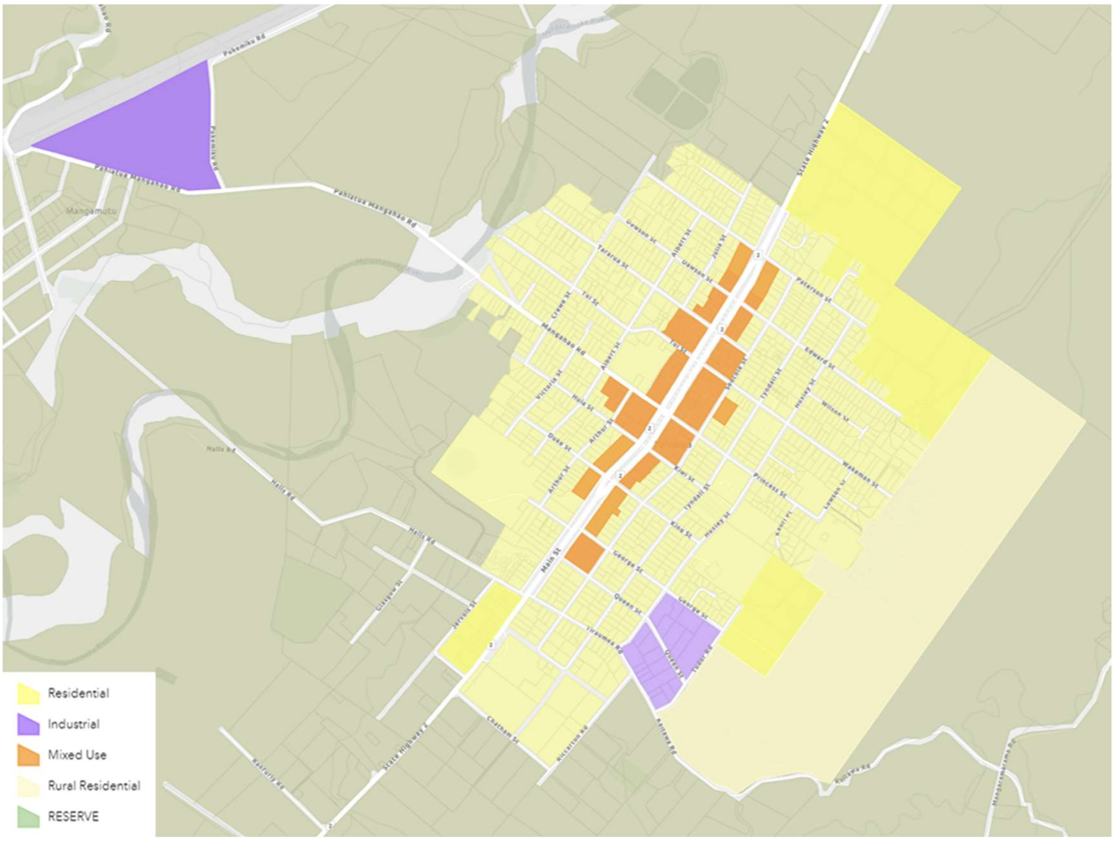


Figure 6-1: Proposed growth areas for Pahiatua.

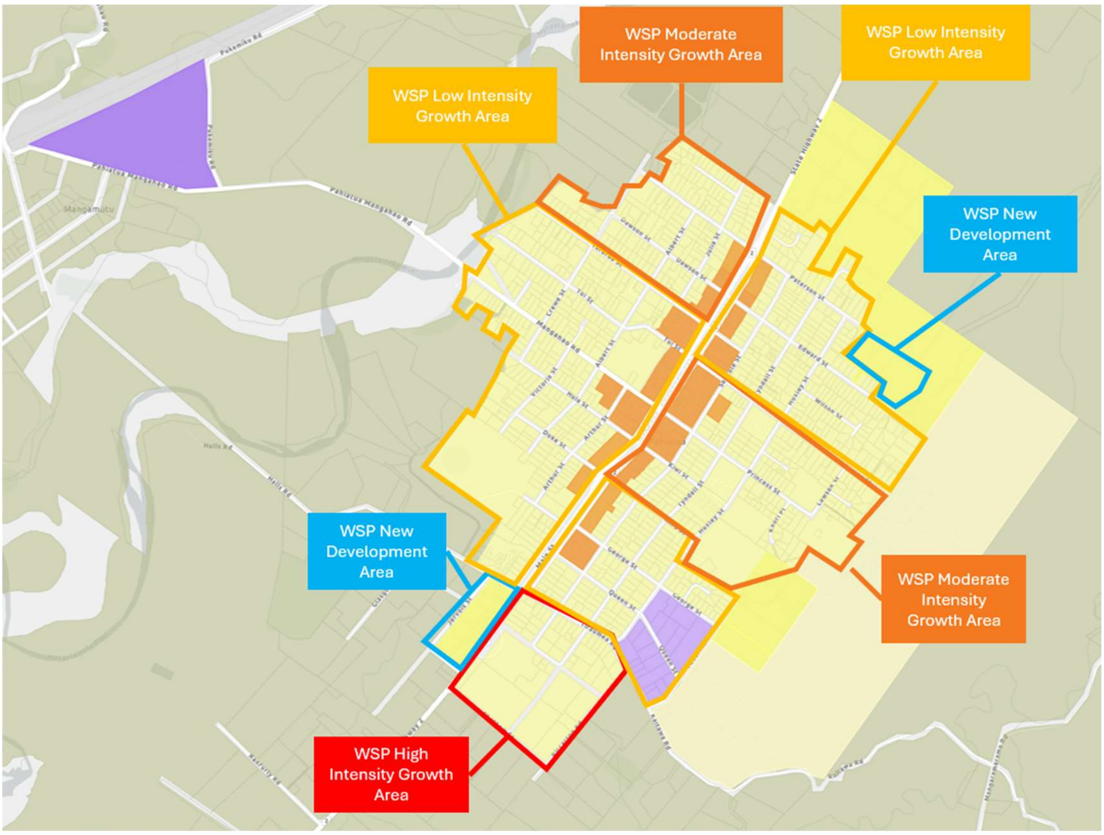


Figure 6-2: Overlay of masterplan growth areas.

6.2 Water Supply and Distribution

6.2.1 Existing System and Challenges

Raw water for the Pahiatua water supply is extracted from the Mangatainoka River at Boundary Road, which is supplemented by a bore. There are limits set to the blended pumping rates dependent on the flow in the river.

From the water treatment plant, located adjacent to the WWTP at the northwestern corner of the township, treated water is pumped to the service reservoirs which are located at elevation on the hills east of the town. Water supply to the network is provided through single outflow pipe from the reservoir complex.

Based on previous investigations for water masterplanning, and subsequent discussion with TDC's three waters team, the following key issues have been identified. A brief assessment has been made of how growth may impact these challenges, which has to some degree informed options development to serve new population growth, as reported later.

Table 6-1 Summary of Identified Key Issues for Pahiatua Water Supply, and Distribution Scheme.

Key Issue / Challenge	How Growth May Impact this Issue
Records show raw water abstraction is above consent limits.	May worsen as demand further increases.
13.5km pipe length requires replacement due to end-of-life criteria (1.5km) and insufficient pipe capacity (12km).	Growth places additional demand on ageing and undersized pipes which are unable to meet desired flow capacity and have increased risk of faults.
Analysis shows there is a high percentage of non-revenue water (34%) in the distribution network.	New connections should be accounted for and billed, so the percentage of non-revenue water is likely to decrease. However, given the investment needed to upgrade the scheme the TDC needs to reduce non-revenue water by minimizing leaks, and ensuring all users who should be billed are.
Reservoirs have daily turnover rates of less than 10%, lower than the required standard of 70% to maintain good water quality.	May improve this issue owing to higher demand / turnover of water.
The whole network northeast of SH2 fails to meet FW2 fire flow requirements, similarly to the southeast area failures are recorded. All FW3 hydrants fail fire flow requirements.	May further exacerbate this issue as demand on the system increases, further reducing available flow for firefighting.

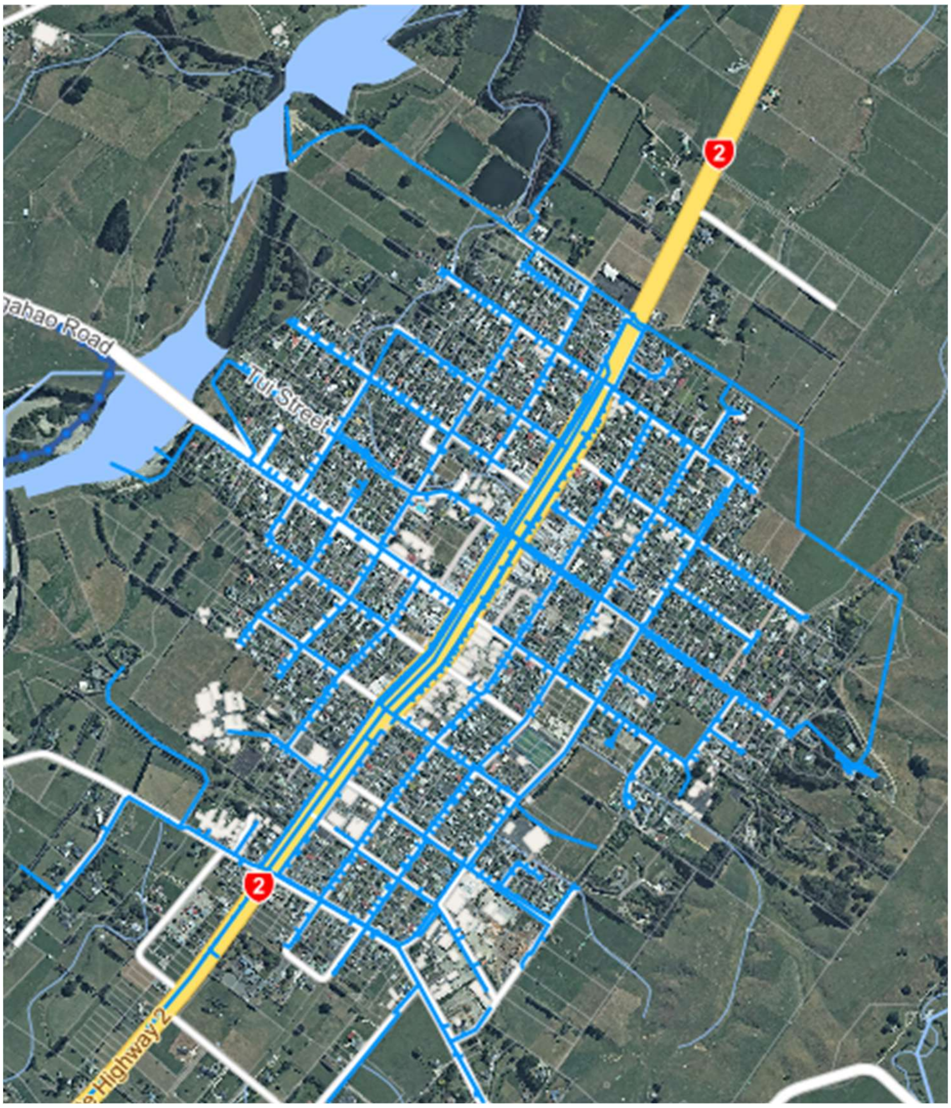


Figure 6-3: Overview of Pahiatua water supply scheme, Tararua GIS 2024.

6.2.2 Water Supply and Distribution Options

SOURCE WATER SUPPLY

Previous investigations have been undertaken to identify alternative or supplementary bore water sources for Pahiatua. It is recommended that alternative sources are considered in a wider review of options, including but not limited to:

- **Demand side management** – this involves the implementation of universal water metering to reduce overall water demand in a way that allows capacity for growth and may avoid the need for a new source. Noting the high level of non-revenue water (i.e. leaks) in the system, a demand-side approach may be of significant benefit, as it could avoid costs for new sources and/or storage.
- **Additional storage** – as either raw water or treated water storage, to manage dry weather periods.

These options should be considered as part of TDC's wider strategic planning process where demand side versus supply side options are to be considered. These will consider growth as this is a requirement of the Water Service Delivery Plan expected to be delivered by TDC in the coming year.

WATER RETICULATION

New Growth Areas

One of the key advantages of the location of the key growth areas for Pahiatua, on the eastern side of the existing town, is that they are close to the existing treated water reservoirs and trunk main. This creates the opportunity to create a new trunk main through a strategic services corridor (as indicated in the schematic further below), fed by an upgraded or duplicate trunk main from the reservoirs. The new trunk main would in turn feed service mains to growth areas.

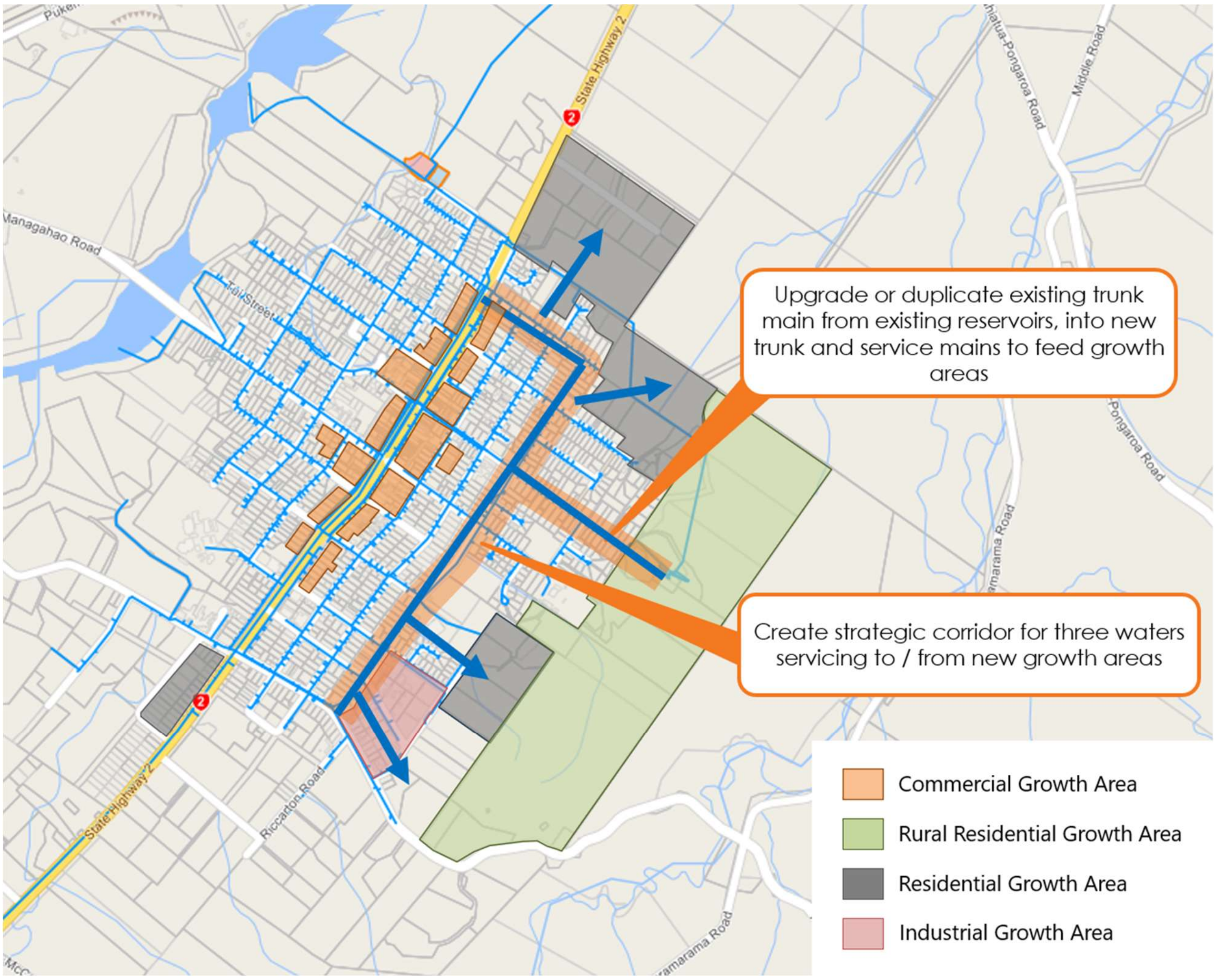


Figure 6-4: Proposed trunk main upgrades to service proposed new growth areas in Pahiatua.

INFILL

While no indication of the extent of residential infill growth has been provided, it is nonetheless expected. Previous water supply modelling in the masterplan identifies moderate to high intensity growth within existing residential areas, so to some degree this has been accounted for in previous analysis and informs future renewals and upgrades programmes provided in the masterplan.

It is recommended that TDC adopt a process for evaluating development proposals with respect to their impact on existing water supply zones by:

- Utilising available existing modelling, create a map of current 'at risk' eater supply zones owing to current level of service challenges (for example, low pressure zones). This can be used to guide early decision making on infill development by identifying extreme risk areas where infill would create significant risk.

- Evaluate all infill proposals based on a water model analysis of additional flow through to supply the new development.

6.3 Wastewater Collection and Treatment

6.3.1 Existing System and Challenges

The wastewater collection system for Pahiatua was established in the 1930's with the first oxidation ponds installed in 1974. 60% of Pahiatua's reticulation comprises of earthenware pipes, constructed prior to 1940. The reticulation is predominantly a gravity system and discharges to a three-stage oxidation pond WWTP located to the northwest of the township. To meet current compliance requirements, a DAF pre-treatment process if to be retrofitted to the existing WWTP.

Treated effluent from the WWTP discharges to the Mangatainoka River.

Figure 6-5: Overview of the Pahiatua wewerage system, Tararua GIS 2024.

Based on previous investigations for water master planning, and subsequent discussion with TDC's three waters team, the following key issues have been identified. A brief assessment has been made of how growth may impact these challenges, which has to some degree informed options development to serve new population growth, as reported later.

Table 6-2: Summary of Identified Key Issues for Pahiatua Wastewater Collection, Treatment and Discharge.

Key Issue / Challenge	How Growth May Impact this Issue
I&I increases wastewater inflows during and after storm events.	Potential for additional flows due to growth to worsen the issue.
Ageing reticulation, particularly earthenware pipes, is a limiting factor in the ability for the network to accommodate additional growth.	Growth places additional demand on ageing and undersized pipes which are unable to meet desired capacity and have increased risk of faults.
Localized capacity issues (particularly in the east of the town)	It would not be possible to service new growth areas from existing reticulation without significant upgrades.
Backwater in the wastewater system due to high water levels at the WWTP, some properties (close to proposed new development areas) struggle to drain to the public network during rainfall events. Modelling does not predict any overflows due to these backwater events.	Growth in certain locations may exacerbate the backwater issue, and there is a risk of poor wastewater flows into the public network at some locations.
It is likely that land disposal of treated effluent will be required in the future. The cost of doing so may be exacerbated by high I&I volumes.	Additional flows will increase treatment and land disposal costs further.

6.3.2 Wastewater Collection and Treatment Improvement Options

NEW GROWTH AREAS

The proposed location of the new growth areas on the eastern fringe of Pahiatua will require the development of new infrastructure for wastewater management, primarily due to capacity constraints in the eastern sub-catchments and the trunk main to the WWTP. These capacity constraints are exacerbated by I&I.

Three key options have been identified to meet growth area needs, which may contribute towards addressing the existing challenges. These are:

- **Option 1 – existing system upgrades.** Undertake upgrades to existing wastewater reticulation to address I&I and capacity constraints for new growth areas and infill. Owing to current constraints, this would likely include:
  - Area wide pipe capacity upgrades, especially in the eastern sub-catchments.
  - The installation of localised pump stations to catch parts of new growth areas in some instances where capacity upgrades cannot be readily or economically achieved.
  - The installation of a new pump station on the main trunk sewer to relieve surcharging issues.
- **Option 2 – split catchments and divert flows.** Delineate the eastern and western catchments (divided along State Highway 2) and divert flows from the eastern catchment to:
  - Enter the WWTP via an alternative trunk main utilising new pump station(s) that collect new growth area and existing flows and transfer them directly to the WWTP; or
  - Construct a second WWTP.
- **Option 3 – manage growth area flows separately**. Manage flows from new growth areas entirely separately, by collecting these and transferring them to the exiting WWTP or decentralised WWTP(s).

An assessment of the options is provided in the table below, based on the criteria previously described in Section 3.

Table 6-3: Evaluation of options for wastewater management to meet growth requirements in Pahiatua.

Evaluation Criteria	Option 1 – Existing System Upgrades	Option 2 – Split Catchments and Divert Flows		Option 3 – Manage Growth Area Flows Separately	
		Centralised WWTP	Second WWTP	Centralised WWTP	Decentralised WWTP
Achievability	5 – Highly achievable	5 – Highly achievable	2 – Potential challenges to consenting	5 – Highly achievable	2 – Potential challenges to consenting
Capacity and capability	5 – no material added complexity	4 – Low level of added complexity	3 – Moderate level of added complexity	4 – Low level of added complexity	2 Relatively high level of added vomplexity
Affordability	2 – Potentially high cost	2 – Potentially high cost	1 – Potentially very high cost	3 – Moderate cost	1 – Potentially very high cost
Added benefit	2 – Low added benefit	4 – High added benefit	5 – Very high added benefit	4 – High added benefit	4 – High added benefit
Overall ranking of options	3rd	2nd	4th	1st	5th

On the basis of this preliminary assessment, as shown in Figure 6-6, the preferred option to enable growth is to manage flows from the new growth areas in the east separately to the existing township, and transfer these to the WWTP independent of the existing network. The next best option is Option 2A, to segregate the east and west networks and transfer the eastern catchment to the WWTP separately. These options present a trade-off between likely cost and the long-term benefit of having segregated the networks.

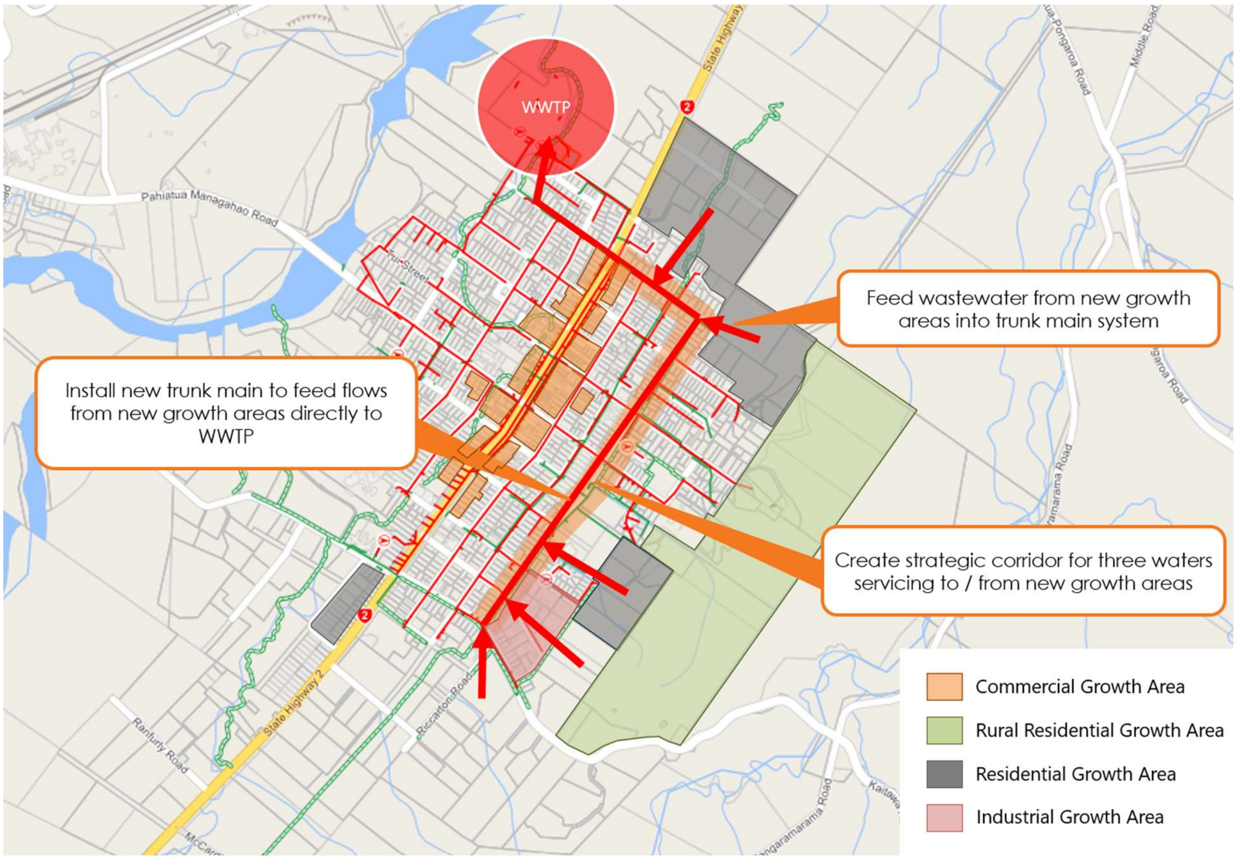


Figure 6-6: Schematic of preferred option for managing wastewater from new growth areas in Pahiatua.

6.4 Stormwater Management

6.4.1 Existing System and Challenges

Stormwater within Pahiatua is generally managed by overland flow via street infrastructure with limited pipe networks and the use of open channels / ditches to divert stormwater towards natural water courses. Pipe systems tend to be confined to localized areas particularly within the commercial central business district area and some surrounding residential zones.

There are two main drainage channels through Pahiatua, that both originate from and collect flows from rural areas south of the town. These drains then pass through the town in a generally northerly direction. Both discharge to waterways that ultimately contribute to the Mangatainoka River.

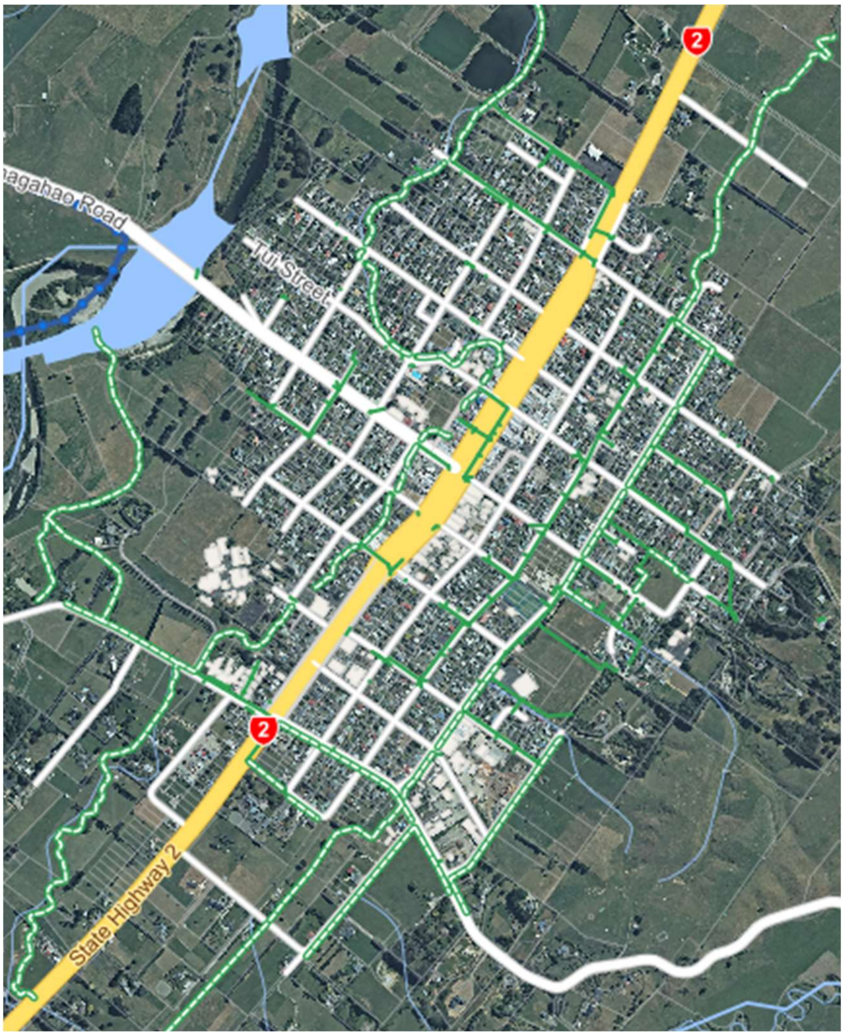


Figure 6-7: Overview of stormwater systems in Pahiatua, TDC GIS, 2024

Stormwater modelling was undertaken in 2022 for the existing and future land use scenarios, finding:

- For a 10-year ARI rainfall event, in the existing scenario 56% of the network is predicted to surcharge due to either backwater conditions or limited capacity, rising to 70% for the future scenario.
- For a 2-year ARI rainfall event, in the existing scenario stormwater flow is predicted to be contained within the primary network (no surcharge or manhole overflows), however for the future scenario 41% of the network is predicted to surcharge due to either backwater conditions or limited capacity.
- The number of buildings within the 100-year future land use flood extend with a depth greater than 50mm is 868, and this is 55% more than in the existing land use scenario (561 buildings).

- The increase of affected buildings (inside a 50mm flood depth) between the 10-year and 100-year ARI rainfall events is 322 for the existing and 341 for the future land use scenarios.

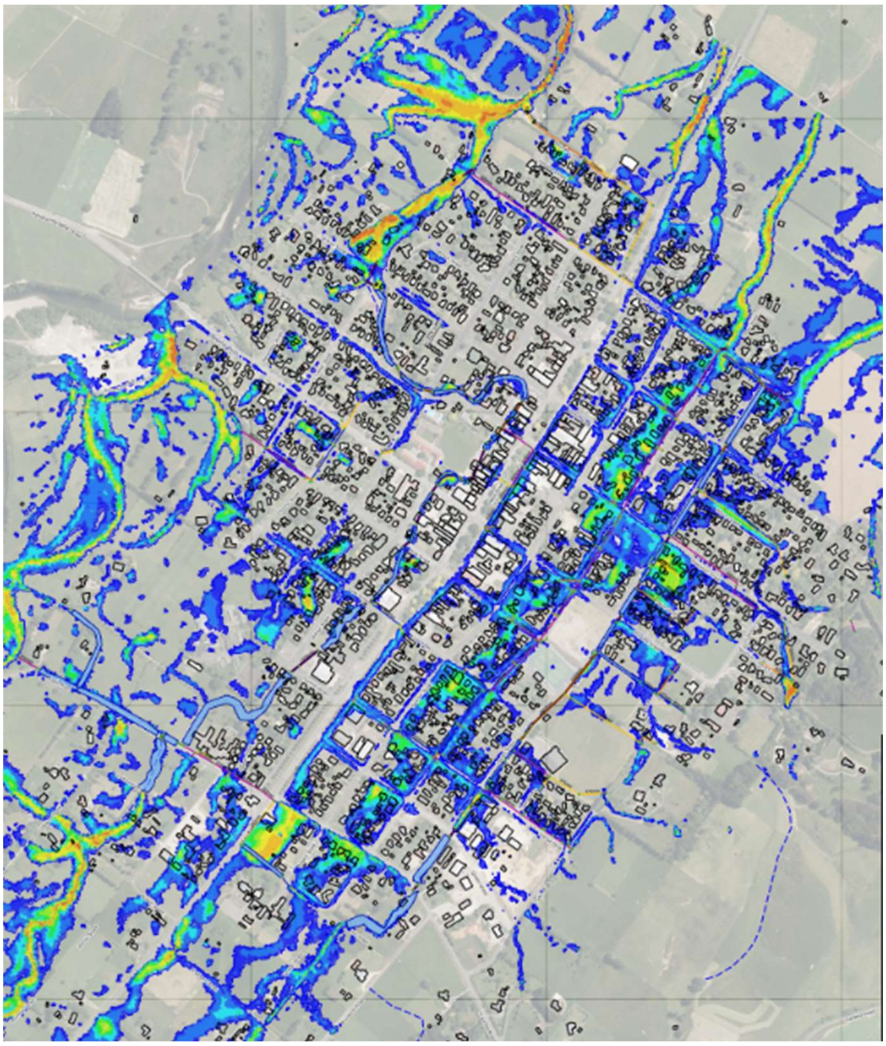


Figure 6-8: Overview of flood modelling in Pahiatua (100yr), Woods, 2022.

Based on previous investigations for stormwater masterplanning, and subsequent discussion with TDC's three waters team, the following key issues have been identified. A brief assessment has been made of how growth may impact these challenges, which has to some degree informed options development to serve new population growth, as reported later.

Table 6-4: Summary of identified key issues for Pahiatua stormwater collection.

Key Issue / Challenge	How Growth May Impact this Issue
Existing stormwater flooding risk and future increase in risk due to climate change and land use development.	Tapping into existing networks to manage stormwater run-off from new growth areas will exacerbate surface flooding risk for existing areas.
Open drains passing through private property makes them difficult to maintain or improve.	Unlikely to make this challenge worse, however increased pressure on existing stormwater systems may accelerate need to undertake upgrades, including infrastructure in private property.
It is unlikely that uncontrolled discharges to natural water courses will be consented in the future, owing to increasing restrictions on freshwater management.	Additional infrastructure may be required to manage stormwater collection, especially where undeveloped areas are developed to include more impermeable surfaces.

6.4.2 Stormwater Management Options

As can be seen in Figure 6-8, flood risk in the eastern areas where growth zones are proposed is significant. Managing this risk to enable growth will require a two-pronged approach, as follows:

1. In order to defer significant infrastructure spend, select growth zones for preferential development which do not present a significant flood risk or from which stormwater generation can be more readily managed. Areas with greater flood risk or requiring greater Council infrastructure response should be given lower priority for development.
2. Develop a long-term system to flood risk management which reduces flood risk potential on existing and future development, including infill.

Each of these approaches is described below.

1. PHASING GROWTH AREAS TO MANAGE FLOOD RISK CHALLENGES

In terms of flood risk, slightly elevated areas in the eastern area of Pahiatua present a lower risk for residential development, and should be prioritised as new growth areas in order to avoid significant Council infrastructure investment in the near term. These are the two areas marked with '1' within Figure 6-9. Even though these areas can be given high priority, flood risk still needs to be managed as follows:

- By preserving water courses within these areas to enable drainage; and
- By requiring stormwater attenuation by developers within these areas as a 'hydraulically neutral' response – i.e. not allowing peak stormwater run-off to create impacts on downstream catchments.
- Requiring elevated flood levels of new dwellings houses.

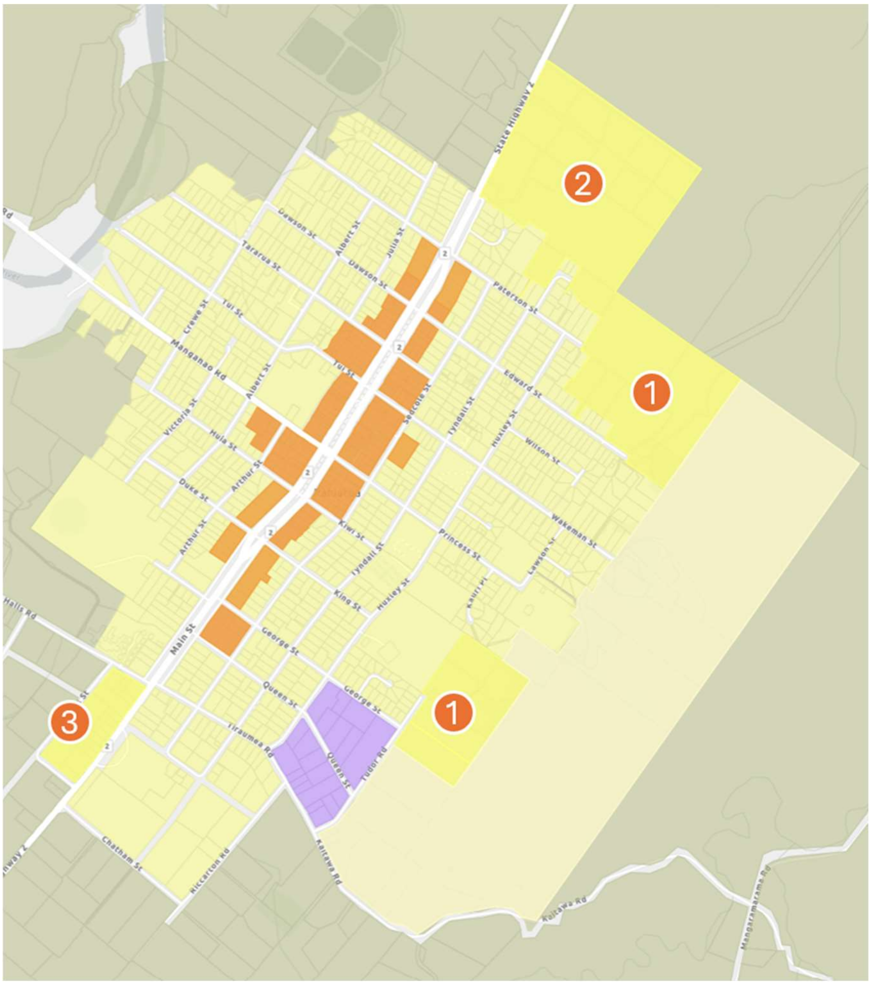


Figure 6-9: Prioritisation of Residential Growth Zones to Manage Flood Risk Challenges in Pahiatua.

A priority 2 zone for growth has been identified to the north-east of the existing town, as shown in Figure 6-9. This area is has an elevated flood risk, owing to both being lower lying and due to potential stormwater run-off from the upstream catchment, including the Huxley Street drain. The flood risk response to this area may be more complex, including consideration of how to attenuate or manage run-off from upstream areas, in addition to the mitigations noted above.

The area proposed for residential growth in the south-west has been deemed a low priority, owing to the substantial flood risk identified on flood hazard maps in this area.

2. LONG TERM FLOOD RISK MANAGEMENT

The long-term management of the substantial flood risk to enable enhanced protection of existing and new developments will require substantial new infrastructure. Analysis of previously undertaken flood monitoring and site assessments has identified that a multi-pronged approach will be required, although it may not resolve flood risk entirely. This approach is shown in the schematic further below and includes:

- Reducing or eliminating the contribution of stormwater from southern rural areas to the eastern areas of the town. This would require the existing drainage system to be 'cut off' south of the town and diverted towards the Mangatainoka River, utilising a pump station to lift flows.
- Improving stormwater conveyance through the existing drain along Huxley Street by widening or deepening it. This may require significant works in the roading corridor or private property to facilitate. Alternatively, a new pipe could be installed along Huxley Street to catch stormwater from new growth areas, however this is likely to require a new pump station at its northern end to lift flows and allow them to drain away, owing to grades.
- Creating localised attenuation within new growth areas to enable the controlled discharge of stormwater to the Huxley Street drain.
- Creating a major attenuation facility in the growth area proposed at the north-east of the town to allow controlled discharge of existing and new flows to waterway.

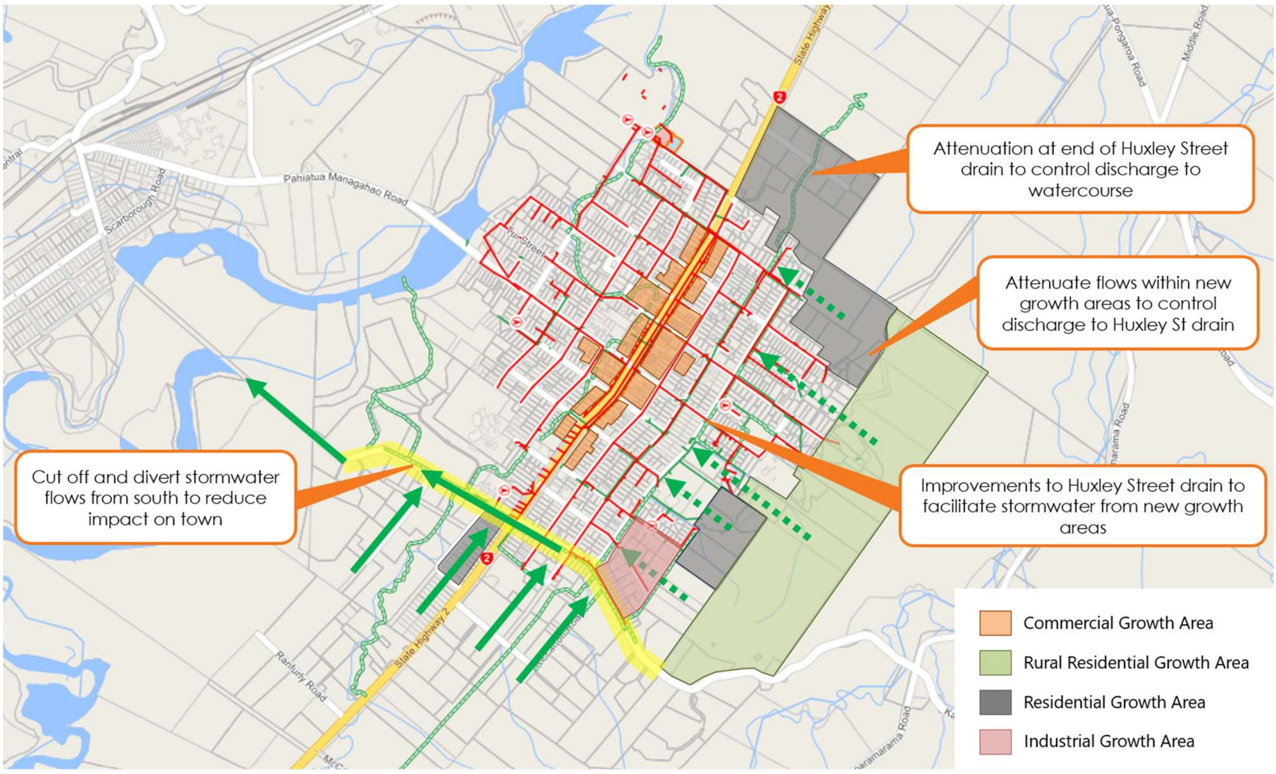


Figure 6-10: Schematic of stormwater management improvements to support growth in eastern Pahiatua.

6.5 Summary of Preferred Options and Costs

The following table provides a summary of the preferred options to support new growth areas and provides a rough order estimate of cost of the proposed portion of infrastructure that would be provided by TDC as previously described.

Costs have been developed based on feasibility level sizing of the infrastructure required for each option, and utilising historic rates from similar projects. The estimates are provided for feasibility purposes only and should not be relied upon for detailed project planning. The estimated accuracy of the estimates provided is +/- 50%.

Table 6-5: Summary of preferred Options and High Level Cost Estimates for Three waters Infrastructure Growth Responses in Pahiatua – New Growth Areas Only.

Water Service	Preferred Option	Estimated cost, excl. GST
Water Supply	Install new trunk main water supply infrastructure along Huxley Street to enable eastern growth areas.	$2.2 - $4.4M
Wastewater Collection	Install new trunk main sewer and pump station to divert flows from growth areas to WWTP	$4.9 – $7.9M
Stormwater management	Phase 1 – near term management of flood risk through prioritization of growth areas and development of technical requirements for stormwater attenuation and flood management in growth zones	$0.1 – 0.2M
	Phase 2 – Long term southern area flow diversion scheme (including 2 x pump stations)	$21.7 – $48.5M

7. Eketāhuna

7.1 Overview of Growth Areas

Due to Eketāhuna's layout residential expansion can naturally take place on the western side of the town, as well as potentially just to the northeast of the town centre. There is space within the town for accommodation of commercial and industrial activity growth, catered for through a mixed-use zone.

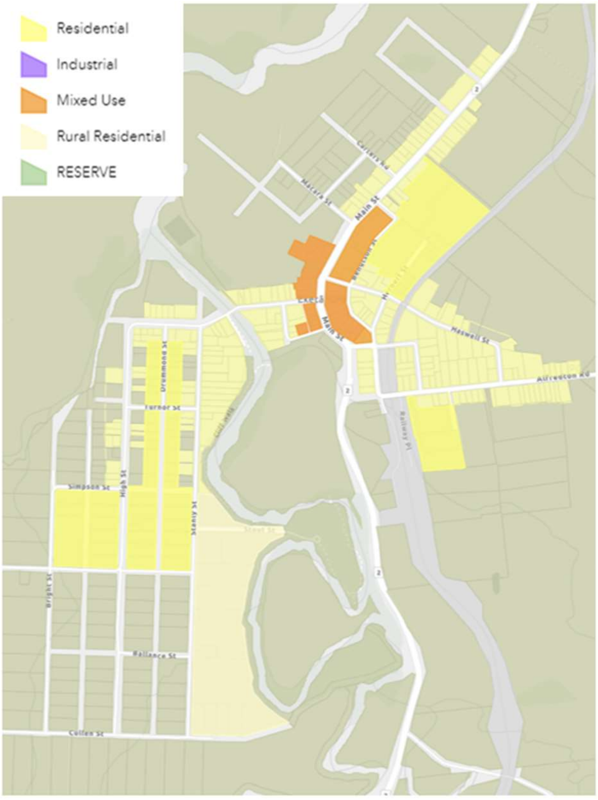


Figure 7-1: Proposed growth areas for Eketāhuna by land use type

Figure 7-2: Overlay of growth areas as reported in the Tararua masterplans

This varies significantly from previously assumed growth areas as reported in the masterplans, upon which infrastructure upgrades were assumed. An overlay of the assumed growth areas and those designated in the Urban Growth Strategy is provided. The key differences are:

- The western residential and rural residential areas identified in the Urban Growth Strategy were not designated as a new development in the masterplans.
- The masterplans assumed low to moderate group catered to via development and infill of existing residential area. No specific projections for infill have been made within the Urban Growth Strategy. For the purposes of this study, it is assumed that some infill will occur within these areas, generally at the rates set out in the WSP Water Master Plan.
- The masterplans proposed a new commercial / industrial development area to the northeast of the town centre, whereas the Draft Urban Growth Strategy proposes this area for new residential, catering to commercial / industrial via a rezoning of the existing area as mentioned.

In essence, this means that any infrastructure upgrade recommendations from the masterplans, other than those for infill, are unlikely to be relevant to servicing the new growth areas in the Urban Growth Strategy.

The residential and rural residential growth areas to the west can be described as moderately undulating, containing modified and natural open water courses, and bounded by the Mākākahi River to the east and stream to the north and west. Several roads pass (some relatively unformed) through the existing growth area with existing dwellings concentration along these roadways. The brownfields nature of the area is likely to lend development to pockets of infill, possibly of multiple dwellings from small feeder roads, rather than large scale mass development.

7.2 Water Supply and Distribution

7.2.1 Existing System and Challenges

Raw water for the Eketāhuna water supply is extracted from the Mākākahi River to a treatment plant located south-west of the town. From here water is pumped to treated water reservoirs and supplied by gravity into a trunk main that enters the local distribution network from the south and west, connecting adjacent to the proposed western growth area.

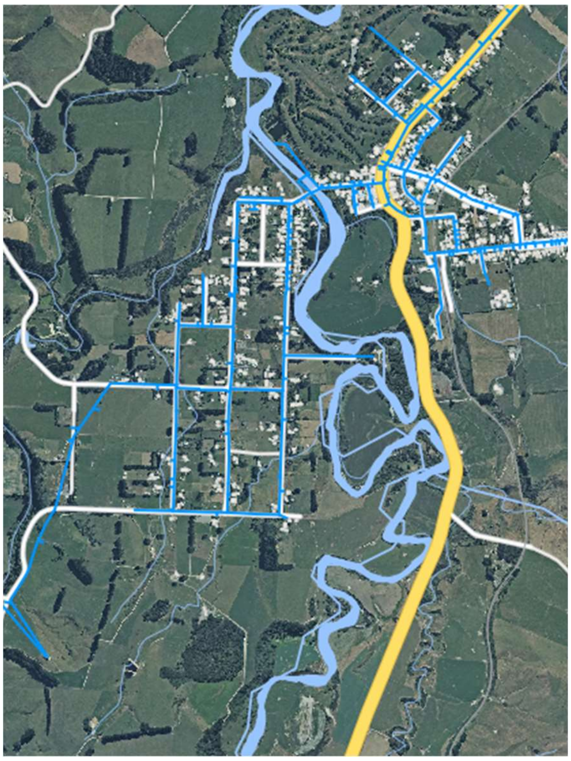


Figure 7-3: Eketāhuna water supply network, Tararua GIS, 2024

Based on previous investigations for water master planning, and subsequent discussion with TDC's three waters team, the following key issues have been identified. A brief assessment has been made of how growth may impact these challenges, which has to some degree informed options development to serve new population growth, as reported later.

Table 7-1: Summary of Identified key issues for Eketāhuna Water Supply.

Key Issue / Challenge	How Growth May Impact this Issue
The per capita consumption of water in Eketāhuna is extremely high (>1,000 per person per day. This is possibly caused by unmetered commercial connections.	Growth may put additional pressure on the water supply.

7.2.2 Water Supply and Distribution Options

Generally speaking, no significant upgrades to the water supply or distribution system are expected to service growth. As with other towns in the District, a demand-side approach to water management, by the installation of universal water metering, is likely to create additional capacity in the water supply and distribution system. This is particularly the case in Eketāhuna where per capita consumption is extremely high. Universal water metering is likely to uncover a number of commercial and rural connections that are currently unmetered, which could change behaviour towards water use for commercial purposes.

7.3 Wastewater Collection and Treatment

7.3.1 Existing System and Challenges

The wastewater collection system for Eketāhuna was established in 1943. The reticulation is a gravity system, however the catchment north of Haswell Street drains north to a pump station before being pumped south to the WWTP via a rising main along State Highway 2.

Approximately 50% of the reticulation has been relined in an effort to reduce high levels of I&I, though this continues to be a significant issue during rainfall.

The Eketāhuna WWTP is a two-stage oxidation pond located on the east bank of the Mākākahi River, discharge of treated wastewater is to the river. It is due to undergo a significant upgrade to meet current compliance requirements. This may include a high rate activated sludge or similar plant, depending on the outcomes of ongoing technical analysis.

Based on previous investigations for water masterplanning, and subsequent discussion with TDC's three waters team, the following key issues have been identified. A brief assessment has been made of how growth may impact these challenges, which has to some degree informed options development to serve new population growth, as reported later.

Table 7-2: Summary of identified key issues for Eketāhuna wastewater collection, treatment and discharge.

Key Issue / Challenge	How Growth May Impact this Issue
I&I significantly increases wastewater inflows during and after storm events. This causes the consented maximum daily volume at the WWTP be exceeded frequently during wet weather.	Potential for further development is currently limited by extremely high I&I to the network, as additional flows due to growth will worsen the issue.
Pump station (WWPS00002) capacity at Newman Road is limited, the pump is bypassed and wastewater discharges directly to the WWTP by gravity.	The diversion provides the opportunity for new growth areas to discharge to the Halswell Street wastewater reticulation.
The existing WWTP is currently not achieving consent compliance.	Although this issue is expected to be rectified before growth occurs, any additional flows will only exacerbate current compliance challenges.

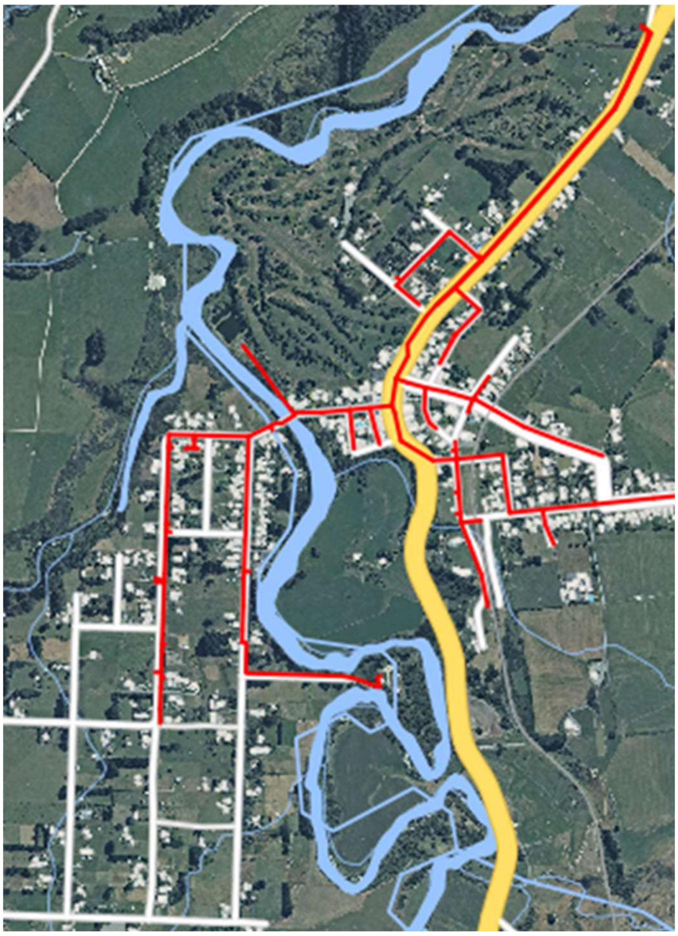


Figure 7-4: Overview of the Eketāhuna sewerage system.

7.3.2 Wastewater Collection and Treatment Options

As previously noted, a significant upgrade to the Eketāhuna WWTP is currently in the planning stages to meet current consent compliance requirements. Additional upgrades are likely within the next five years to meet future consent conditions. In relation to this, a strategy is being developed to address I&I in the town. Doing so should provide the additional capacity required to address growth. Given that this programme of work is already underway, to meet issues other than and more significant than just growth, alternative options to address growth have not been explored.

7.4 Stormwater Management

7.4.1 Existing System and Challenges

Stormwater within Eketāhuna is generally managed by overland flow via open channels / ditches along road corridors and through private property to divert stormwater to natural water courses. The Drummond Street and Bright Street open drains are the main collector drains. There are very limited pipe systems, which to be confined to localized areas particularly within the commercial central business district area, immediately surrounding residential zones, and the east to west Alfredton Road corridor.

Stormwater modelling was undertaken in 2022 for the existing and future land use scenarios, finding:

- For a 10-year ARI rainfall event, in the existing scenario 47% of the network is predicted to surcharge due to either backwater conditions or limited capacity, rising to 53% for the future scenario.
- For a 2-year ARI rainfall event, in the existing scenario stormwater flow is predicted to be contained within the primary network (no surcharge or manhole overflows), however for the

future scenario 28% of the network is predicted to surcharge due to either backwater conditions or limited capacity.

- The number of buildings within the 100-year future land use flood extend with a depth greater than 50mm is 212, and this is 23% more than in the existing land use scenario (173 buildings).
- The increase of affected buildings (inside a 50mm flood depth) between the 10-year and 100-year ARI rainfall events is 61 for the existing and 66 for the future land use scenarios.

Based on previous investigations for water masterplanning, and subsequent discussion with TDC's three waters team, the following key issues have been identified. A brief assessment has been made of how growth may impact these challenges, which has to some degree informed options development to serve new population growth, as reported later.

Table 7-3: Summary of identified key issues for Eketāhuna stormwater collection.

Key Issue / Challenge	How Growth May Impact this Issue
Existing stormwater flooding risk and future increase in risk due to climate change and land use development.	Tapping into existing networks to manage stormwater runoff from new growth areas will exacerbate surface flooding risk for existing areas.
Open drains passing through private property makes them difficult to maintain or improve.	Unlikely to make this challenge worse, however increased pressure on existing stormwater systems may accelerate need to undertake upgrades, including infrastructure in private property.
It is unlikely that uncontrolled discharges to natural water courses will be consented in the future, owing to increasing restrictions on freshwater management.	Additional infrastructure may be required to manage stormwater collection, especially where undeveloped areas are developed to include more impermeable surfaces.

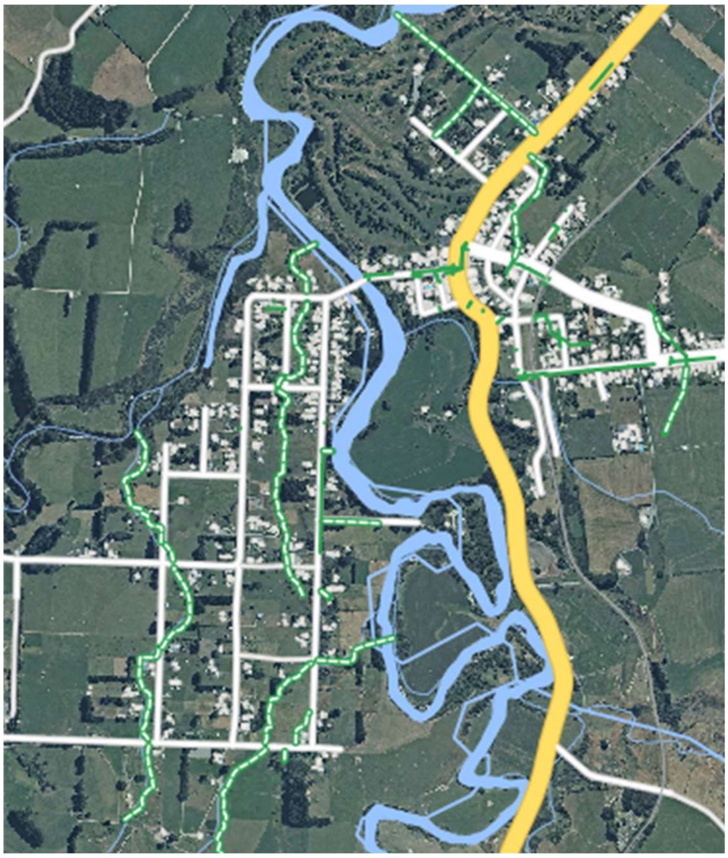


Figure 7-5: Overview of stormwater systems in Eketāhuna.

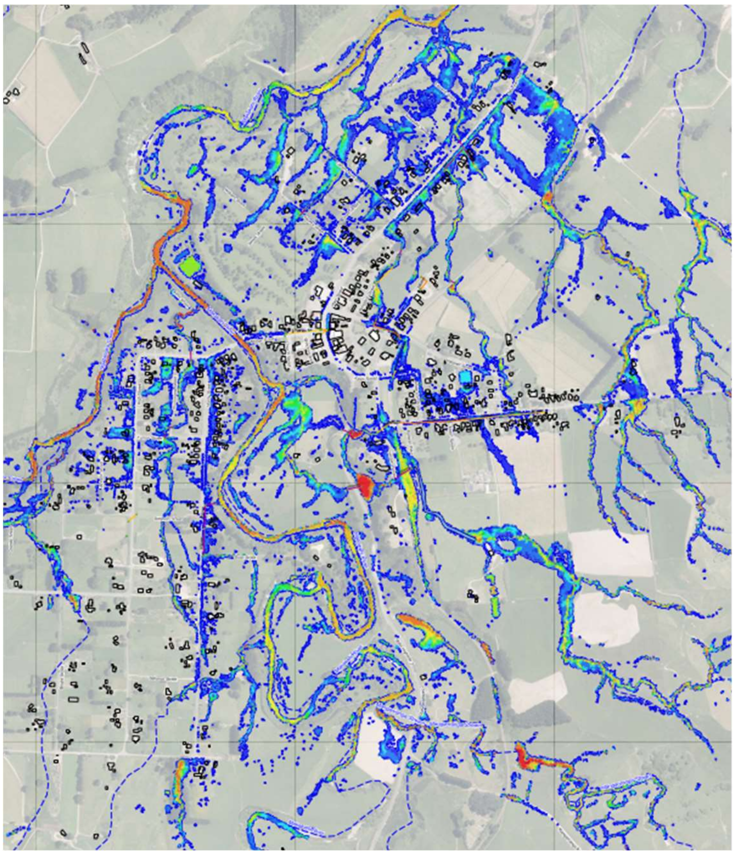


Figure 7-6: Overview of flood modelling in Eketāhuna (100yr), Woods, 2022.

7.5 Stormwater Management Options

The improvements required for the stormwater network to service new growth areas are limited, as shown in Figure 7-7 below.

Options to improve the stormwater network in order to service growth include:

- Re-alignment of the stormwater drain in the growth area to the southwest to the road corridor. This will enable better maintenance access and enable better development of this area.
- Addressing stormwater flows through the north-eastern residential growth area. This site is known to have saturated soils owing to stormwater runoff over and under the area. The solution adopted will highly depend on the nature / configuration of development at this location. It is therefore prudent to consider a developer-led approach for this area.

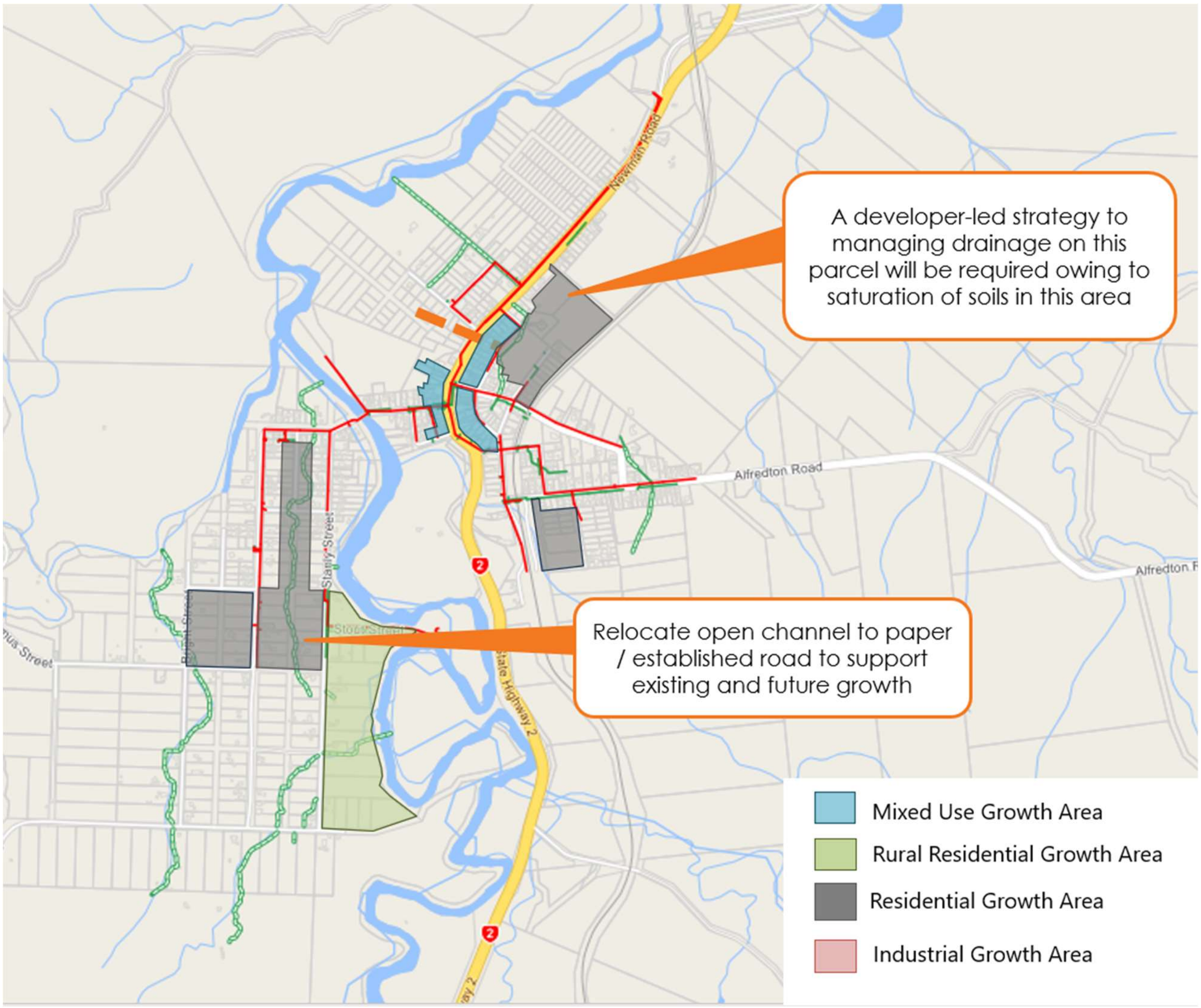


Figure 7-7: Schematic of proposed stormwater improvements to support growth in Eketāhuna.

7.6 Summary of Preferred Options and Costs

The following table provides a summary of the preferred options to support new growth areas and provides a rough order estimate of cost of the proposed portion of infrastructure that would be provided by TDC as previously described.

Costs have been developed based on feasibility level sizing of the infrastructure required for each option, and utilising historic rates from similar projects. The estimates are provided for feasibility purposes only and should not be relied upon for detailed project planning. The estimated accuracy of the estimates provided is +/- 50%.

Table 7-4: Summary of preferred options and high-level cost estimates for stormwater infrastructure to growth – New Growth Areas Only.

Water Service	Preferred Option	Estimated cost, excl. GST
Water Supply	-	-
Wastewater Collection	Wastewater system improvements	Not costed as already planned
Stormwater management	Realign existing drains – allowance	$0.7 - $1.5M

8. Development Contributions

It is recommended TDC consider development of a Development Contributions Policy. This enables Council to impose charges on developers to recover some of the capital costs incurred by Council when providing infrastructure services for the development. The purpose of such a policy is to ensure that a fair, equitable, and proportionate share of the cost of the infrastructure is funded by development.

Department of Internal Affairs (DIA) provides a template for use by Councils to develop their Policy[16], it has three main parts:

- Part 1: Policy operation
    - The charges.
    - Liability for development contributions.
    - When development contributions are levied.
    - Determining infrastructure impact.
    - Review rights.
    - Other operational matters.
- Part 2: Policy background and supporting information
    - Funding and funding policy summary.
    - Catchment determination.
    - Significant assumptions.
    - Cost allocation.
    - Development contribution calculations.
    - Future assets and programmes funded by development contributions.
    - Past assets and programmes funded by development contributions.
- Part 3: Catchment maps for the development contributions
    - Show where the development contributions in the Policy apply.

While the template provides substantial guidance for development of a Policy, TDC will require analysis to determine the district charges:

1. Agree the catchment areas.
2. Identify the past and future (30-year) assets and programmes and determine the percentage of each infrastructure investment that is to be funded by development contributions (e.g. how much of the activity is providing for growth) by activity and catchment.
3. Calculate the total cost for each activity and catchment to be funded by development contributions.
4. Calculate expected loan interest for the past and future programmes, and the portion of this to be funded by development contributions.
5. Calculate the charge per Household Unit Equivalent (HUE) for each activity for which development contributions are required. Based on the capacity life (number of years the infrastructure will provide capacity for) and associated HUEs.

[16] https://www.dia.govt.nz/diawebsite.nsf/Files/Development-contributions-policies-guide/$file/TEMPLATE-Development-Contributions-Policy.docx