TE RAPA

INTEGRATED CATCHMENT MANAGEMENT PLAN

Draft – May 2025

Hamilton City Council
Te kaunihera o Kirikiriroa

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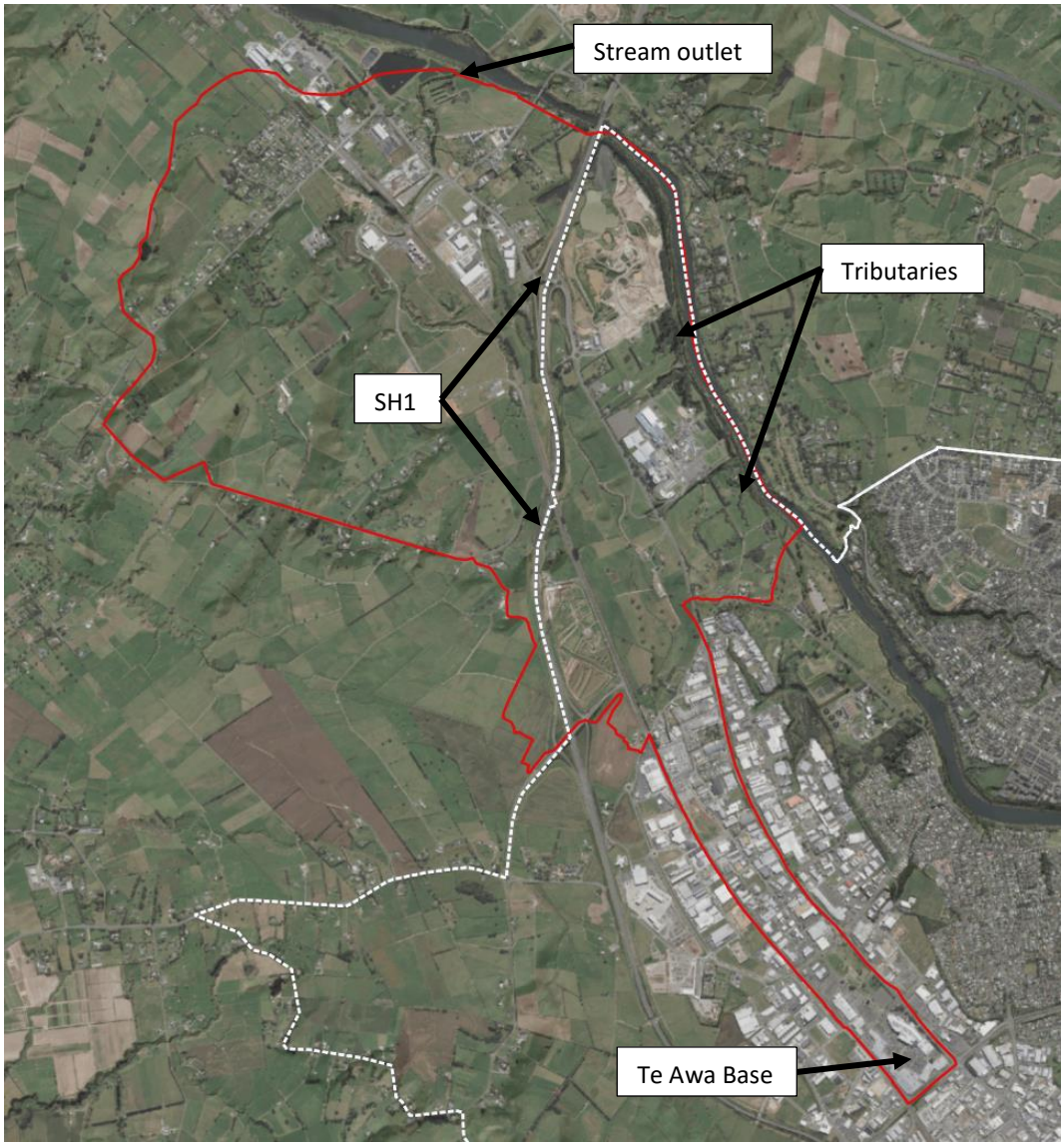
1. EXECUTIVE SUMMARY

Catchment Description

The Te Rapa Catchment is located in the north of Hamilton, on the western side of the Waikato River. The headwaters and mid-catchment are located in the Hamilton City Council (HCC) jurisdictional area with the lower portion of the catchment within the Waikato District Council (WDC) area. The Te Rapa Stream flows in a generally northerly direction, with the Waikato River confluence located approximately 400m downstream of the Horotiu Bridge.

In addition to the main Te Rapa Stream, two small ephemeral watercourses which discharge directly to the Waikato River are also included in the ICMP area.

The total area of the catchment is approximately 1,140 ha, with approximately half of this lying within the HCC jurisdictional area. A map of the catchment/ICMP area is shown in the figure below.



Te Rapa North ICMP area. ICMP area shown in red, territorial boundary in white.

Tangata Whenua Context

Te Ture Whaimana (The Vision and Strategy for the Waikato River) and iwi Environmental Plans set clear direction for the environmental outcomes the Te Rapa ICMP needs to help achieve.

In brief, the ICMP needs to set a course towards the restoration and protection of the health and wellbeing of the Stream and its receiving water, the Waikato River. To achieve this the ICMP needs to identify a solution that is sufficiently investigated and assessed to demonstrate that restoration and protection will occur if it is implemented.

This includes restoring and protecting water quality, biodiversity, and the relationship of Iwi and Hamilton residents with the Stream, protecting significant sites, and improving access to the Stream for recreation and cultural activities. It also involves tangata whenua involvement in management of development of the catchment to protect te mana o te awa in accordance with long-established tikanga.

A Cultural Values Assessment was prepapred by THaWK in 2021 to support preparation of the ICMP. This identified known archaeological sites within the Te Rapa area and sets outs the Mana Whenua aspirations for area which include supporting Mana Whenua's Kaitiakitanga over the land, application Matauranga Maori values over the environment and protection of the pre-European history held within the land.

The Te Rapa ICMP team have engaged with iwi and mana whenua around the approaches to be taken to manage the potential adverse environmental effects (such as ongoing stream erosion issues) within the catchment.

There is an expectation that all who live in the catchment will contribute to restoring and protecting the health and wellbeing of the Stream. This extends beyond simply avoiding or mitigating the adverse effects of activities to contributing towards environmental enhancement or betterment.

Issues & Outcomes

Key issues and associated outcomes form the various technical workstreams are summarized below in Table 1. These are further expanded in Section 7.

Table 1: Summary of ICMP issues and outcomes.

Issue	Mitigation	Implementation
Values: • Sites of significance to Maaori (Waahi Tapu) have been identified in the catchment. • Watercourse health and biodiversity have been degraded through land drainage and urbanisation.	• Sites of cultural significance are to be identified and protected through resource consents. • The ICMP must give effect to mana whenua values relating to freshwater as expressed in Te Ture Whaimana. • Watercourse and wetland restoration opportunities have been identified.	• At time of consent, developments apply archaeological and cultural protocols. • Watercourse restoration to be achieved through developer-led riparian planting, supported by council programme of works.
Receiving Environment: • Te Rapa Stream is prone to erosion, particularly in	• Stormwater volume management and water quality treatment are key components	• At time of consent, design parameters and means of compliance need to be achieved.

Table 1: Summary of ICMP issues and outcomes.

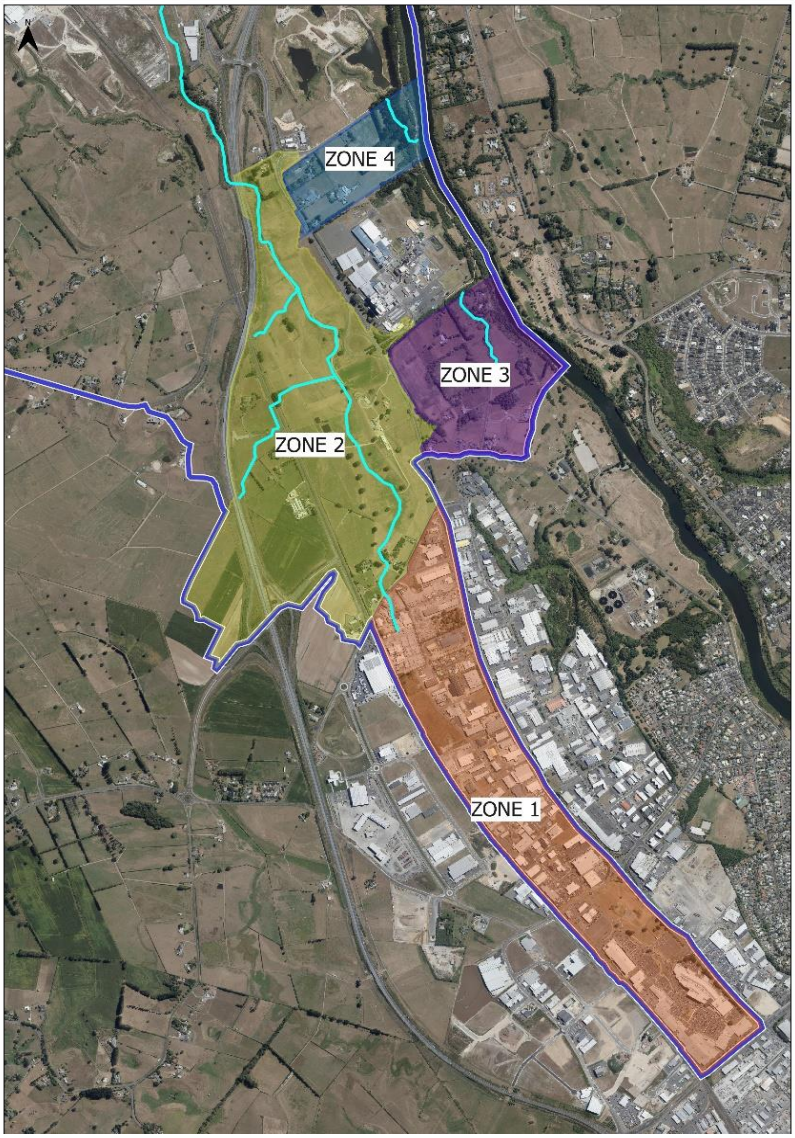
Issue	Mitigation	Implementation
downstream reaches towards the outlet. • Multiple potential freshwater wetlands have been identified within the catchment. • Existing water and habitat quality is degraded from the natural state.	of the design parameters for new development. • Potential natural wetlands are required to be identified and protected through consents. • Funding recommendations developed for HCC watercourse resilience programme.	• HCC to incorporate erosion/watercourse resilience funding recommendations through the Long Term Plan process.
Flooding & Overland Flowpaths (OLFP): • Parts of the Te Rapa Stream are relatively low capacity, so flooding will need to be managed for new development. • No engineered OLFP is present connecting existing brownfield area to the Te Rapa steam. • Network capacity in existing urban areas does not align with new design levels of service.	• Flooding controls and stormwater attenuation requirements have been incorporated into the design parameters and means of compliance. • A future project has been identified to create an OLFP connection between the Boulevard and the Te Rapa Stream.	• At time of consent, design parameters and means of compliance need to be achieved. • Future OLFP project to be implemented at time of re-development.
Hydrogeology: • Shallow groundwater likely to be present in some areas. • Excavation below the groundwater table may lead to drawdown effects. • Soakage adjacent to watercourses may lead to slope instabilities.	The means of compliance identifies groundwater monitoring & assessment requirements. Areas where soakage should be avoided are also identified.	• At time of consent, relevant hydrogeological and geotechnical investigations and monitoring is required from development.
Geotechnical: • Stability of the Waikato River bank needs to be considered for new development. • Potential liquefaction and lateral spreading risks need	Geotechnical assessment requirements have been identified and are incorporated into the means of compliance.	

Table 1: Summary of ICMP issues and outcomes.

Issue	Mitigation	Implementation
to be appropriately managed.		
Brownfield Stormwater Management: • Some existing urban areas are untreated due to being developed prior to modern stormwater management requirements. • Infill development will require on-lot stormwater management as no end-of-pipe devices exist.	• Retro-fit stormwater management opportunities have been identified & future funding estimates have been developed. • Design parameters for infill development are defined. • The means of compliance identifies preferred stormwater management measures and other development requirements.	• In-fill development to demonstrate compliance with relevant design parameters (and Means of Compliance) at time of consent. • HCC to incorporate brownfield treatment funding recommendations through the Long Term Plan process.
Greenfield Stormwater Management: • New development will need to mitigate/manage effects related to stormwater quality & quantity.	• Four (4) stormwater management zones have been identified for the catchment with best practicable treatment trains defined for each zone. Associated means of compliance and recommended supporting programme of works have been identified. • Key catchment-scale volume mitigation infrastructure has been identified.	• At time of consent, design parameters and means of compliance need to be achieved. • HCC to include stormwater management funding estimates into future Long Term Plan considerations for the Te Rapa growth cell. Developers need to collaborate on timing and funding for shared infrastructure.

Design Parameters, Best Practicable Option and Means of Compliance

The Best Practicable Option (BPO) is defined by the RMA as the best method for preventing harm to the environment. The ICMP as a whole should be considered to comprise the best practicable option. The BPO and associated means of compliance address the main issues for the catchment and meet generic and catchment specific objectives which are presented in Section 5, and design parameters, which are presented in Section 8.3. The majority of means of compliance are based on provision for growth and avoiding or otherwise minimising issues related to growth. The BPO addresses all the main issues and effects identified. Design parameters have been defined based on stormwater management zones which each have a defined stormwater treatment train. These zones are shown in the figure below. Design parameters are shown in Table 2.



Sub-catchment (SW management zones) extents

Table 2: Design Parameters

REF	Design Parameter	Sub-catchment			
		Zone 1	Zone 2	Zone 3	Zone 4
Water Quality - Devices					
1	Gross Pollutant removal	√	√	√	√
2	Water Quality - contaminant removal that complies with RITS, HCC CSDC and relevant WRC guidance.	√	√	√	√

Table 2: Design Parameters					
REF	**Design Parameter**	**Sub-catchment**			
		Zone 1	**Zone 2**	**Zone 3**	**Zone 4**
3	Water Quality – New high contaminant load surfaces (as defined by the RITS) to provide pre-treatment.	√	√	√	√
4	<25°C at the point of discharge to a waterway and water temperature change of no more than 3°C. Achieved via wetland planting over 80% of the device area or vegetated swale as per the RITS.	√	√	√	√
5	Lots with High-Risk activities require a Pollution Control Plan as per the Hamilton Stormwater Bylaw 2015, and on-lot source control and treatment.	√	√	√	√
Stream Erosion Control					
6	Retain a minimum of either 10mm or the initial abstraction volume (whichever is greater) on average across the site. This is to be achieved through a combination of reuse and soakage.	√	√	√	√
7	Match pre-development runoff volume up to the 2-year ARI event within the sub-catchment – i.e. volume control required. Preference is for this to be achieved through a centralised diversion pipeline. Where this is not achieved (such as Zones 3 & 4), mitigation within the receiving environment will be required.	√	√		
9	Extended Detention (where discharging to a stream or gully). *Note: Where volume control is being provided up to the 2y ARI event, extended detention is not required.*	√	√	√	√
Stormwater Flows (unless discharging directly to the Waikato River)					
10	Soakage of the 10 year event to be provided where soakage rates meet RITS thresholds. Soakage devices should be as far back from waterways as is practical. If 10 year soakage devices are within 20 m of the primary gully setback line, consideration shall be given to the effects on bank stability and risk of piping.	√	√	√	√

Table 2: Design Parameters					
REF	**Design Parameter**	**Sub-catchment**			
		Zone 1	**Zone 2**	**Zone 3**	**Zone 4**
11	2 Year Attenuation.	√	√	√	√
12	10 Year Attenuation.	√	√	√	√
13	100 Year Event Attenuation. (Required to be achieved at outlet of the catchment, i.e. SH1 culverts)	√	√		
Water Quality - Receiving Watercourse (achieved after reasonable mixing)					
14	Turbidity no greater than 25 NTU for stormwater discharge in a water quality storm (1/3rd of a 2year 24 hour storm).	√	√	√	√
15	No conspicuous changes in colour downstream of the discharge point	√	√	√	√
16	Dissolved oxygen greater than 80% of saturation concentration. If the concentration of dissolved oxygen in the receiving environment is below 80 percent saturation concentration, any discharge into the water shall not lower it further. (WRC Regional Plan).	√	√	√	√
17	Existing natural watercourses shall be retained and enhanced. Existing farm drains where indicated on Figure 48 shall also be maintained as open channel conveyance corridors. Re-alignment of existing drains may be appropriate where approval has been sought from HCC and WRC.	√	√	√	√
18	Riparian corridors shall be established at time of development. A minimum width of 10m from top of bank (either side of the watercourse) is required along the main Te Rapa Stream, 5m in other locations. Riparian margin widths are exclusive of any other requirements within the stream corridor (e.g. maintenance access).	√	√	√	√
Site Design					
19	Freeboard shall be based on the 100-year MPD flooding scenario (including provision for climate change).	√	√	√	√

Table 2: Design Parameters					
REF	**Design Parameter**	**Sub-catchment**			
		Zone 1	**Zone 2**	**Zone 3**	**Zone 4**
20	Floor levels shall be constructed 150mm above the 100-year flood depressions level.	√	√	√	√
21	Operation and maintenance access to stormwater assets and systems (including drains and watercourses) shall be provided in accordance with the relevant asset owners requirements – to be confirmed at time of resource consent.	√	√	√	√
22	At time of sub-division and where the relevant RMA triggers apply, esplanade reserves shall be vested to HCC. Where this conflicts with achieving practicable development layouts this can (in agreement with HCC) be reduced to the minimum riparian and operation and maintenance access requirements as specified in this table. It is expected that development layouts (and associated infrastructure) will broadly align with the central stream corridor concept shown in Figure 50.		√	√	√

2. THE MANA WHENUA STORY

Mihi

Titiro nei au ki te rangi. Kei reira ngaa whetuu o Matariki e kaanapanapa mai ana ki runga i Te Koopu Maania o Kirikiriroa hei kaainga haumaru moo te katoa. E kaha rere nei te awa tuupuna ko Waikato hei oranga tonu moo te Iwi.

E kore e ngaaro ki roto i teenei ao hou. Maa ngaa tohutohu o Ranginui raaua ko Papatuuaanuku taatou hei tiaki, me taatou anoo raaua hei tiaki. Ko te awa ko au, ko au ko te awa. He rite tonu te whakakotahitanga o te Kiingitanga ki etahi atu. He hononga oorite kotahi ki te hononga o te Kiingitanga. Paimaarire.

2.1 Introduction

This chapter outlines the story of the Te Rapa catchment from the perspective of the descendants of the Maaori who lived in the area prior to European settlement of New Zealand and exercised traditional authority over it, the mana whenua. The importance of the area to iwi extends beyond the watershed catchment, the wider area is discussed in the Cultural Values Assessment (Appendix A).

A watershed catchment is defined as water that would drain to the Te Rapa Stream or nearby to the Waikato River and this is the area for which the outcomes of this ICMP will be considered for future development.

The mana whenua story sets the scene and has major implications for this Integrated Catchment Management Plan (ICMP). Figure *1* shows cultural and archaeological sites in the Catchment.

2.2 Maaori Settlement

Today, the descendants of the original mana whenua who lived in the Te Rapa catchment affiliate to the following groups: Ngaati Maahanga, Ngaati Tamainupoo, Ngaati Wairere, Ngaati Koroki Kahukura, and Ngaati Hauaa, who all descend from Tainui waka. Each group has its own, and sometimes different, stories about its relationship with the Te Rapa catchment.[1] They are the kaitiaki (guardians) of the catchment.

The abundance of natural resources in the Hamilton basin attracted mana whenua to the area. Mana whenua obtained most of what they needed to support their material requirements from nearby bush, wetlands, the Waikato River, streams and what they could cultivate from the land. These areas provided food, rongoa (medicines) and materials for making tools, clothing, houses, fortifications, and canoes.

Mana whenua conducted many traditional spiritual ceremonies throughout the area to secure spiritual protection. These included, for example, tohi (baptisms), karakia moo te hunga maauiui (prayers for the sick), whakanoa tangata/taonga (removing tapu from people and things), te whakarite ope taua (preparing war parties) and funeral rites, including placing the bones of deceased in rua kooiwi (burial caves).

The Waikato River, streams, lakes, and extensive wetlands in the district would have teemed with life. Tuna (eels), whitebait species (inanga, banded kokopu and giant kokopu), smelt, piharau (lamprey eels), kanae (mullet – yellow-eyed and grey), paatiki (flounder), kaakahi/kaaeo (freshwater mussels) and koura (freshwater crayfish)[2] lived in one or more of these different types of water body. Some of these species are still found in the Te Rapa catchment today.

Prior to European settlement, the Te Rapa Stream ("the Stream"), Waikato River and all its tributaries in present-day Hamilton would have had very high water-quality and been mostly free of contaminants other than those occurring naturally, such as vegetation litter, sediments from stream erosion and scour, and yellow discolouration that results when groundwater rich with iron contacts atmospheric oxygen[3].

Mana whenua often built eel weirs on streams to facilitate eel trapping. A notable eel weir called Te Raratuna O Tutumua was in the gully discharging to the Waikato River between Mangaharakeke Paa and Pukete Paa. The weir's name was subsequently adopted for a local urupaa and the gully system that can be seen from Maui Street (Puke, 2004, p.6). In addition, there are accounts of Toa Kotara, a distinguished high priest, spiritual advisor, and strategist for Ngaati Tamainupoo raiding parties who had a significant Paa eel weir named Tamangane. This weir was located at the mouth of a stream flowing into the Waikato River near the Horotiu bridge and was instrumental in providing abundant catches for hapuu and was distributed to related hapuu and visitors during expeditions[4].

[1] Appendix A.1 of *Te Rapa North Cultural Values Assessment* (Te Haa o Te Whenua o Kirikiriroa, 2021)
[2] Waikato-Tainui Te Kauhanganui Incorporated, 2013, s.22.1.5, p.186
[3] The orange or rust colour is iron-oxidising bacteria, which turn ferrous iron (Fe^{2+}) into ferric iron (Fe^{3+}) to produce energy. This oxidation makes the iron insoluble, which produces a fuzzy or slimy texture. The bacteria are not harmful to humans or aquatic organisms, but may cause odour and taste issues if found in well water (Jackson, 2020)
[4] George Barrett, Oral and Traditional History Report 1-9 (Wai 775), "Korero tuku iho Tamainupo and Toa Kotara," Waitangi Tribunal

Before-European settlement, there were times of peace and times of conflict. In times of conflict, it was common for tribes to send war parties to invade other areas to settle old scores, take prisoners as slaves, or to take control of the area and its resources[5]. Consequently, the settlements were usually centred on fortified paa built in strategic positions, such as on steep-sided promontories on riverbanks or gullies, which could be fortified with a minimum of construction, and easily defended.

Fortification was achieved using heavy timber palisades and by digging trenches and building earth embankments. While some people lived within the paa, others had their homes outside the fortifications and only retreated to the paa when under attack or threatened.

By the time Europeans first visited the area in the 1830s, Maaori had extensively settled the area[6]. Many of these settlements were located on, or near the Waikato River, which served as a major transport and communication route. Taunga waka (canoe landing places) were associated with riverside settlements. An example is site S14/254 on the southern boundary of Te Rapa catchment at the river – see *Figure 1.*

2.3 European Settlement

After about 1830, European missionaries and traders began to visit Kirikiriroa (Hamilton) and other Maaori settlements in the Waikato. After 1840, tourists began to visit Kirikiriroa. They included European hunters and others keen to see the progress of agriculture, European style education and missionary endeavour.[7]

Waikato Maaori adopted European technology and farming methods introduced by missionaries and other settlers. The growing European settler population in Auckland provided a ready market for food produced in the Waikato. During the "golden years" that lasted for around 15 years between the early 1840s to the mid-1850s, many Waikato-Tainui hapuu prospered. The hapuu had extensive cultivations of kumara, potato, corn, and wheat that they processed in their own mills and traded for goods in Auckland, Tauranga and beyond.[8]

In July 1863, the Crown's military forces crossed the Mangataawhiri River and war ensued with Waikato tribes and supporters of the Kiingitanga (King movement).[9] In 1864 and 1865, military settlements, including Hamilton and Cambridge, were established.[10] In 1865[11], by Orders in Council under the *New Zealand Settlements Act 1863*, the Crown unjustly confiscated approximately 1.2 million acres of Waikato-Tainui land from the Tainui iwi in order to punish them and gain control of the land placed by them under the protection of the Kiingitanga.[12]

The Crown subsequently paid small amounts of monetary compensation and returned, but not under customary title and generally not to those who had fought for the Kiingitanga, approximately one-quarter of the land confiscated.[13]

[5] Opus International Consultants Ltd (Opus) et al, 2000, p.10
[6] Opus et al, 2000, p.1
[7] Opus et al, 2000, p.1
[8] Southern Links Tangata Whenua Working Group, 2014, p.6.
[9] *Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010*, Preamble, paragraph 5
[10] Ibid, Preamble, paragraphs 6
[11] Ibid, Preamble, paragraph 7
[12] *Waikato Raupatu Claims Settlement Act 1995*, Preamble, paragraph F.
[13] Ibid.

New settlers occupied the confiscated lands, wetlands were drained, and farms and towns developed. The development contributed to economic growth of New Zealand but resulted in the pollution and deterioration of the health of the Waikato River and significantly impacted on the fisheries and plant life of the River.[14]
Widespread suffering, distress, and deprivation were caused to the Waikato iwi because of the war waged against them, the loss of life, the destruction of their taonga and property, and the confiscations of their lands, and the effects of the Raupatu have lasted for generations.[15]

2.4 Waikato-Tainui Search for Justice

From the time of the Raupatu (confiscation), Waikato-Tainui were excluded from decision-making regarding the Waikato River.[16]However, Waikato-Tainui never willingly or knowingly relinquished their rights and interests in, or authority over, the Waikato River[17]. From the 1860s onwards, Waikato-Tainui continually sought justice for their Raupatu claim and protection for the River[18].

A Royal Commission (the Sim Commission) was appointed in 1926 to consider the confiscations under the New Zealand Settlements Act 1863 and its amendments.[19] In response to the Commission's findings and recommendations, compensation was granted pursuant to the Waikato-Maniapoto Maori Claims Settlement Act 1946 by the payment of an annual sum of money into the Tainui Maori Trust Fund, to be administered by the Tainui Maori Trust Board for the benefit of those members of the Maori tribes in the Waikato District whose lands had been confiscated.[20]

The Treaty of Waitangi Act 1975 established the Waitangi Tribunal. At first, the Tribunal could only hear claims about current government actions which meant that it could not investigate the historic claims of many tribes, including Waikato-Tainui. It wasn't until 1985 that the Tribunal could hear retrospective claims back to 1840.[21]

In 1985, the Waitangi Tribunal wrote in the Manukau Report (Wai 8) on page 17: "… all sources agree that the Tainui people of the Waikato never rebelled but were attacked by British troops in direct violation of Article II of the Treaty of Waitangi".[22]

In 1987, Waikato-Tainui lodged its claim for the unlawful confiscation of their lands.[23]

In 1989, the Court of Appeal noted that the Sim Commission's report had failed to convey "… an expressed sense of the crippling impact of Raupatu on the welfare, economy and potential development of Tainui", and that the subsequent annual monetary payments made by the Government were trivial "in present day money values" and concluded that "Some form of more real and constructive compensation is obviously called for if the Treaty is to be honoured".[24]

[14] *Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010*, Preamble, paragraph 9
[15] *Waikato Raupatu Claims Settlement Act 1995*, Preamble, paragraph G
[16] *Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010*, Preamble, paragraph 8
[17] Ibid, Preamble, paragraph 17(d)
[18] Ibid, Preamble, paragraph 16
[19] Ibid, paragraph I
[20] Ibid, paragraph J
[21] Waitangi Tribunal website, About the Tribunal, Past, present & future
[22] *Waikato Raupatu Claims Settlement Act 1995*, Preamble, paragraph K
[23] Ibid, paragraph L
[24] Ibid, paragraph N

Waikato-Tainui negotiated directly with the Crown and reached settlement of their Raupatu land claim in 1995 and their Raupatu river claim in 2008.[25]

2.5 Settlement of the River Claim

The New Zealand Parliament passed the *Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010* to give effect to the river settlement and provide redress. The overarching purpose of the settlement is to restore and protect the health and wellbeing of the Waikato River for future generations[26]. Under this Act the Waikato River includes the river's main stem, from Huka Falls to the Waikato River mouth, and all its tributaries.[27]

To Waikato-Tainui the following statement encompasses a full expression of the Waikato River:

> *The Waikato River is our tupuna (ancestor) which has mana (spiritual authority and power) and in turn represents the mana and mauri (life force) of Waikato-Tainui. The Waikato River is a single indivisible being that flows from Te Taheke Hukahuka to Te Puuaha o Waikato (the mouth) and includes its waters, banks and beds (and all minerals under them) and its streams, waterways, tributaries, lakes, aquatic fisheries, vegetation, flood plains, wetlands, islands, springs, water column, airspace and substratum as well as its metaphysical being…*[28]

Amongst other redress, the Act recognises Te Ture Whaimana o te Awa o Waikato[29] as the primary direction-setting document for the Waikato River and activities within its catchment affecting the Waikato River.[30] Te Ture Whaimana is deemed part of the Waikato Regional Policy Statement[31], and regional and district plans are required to give effect to it[32].

2.6 Te Haa o Te Whenua o Kirikiriroa aspirations

Mana whenua's ultimate aspiration is the return of this their traditional land so that they can:

- Exert their traditional kaitiakitanga (guardianship) over the land.
- Apply maatauranga Maaori values over the environment.
- Protect the centuries of pre-European history held within the land[33].

As most of the land in Te Rapa North is in private ownership, it is unlikely to be returned. Therefore, the only options available to achieve these aspirations is to:

- Mitigate any damage done to sites of significance.
- Commemorate the Maaori history of the land.
- Ensure that mana whenua values regarding the land and environment are incorporated into any development.

The history of the people who lived on these lands informs the types of mitigations, commemorations, and enhancements that mana whenua will expect to be incorporated into any proposed/planned development of Te Rapa North area. Examples of possible mitigations, along with some explanation of the reasoning underpinning their selection, and some examples of their practical implementation, are presented in Appendix E.3 of *Te Rapa North Cultural Values Assessment* (Te Haa o Te Whenua o Kirikiriroa, 2021). Some broad examples include.

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[25] *Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010*, Preamble, paragraphs 12 and 15
[26] Ibid, s.3
[27] Ibid, s.6, interpretation of "Waikato River"
[28] Ibid, s8(3)
[29] Ibid, Schedule 2
[30] Ibid, s.5(1)
[31] Ibid, s.11
[32] Ibid, s.13(4)(b)
[33] Te Haa o Te Whenua o Kirikiriroa, 2021, p.2

- Recognising the Maaori values (history, people, and environment) associated with this land and commemorating/recording it appropriately and in a way that will be recognised and understood by none Maaori.
- Protecting any/all sites of significance to Maaori (waahi tapu), and mitigating any physical damage done to these sites by any development.
- Identifying, protecting, and enhancing the environment of the area (fauna and flora on land and in the waterways).
- Protecting the Waikato River and all local waterways from any damage during and after the development phases and enhancing the water quality in the area so that it meets the Waikato-Tainui defined A+ scorecard.
- Re-establishing mana whenua's connection to the life they lived on this whenua before the confiscations.

2.7 Implications for the Te Rapa ICMP

The Te Rapa ICMP will inform any changes to the District Plan affecting the Te Rapa North area and wider Te Rapa Catchment. The Resource Management Act (RMA) requires, amongst other things, the Plan Change to give effect to Te Ture Whaimana [34] and Council, when changing the District Plan, to take the Waikato-Tainui and Ngaati Hauaa Environmental Plans and the Ngaati Tamainupoo Maatauranga and Taonga Management Plan into account[35].

Te Ture Whaimana and the Iwi Environmental Plans set clear direction for the environmental outcomes the Te Rapa ICMP needs to help achieve.

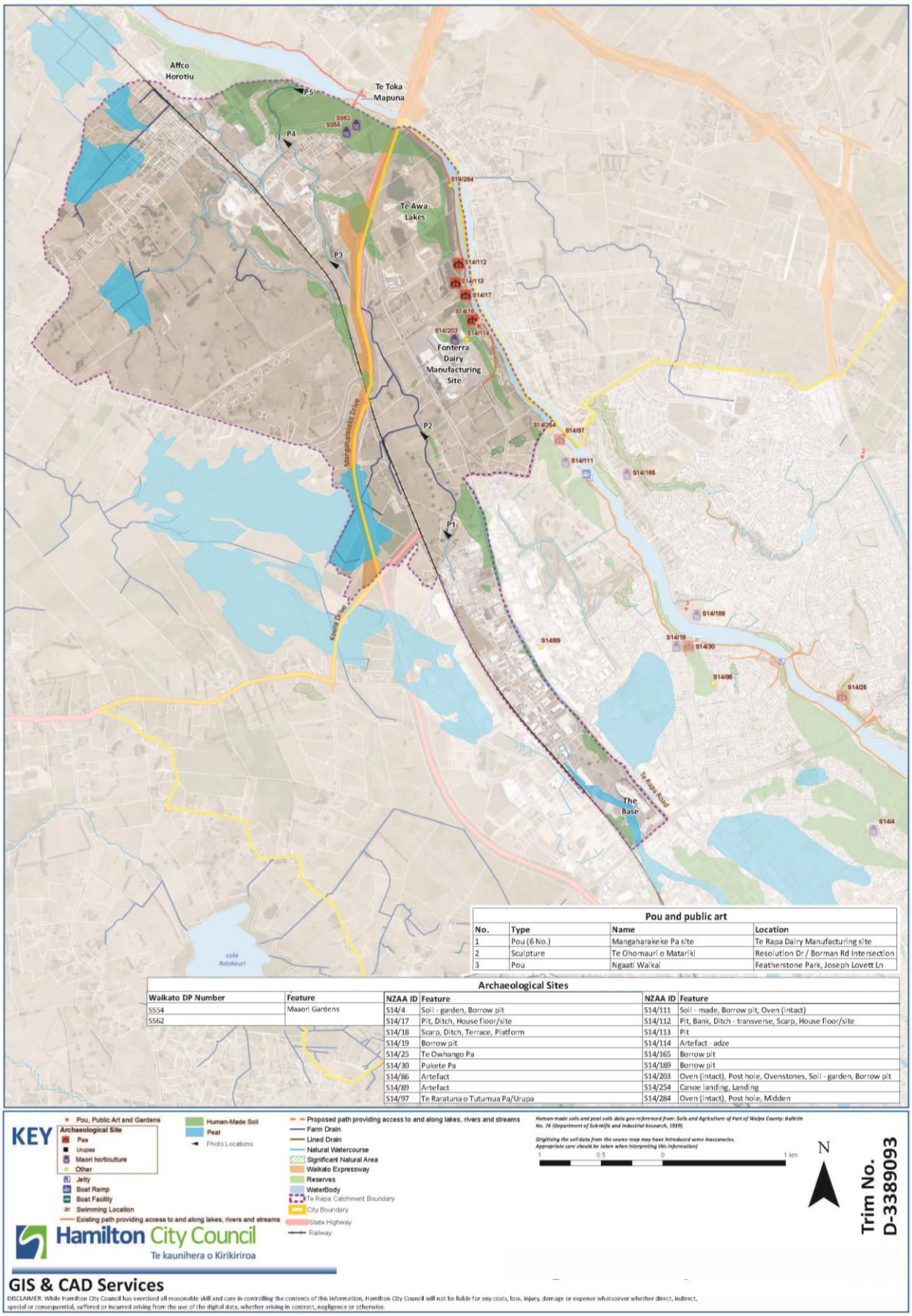
In brief, the ICMP needs to set a course towards the restoration and protection of the health and wellbeing of the Stream and its receiving water, the Waikato River. This includes restoring and protecting water quality, biodiversity, and the relationship of Waikato-Tainui and Hamilton residents with the Stream, protecting significant sites, and improving access to the Stream for recreation and cultural activities. It also includes involving mana whenua in freshwater management, including decision-making processes.[36]

There is an expectation that all who live in the catchment will contribute to restoring and protecting the health and wellbeing of the Stream[37]. This extends beyond simply avoiding or mitigating the adverse effects of activities to contributing towards environmental enhancement or betterment.[38]

The Waikato-Tainui Environmental Plan[39] identifies the state of the environment that should be aspired to is that which existed in 1863.

Whakataukii
Ko Mookau ki runga
Ko Taamaki ki raro
Ko Mangatoatoa ki waenganui.
Pare Hauraki, Pare Waikato
Te Kaokaoroa-o-Paatetere.

[34] S.75(3)(c) of the RMA
[35] S.74(2A) of the RMA
[36] S.3.4(1) of The National Policy Statement for Freshwater Management (2020, pp12-13)
[37] Vision (2) of Te Ture Whaimana
[38] Vision (3)(i) of Te Ture Whaimana
[39] Opposite p.1



Pou and public art

No.	Type	Name	Location
1	Pou (6 No.)	Mangaharakeke Pa site	Te Rapa Dairy Manufacturing site
2	Sculpture	Te Ohomauri o Matariki	Resolution Dr / Borman Rd Intersection
3	Pou	Ngaati Waikai	Featherstone Park, Joseph Lovett Ln

Archaeological Sites

Waikato DP Number	Feature	NZAA ID	Feature	NZAA ID	Feature
SS54	Maaori Gardens	S14/4	Soil - garden, Borrow pit	S14/111	Soil - made, Borrow pit, Oven (intact)
SS62		S14/17	Pit, Ditch, House floor/site	S14/112	Pit, Bank, Ditch - transverse, Scarp, House floor/site
		S14/18	Scarp, Ditch, Terrace, Platform	S14/113	Pit
		S14/19	Borrow pit	S14/114	Artefact - adze
		S14/25	Te Owhango Pa	S14/165	Borrow pit
		S14/30	Pukete Pa	S14/189	Borrow pit
		S14/86	Artefact	S14/203	Oven (intact), Post hole, Ovenstones, Soil - garden, Borrow pit
		S14/89	Artefact	S14/254	Canoe landing, Landing
		S14/97	Te Raratuna o Tutumua Pa/Urupa	S14/284	Oven (intact), Post hole, Midden

Figure 1: Te Rapa Cultural and Archaeological Catchment Features

3. PURPOSE – WHY THIS ICMP HAS BEEN PREPARED

This ICMP has been prepared for the following purposes:

1) To contribute to the overall city-wide vision that *Stormwater management accommodates growth and complies with regulatory requirements. The health and wellbeing of waterways are restored and protected, and natural hazards are minimised.*
2) To identify how potable water supply, wastewater and stormwater will be managed in the Te Rapa Catchment in an integrated way to:
    a) Comply with, or give effect to, relevant legislation, policies, plans, the Hamilton City Council's Comprehensive Stormwater Discharge Consent (CSDC #105279) and industry best practice;
    b) Accommodate urban growth and new land uses;
    c) Avoid as far as practicable, and otherwise minimise, the cumulative adverse effects of three waters activities in the catchment;
    d) Ensure that the Levels of Service (LOS) of the existing three water networks are not compromised;
    e) Optimise the use of existing infrastructure and minimise the need for new infrastructure, taking whole of life costs into account;
    f) Guide on-going decision making on management and maintenance of water, wastewater and stormwater infrastructure following full development of the Te Rapa North Growth Cell, and to allow for future connectivity to adjoining land and catchments.
3) To facilitate the process for surrender of developers' consents for diversion and discharge of stormwater associated with subdivision or development to Waikato Regional Council, following construction, and for these continuing activities to be authorised by the CSDC. Conditions 3(a), 3(c) and 30 of the CSDC provide for this to happen if all new stormwater diversion and discharge activities in developing catchments are consistent with a WRC certified Catchment Management Plan.

In fulfilling the above purposes, the ICMP sets out:

1) The environmental and cultural values of the catchment and its water bodies.
2) Objectives to achieve the above outcomes.
3) Flood hazard maps that can be used to manage development to minimise flood risks.
4) Water sensitive principles and techniques to reduce demand for potable water and minimise wastewater generation, wastewater overflows and the need for three waters infrastructure.
5) An implementation plan including capital works, maintenance and operations activities, education and encouragement initiatives and monitoring. These will inform Council's Capital Works and Operations Programmes, Long Term Plans (LTP) and Annual Plans.
6) What developers need to do to comply with the ICMP.

4. CATCHMENT DESCRIPTION

4.1 Introduction

The Te Rapa Catchment is located in the north of Hamilton, on the western side of the Waikato River. The headwaters and mid-catchment are located in the Hamilton City Council (HCC) jurisdictional area with the lower portion of the catchment within the Waikato District Council (WDC) area. The Te Rapa Stream flows in a generally northerly direction, with the Waikato River confluence located approximately 400m downstream of the Horotiu Bridge, within the Horotiu AFFCO New Zealand site.

In addition to the main Te Rapa Stream, two small ephemeral watercourses which discharge directly to the Waikato River are also included in the ICMP area.

The total area of the catchment is approximately 1,140 ha, with approximately half of this lying within the HCC jurisdictional area. A map of the catchment/ICMP area is shown in Figure 2.

For the purpose of this ICMP, the Te Awa Lakes area immediately south of the Waikato Expressway (WEX) and the Fonterra Dairy Factory have not been considered in development of future stormwater solutions. Both areas drain directly to the Waikato River and are covered by separate stormwater discharge consents.

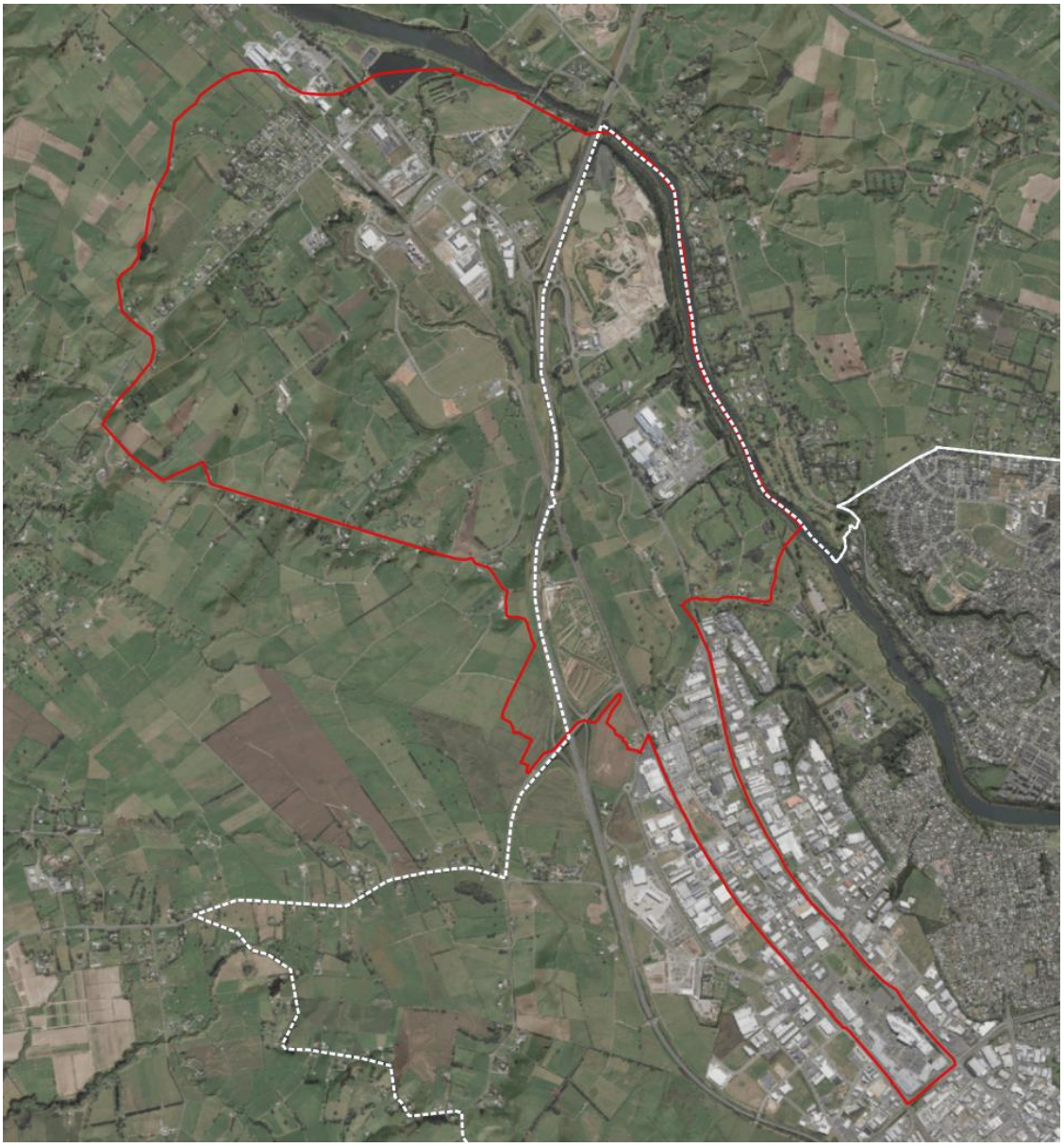


Figure 2: Te Rapa North ICMP area. ICMP area shown in red, territorial boundary in white.

4.1.1 Upper Catchment (existing brownfield)

The upper Te Rapa catchment extends from The Base shopping complex through to Ruffell Road and incorporates the commercial and industrial properties adjoining The Boulevard. The Upper catchment is relatively narrow, being bounded by Te Rapa Road to the east and the North Island Main Trunk Rail to the west. The Upper catchment has been almost fully developed into industrial or commercial landuses.

In the upper catchment the Te Rapa Stream has effectively been fully piped, with a short section of engineered open drain prior to discharging into the culvert structure below Ruffell Road.

4.1.2 Mid Catchment (Ruffell Road to WEX)

Downstream of Ruffell Road the Te Rapa Stream discharges into what is currently Fonterra owned farmland area. From Ruffell Road to a location adjacent to the Fonterra site, the Te Rapa steam runs through a natural floodplain valley approximately 100m – 200m wide which is bounded by higher terrace areas adjacent to Onion Road and Te Rapa Road. Downstream of this the stream floodplain widens to encompass most of the area between the rail line and Te Rapa Road (with some higher areas remaining adjacent to Te Rapa Road. The WEX forms the boundary of the Te Rapa Stream catchment within the HCC jurisdictional area. The stream discharges to a large set of culverts (2x2100mm) below the WEX road embankment.

4.1.3 Lower Catchment (Downstream of WEX)

The lower Te Rapa catchment is within the WDC jurisdictional area. Downstream of the WEX, the Te Rapa Stream forms a more incised gully system without a defined floodplain. The main stream runs through the Horotiu area with multiple road crossings. The Innovation Way road embankment and associated culvert structure have created a large flood storage area within the gully which provides significant flow attenuation for areas downstream. The main stream continues for approximately 2km downstream of the HCC jurisdictional boundary and discharges to the Waikato River approximately 500m north-west of the Horotiu Bridge.

The major tributary of the Te Rapa Stream joins the main branch in the lower catchment, just upstream of Washer Road. This tributary drains the Horotiu area and is bounded by Horotiu Road and Onion Road. The Horotiu tributary represents approximately 40% of the overall catchment area of the Te Rapa Stream.

4.1.4 Waikato Tributaries

The Te Rapa ICMP encompasses two smaller Waikato ephemeral tributaries located immediately north and south of the existing Fonterra Dairy Factory. The northern gully receives flows from the Te Awa Lakes area and the surrounding rural residential area before discharging through a culvert structure below the Te Araroa Trail. The southern gully discharges to a pipe outlet at the southern boundary of the Fonterra facility which then discharges to the internal Fonterra stormwater management system. The southern gully catchment is characterised by rural residential landuse.

4.2 Landuse

4.2.1 Historic Landuse

Maaori settlement of New Zealand is considered to have begun in around the 14th century. Archaeological evidence shows multiple borrow pits used for agricultural purposes within the Te Rapa catchment, and two paa sites. As evidenced in Section 1, by the time Europeans first visited the area of modern Hamilton in the 1830s Maaori had extensively settled the area[40]. Contact with Europeans introduced new crops, and it is likely that by the 1840s, iwi within the catchment were cultivating kumara, potato, corn and wheat for trade with burgeoning European settlements. In 1863 crown military forces crossed the Mangataawhiri River, and war ensued with Waikato tribes and supporters of the Kiingitanga (King movement).[41]

[40] Opus et al, 2000, p.1

[41] *Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010*, Preamble, paragraph 5

The population of the entire Waikato in 1863 has been estimated at 12,500[42] and it can be inferred that the population of the Te Rapa catchment at that time was comparatively low. European surveys carried out between 1840 and 1860 (Figure 3) show a combination of forest, fernland, grassland, scrubland or swamp in the Waikato including the area of modern Hamilton.

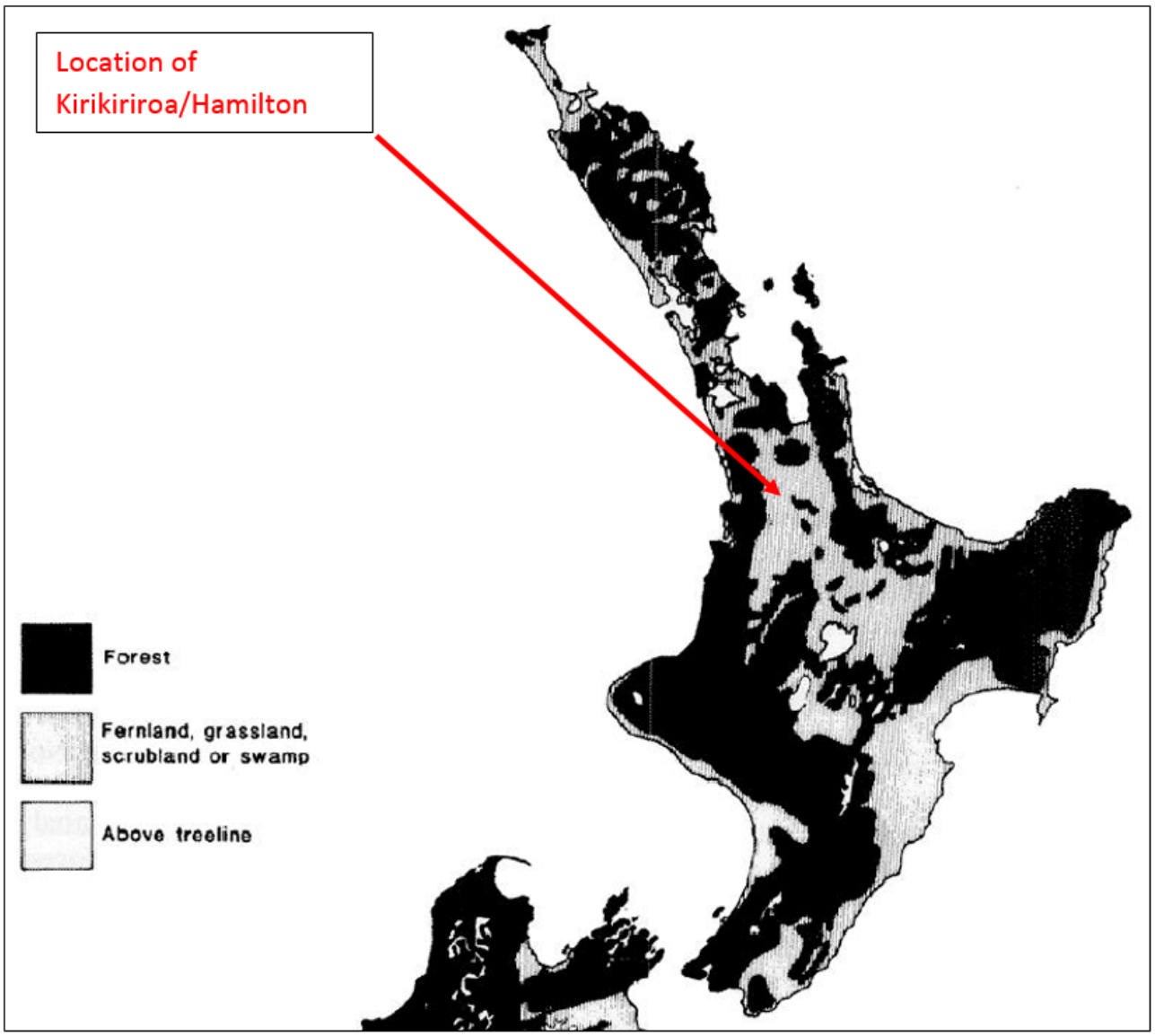


Figure 3: Extent of various vegetation types in the North Island during the time of the first European Surveys (1840 – 1860)[43] – Location of Kirikiriroa/Hamilton added.

In 1864, Hamilton was established as a European military settlement. In 1865, 1.2 million acres of the Waikato were confiscated from Waikato Tainui by the Crown. Following the confiscation, the Te Rapa catchment was progressively drained and used for agricultural purposes by European settlers.

The Te Rapa North growth cell was incorporated into Hamilton City in 2011, from the Waikato District. This boundary adjustment was originally gazetted in 2011, with minor amendments made in 2012.

Section 2 describes the history of the catchment in more detail.

[42] WRC, 2018, Prediction of water quality within the Waikato and Waipa River catchments in 1863, TR2018/54
[43] McGlone 1989 (Cited WRC TR2018/54, p. 7)

4.2.2 Existing Landuse

Existing landuse within the Te Rapa catchment is summarised below and is shown in Figure 4.

- Existing landuse within the upper catchment (upstream of Ruffell Road) is predominately commercial or industrial. This area has been almost completely developed at the time of compiling the ICMP.
- Between Ruffell Road and the WEX corridor, landuse is characterised by rural (agricultural) or rural residential landuse.
- Downstream of WEX within the WDC jurisdictional area landuse is characterised by a mixture of industrial and residential landuse through the Horotiu urban area, with rural landuse to the west of this.

Figure 4: Overview of existing landuse (catchment boundary shown in black).

4.3 Future Landuse Changes

The current HCC ODP zoning for the Te Rapa catchment is shown in Figure 5. The greenfield area of the Te Rapa catchment is overlain primarily by the Te Rapa North Industrial Zone, the exception being the Fonterra dairy factory site and the Te Awa Lakes (refer Figure 5). The Fonterra site is current zoned Industrial Area – Dairy Factory, and the Te Awa Lakes area is covered by a Private Plan Change which has been incorporated in to ODP through the Te Awa Lakes area was rezoned through a Private Plan Change, which has been included in the ODP since September 2020.

Based on the current HCC ODP, the Te Rapa North Industrial Zone is an area of Deferred Industrial zoning. For the purposes of this ICMP it has been assumed that all the deferred industrial zoning will be fully developed into an industrial landuse. For the purpose of conceptual sizing of stormwater management infrastructure an increase to 90% imperviousness has been allowed for in the future industrial zone.

The existing urbanised area of the Te Rapa catchment already has either an industrial or business zoning, with no increase in permitted imperviousness expected in this area.

Within the WDC jurisdictional area, approximately 50% of the Te Rapa catchment is zoned as Rural landuse. The Proposed Waikato District Plan (PWDP), which at the time of writing was working through the appeals stage before becoming fully operative, shows no significant land-use changes are expected in the part of the catchment lying within Waikato District. The remaining land use is made of industrial, residential and local centre uses (refer Figure 6). For the purposes of assessing effects of proposed development within the HCC area, current ODP landuse has been adopted for Existing Development (ED) and Maximum Probable Development (MPD) scenarios.

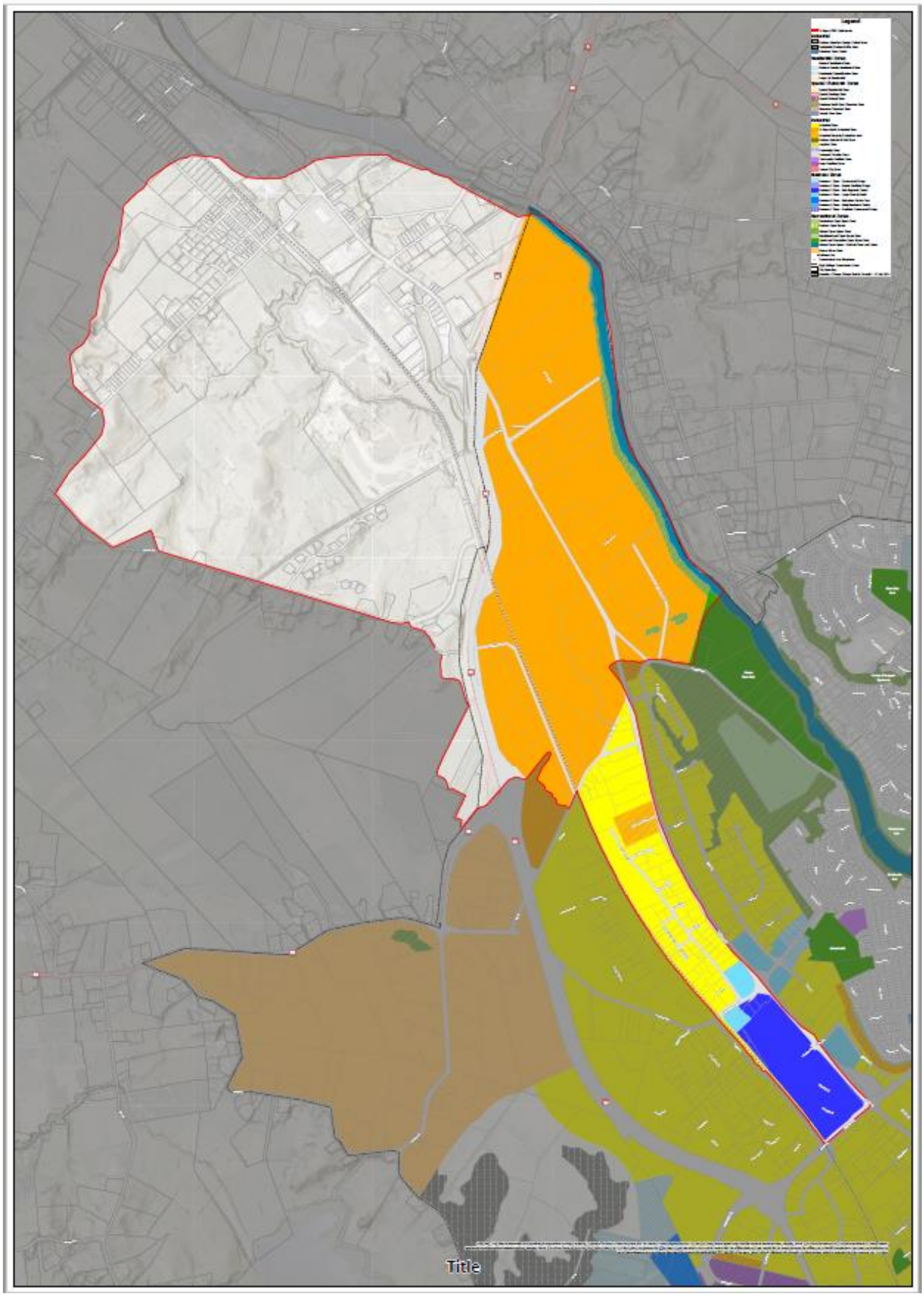


Figure 5: Te Rapa Catchment HCC ODP Zoning

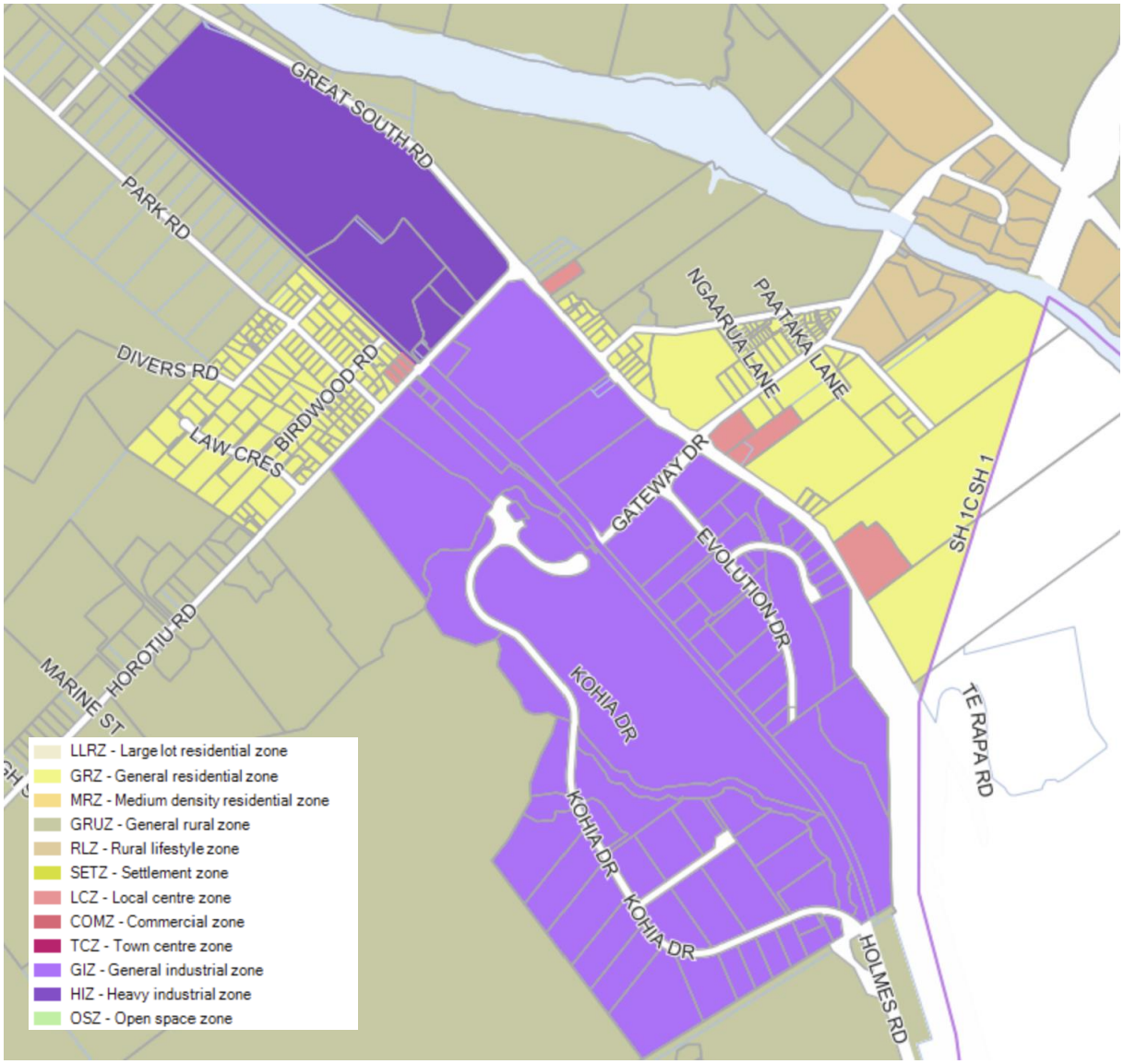


Figure 6: Extract from WDC PDP showing proposed land use types

4.3.1 Major Transport Corridors & Critical Infrastructure

Two major transport corridors are located within the Te Rapa North area, these are:

- The SH1/WEX corridor, which is administered by Waka Kotahi and has already been fully developed to the designation extent. It is noted that the designation extends along a short section of Koura Drive to the east of the WEX with the intention that this will link to a future northern Waikato River crossing which has not been designated at this stage. Any future designation would be led by HCC.
- A corridor running along Te Rapa Road extending from the Horotiu interchange with the WEX through the Te Rapa North area and continues south into the central Hamilton area.

Critical gas and wastewater mains are located within the Te Rapa North area, however both are associated with the Fonterra Dairy Factory.

Locations of major transport corridors and critical infrastructure are shown in Figure 7.

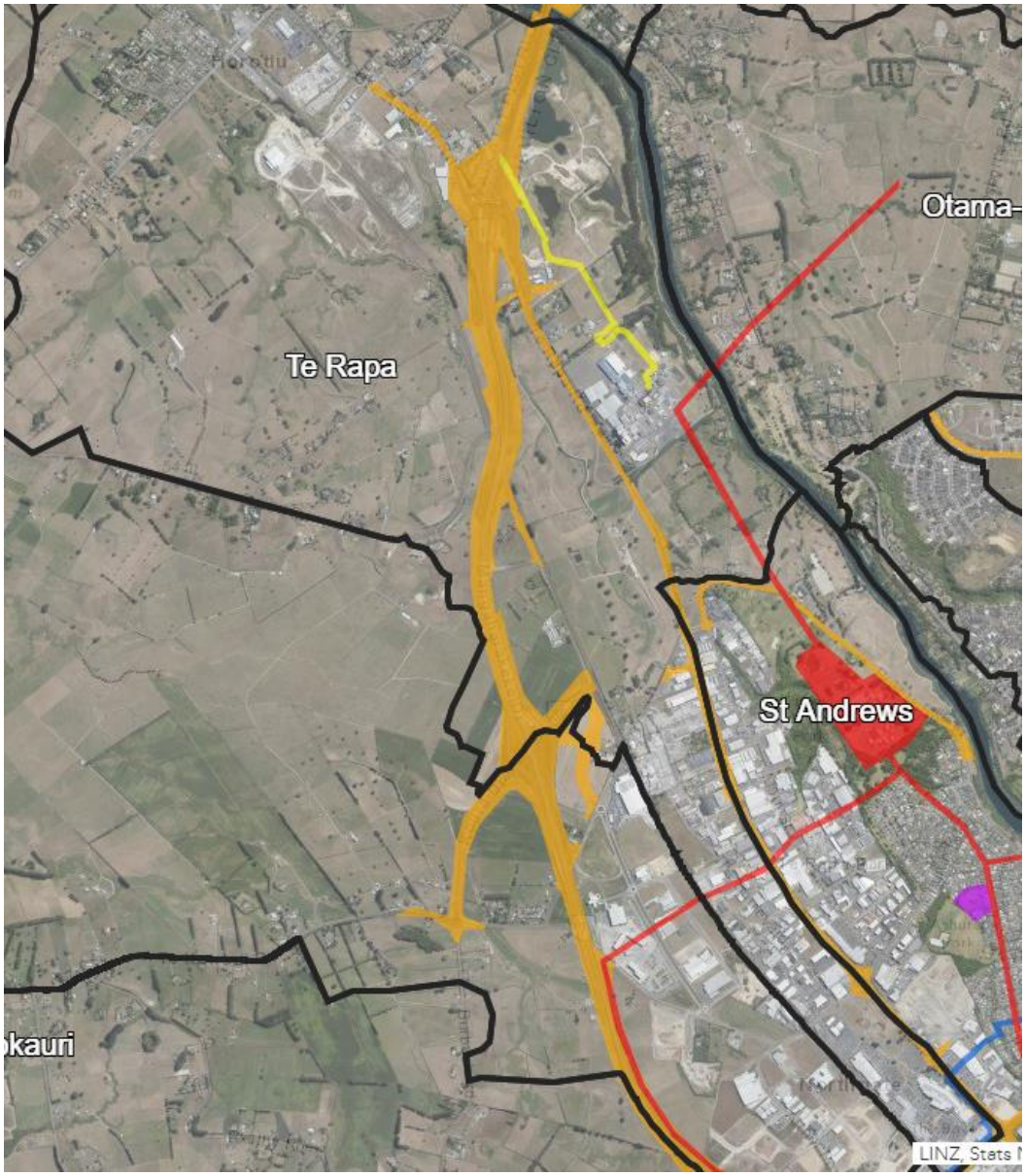


Figure 7: Major Transport Corridors and Critical Infrastructure. Transport corridors shown in orange, wastewater infrastructure shown in red and gas in yellow

4.4 Physical Environment

4.4.1 Topography

Upper catchment:

The existing Te Rapa industrial area has been heavily modified through earthworks associated with development. Elevations vary from approximately 33 mRL at the headwaters (The Base) through to approximately 25 mRL at the discharge point below Ruffell Road. The existing watercourse has been filled and piped for the majority of its length through the upper catchment.

Mid catchment:

The mid-catchment is characterised by two distinct terrain types. The main Te Rapa channel lies within a well-defined 'valley' which increases in width as the channel progress downstream. This is bounded by higher terraces which sit approximately 6m - 8m above the stream.

The western edge of the catchment is defined by very flat terrain with the SH1 road embankment forming an 'arbitrary' catchment boundary between it and the upper Mangaheka stream.

Lower catchment:

The lower catchment downstream of the Waikato Expressway (WEX) has been significantly modified through historic development. The Te Rapa Stream forms an incised gully system through this area. Towards the confluence with the Waikato River the terrain reflects more pre-development conditions.

Waikato Tributaries:

The minor tributaries which discharge directly to the Waikato River are generally characterised by incised gullies which transition into flat floodplains once bank level is exceeded.

A map of the Te Rapa catchment topography is shown in Figure 8.

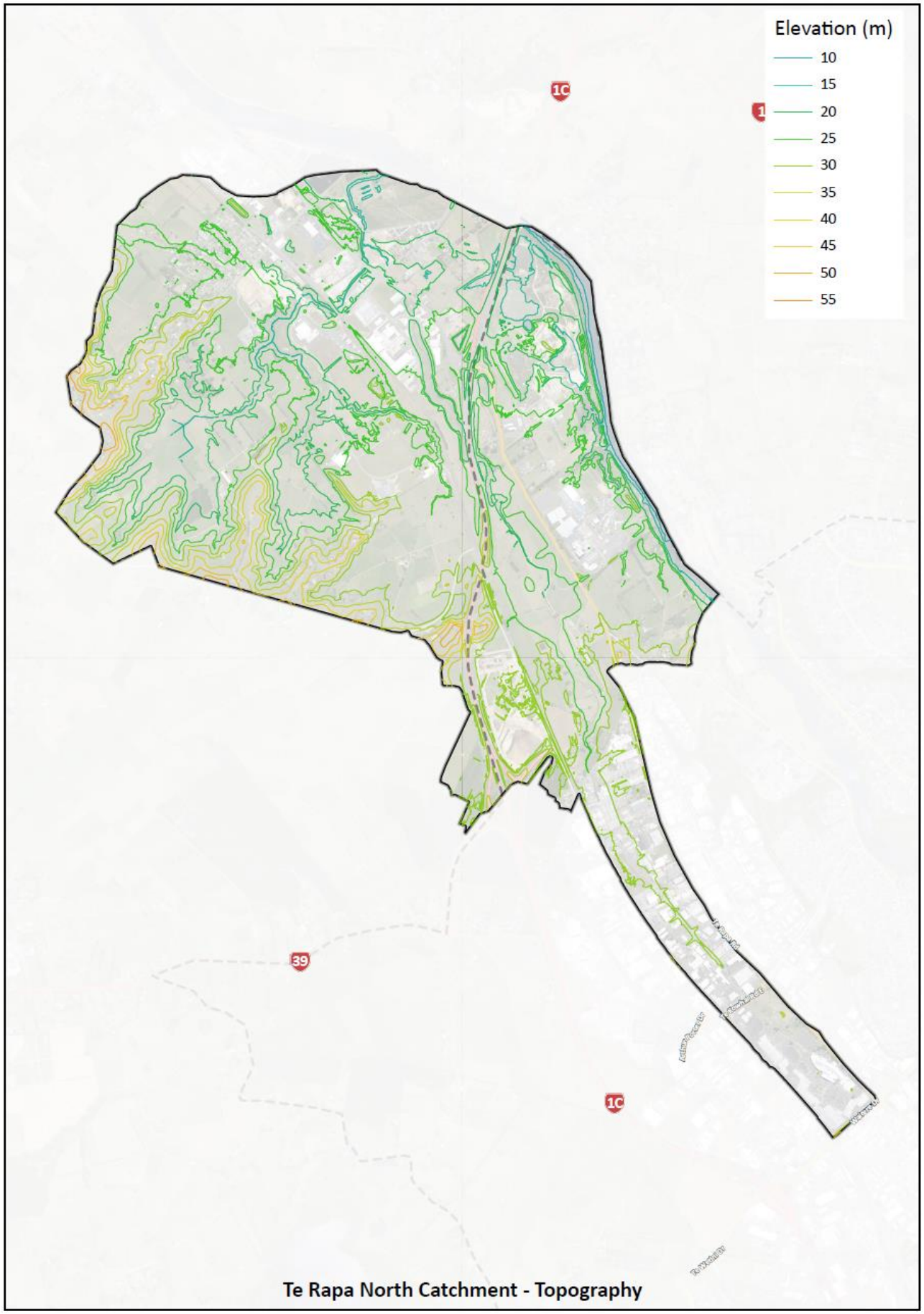


Figure 8: Catchment Topography

4.4.2 Geomorphology

The Te Rapa Stream has been piped for much of the upper reaches which outlets into a modified drainage channel approximately 200m upstream of the Ruffell Road culvert crossing. Downstream of Ruffell Road the Te Rapa Stream becomes a modified farm drain with relatively low capacity. Alignment of the channel appears to generally follow the alignment of the original natural stream. While complete clearing of natural vegetation has historically been undertaken, some riparian revegetation was observed through the Fonterra farmland. Figure 9 below shows a typical example of the stream channel in this part of the catchment. All sections of the Te Rapa Stream and lateral tributaries were observed to be perennial.

Other drainage channels (tributaries) through the mid-catchment have been modified into farm drains. The stream-walkover identified these as being generally stable as bank grades are typically shallow and vegetation (mainly exotic grasses) cover is good.

Downstream of the WEX the stream channel takes the form of a relatively low capacity low-flow channel confined within a broader but well-defined higher flow cross section. Construction of Great South Road and Innovation Way roading corridors (and associated culvert structures) have created a flood storage area of significant capacity. Figure 10 shows a typical section of this section of the stream.

Downstream of Great South Road, the Te Rapa Stream channel becomes a more steeply incised gully system. Figure 11 shows a typical section downstream of Horotiu Bridge Road, and Figure *12* shows a section adjacent to the AFFCO site towards the confluence with the Waikato River. Significant erosion issues were observed through these reaches due to clearing of riparian vegetation and the steeper bank grades.

Figure *9*: Typical stream cross-section through Fonterra farmland.

Figure *10*: Typical stream cross section between SH1 and Great South Road.

Figure *11* : Te Rapa Stream channel downstream of Horotiu Bridge Road (circa 2019).

Figure 12: Te Rapa Stream channel towards outlet & adjacent to AFFCO site.

4.4.3 Surface water classification and features

The Waikato Regional Plan has a series of watercourse definitions which trigger different levels of management requirements and consenting requirements. These are:

Artificial watercourse: A watercourse that contains no natural portions from its confluence with a river or stream to its headwaters and includes irrigation canals, water supply races, canals for the supply of water for electricity power generation and farm drainage canals;

Ephemeral streams: Streams that flow continuously for at least three months between March and September but do not flow all year;

Farm drainage canal: An artificial watercourse on a farm that contains no natural portions from its confluence with a river or stream to its headwaters and includes a farm drain or a farm canal;

Modified watercourse: An artificial or modified channel that may or may not be on the original watercourse alignment and which has a natural channel at its headwaters;

Perennial stream: A stream that flows all year round assuming average annual rainfall;

River: A continually or intermittently flowing body of fresh water and includes a stream and modified watercourse; but does not include any artificial watercourse (including an irrigation canal, water supply race, canal for the supply of water for electricity power generation, and farm drainage canal); and

Wetland: Includes permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions.

Appendix D of the ICMP has provided a high-level assessment of watercourses and wetlands against these definitions for strategic planning purposes. This is summarised further on in this document in Figure 33. Further assessment of watercourse reaches against these definitions and delineation of wetland will be required for resource consenting.

4.4.4 Geology and Soils

Regional Geology

Hamilton City lies roughly in the centre of the Hamilton Basin, a large alluvial fan approximately 40km wide by 90km long extending from the Maungatautari Gorge to the southeast, and Taupiri Gorge in the northwest.

The basin is estimated to be deepest in the Te Rapa area, where it may be about 1km to basement greywacke. Overlying basement rock are predominantly primary and reworked volcanic materials derived from volcanic activity in the central North Island during the Quaternary period (last 2 Million years).

The materials within the basin are broadly divided into several groups. The oldest soils belong to the Walton Subgroup and comprises volcanic ash, tephra, ignimbrite and alluvially reworked volcaniclastic materials. Walton Subgroup is typically tens of metres depth below the ground surface across the alluvial fan but occurs near the surface basin where the low rounded hills (Hamilton Hills) protrude above the plain surface. The Hamilton Hills are typically mantled by several metres of volcanic tephras grouped as Kauroa Ash Formation (780k.a to 2M.a) and the Hamilton Ash Formation (50k.a to 340k.a) which are interfingered within the Walton Subgroup.

Younger soils within the basin are predominantly alluvial and lacustrine and are grouped as Piako Subgroup soils. The upper soils of the Piako subgroup include the Hinuera Formation. This group of soils typically make up the ground surface of the alluvial fan (including within the Te Rapa North ICMP boundaries) and comprise sandy, pumice rich alluvium, with interbedded peat, silt and tephra layers. Hinuera Formation has been deposited by successive aggradation events on the alluvial fan as volcanics have been mobilised from the TVZ, particularly following the 26.5k.a Oruanui Eruption.

Since about 14k.a to 17k.a, the Waikato River has ceased migrating across the alluvial plane and has become entrenched into its current course. This has largely cut the supply of sediment across the alluvial

fan. Holocene (approximately 12,000 years to present) deposits typically comprise volcanic ash and localised peat bogs, lake deposits and alluvium.

Catchment Geology

The relevant published geological maps (Edbrooke, 2005) for the area show the site to be underlain by Walton Subgroup, Piako Subgroup and Holocene alluvial soils.

The majority of the area is underlain by Hinuera Formation, consistent with the flat to undulating planar surface across the majority of the site area.

Walton Subgroup is mapped to occur at the surface where there is raised topography to the west and a small hill near the centre-east of the site.

Recent (Holocene) alluvium is mapped to occur along several small tributary gullies in the central to northern area of the site, and at the low terrace adjacent to the Waikato River at the northern end of the site. Taupo Formation is also mapped to occur along the margin of the Waikato River.

Available geotechnical investigation data is generally in agreement with the mapped geology of the catchment. Figure **13** shows the catchment geology.

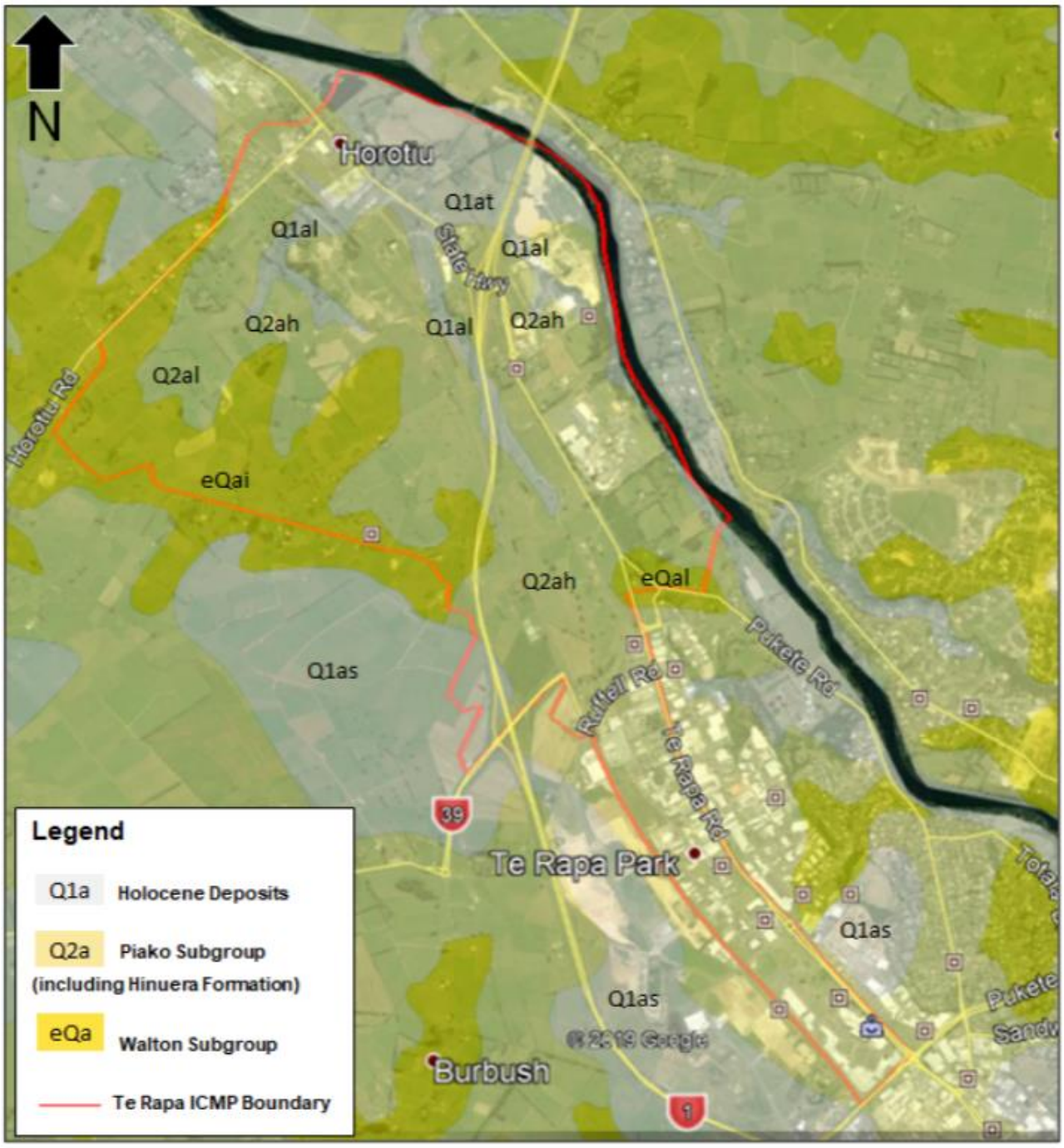


Figure 13: Catchment Geology.

Soils

Soil types vary across the Te Rapa catchment. Underlying geology is shown in Figure **13**. Darker areas labelled eQa are Hamilton Ash soils likely to be of low soakage. Lighter areas of Q2a and Q1a are Hinuera formation with better soakage.

Soils over the Hinuera formation generally have a deep profile, high water holding capacity and are free draining. Hamilton Ash soils over the hills have more clay content, are shallower with reduced water holding and drainage capacity. Within the gullies, soils tend to have a lower drainage capacity. Soils within the catchment are diverse and spatial extents indicate a potentially complex hydrogeology with respect to groundwater and spring discharge to support stream baseflow. Figure **14** shows the variability in soil drainage across the catchment. The best soils for soakage (sandy soils) make up a small percentage of the

Te Rapa catchment. Poorly drained clay soils also make up a small portion of the catchment. Moderately drained silty soils make up most of the catchment. This variability in the soils across the catchment will result in variable groundwater recharge and surface runoff.

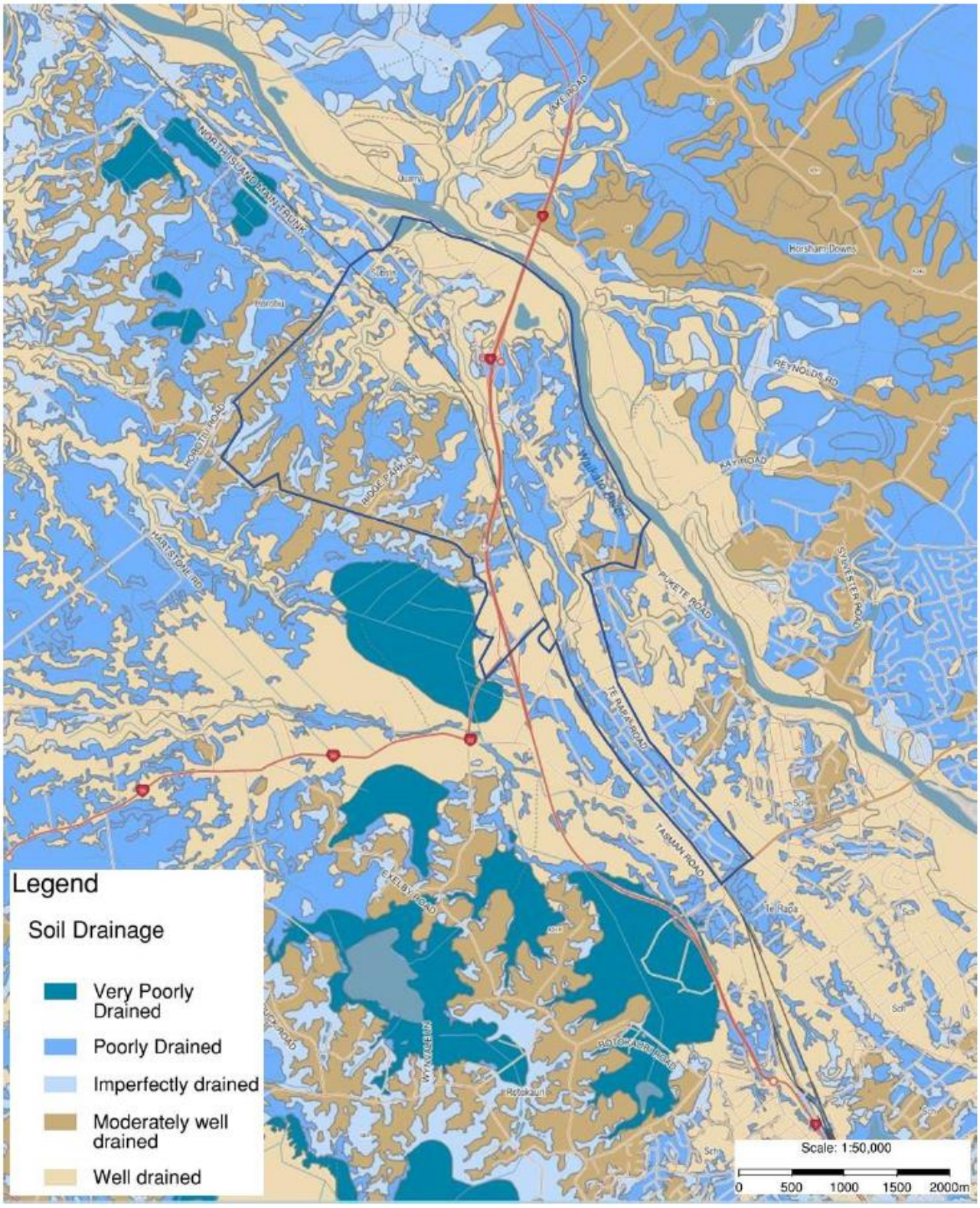


Figure 14: Soil Drainage Map

Presence of Peat

In 2024, Tonkin + Taylor were engaged by Hamilton City Council to update citywide peat mapping previously produced as part of the stormwater master plan version 2. The citywide peat mapping is developed through a synthesis of several different geological and geomorphic mapping sources. Figure **15** shows the mapped peat extents within the HCC jurisdictional area. Peat within the Te Rapa North area is generally expected only along the western boundary with the Mangaheka catchment. These areas have already been developed through the Empire sub-division and the Te Awa Base development. Irrespective, the potential presence of peat (and associated acid sulphate soil potential) within the catchment has been recognised in the ICMP means of compliance.

Figure 15: Citywide peat mapping (Te Rapa catchment).

4.4.5 Indigenous Land Cover

Figure 16 shows a map of inferred indigenous vegetation cover for the Hamilton City area. This map has been adapted from a 2007[44] study undertaken by The University of Waikato and Landcare Research which uses landform to infer indigenous vegetation cover types. The 2007 study reports that less than 2% of indigenous ecosystems remain within the Hamilton Ecological District. This indigenous landcover provides some target for restored vegetative states, although it should be recognised that any restoration needs to be staged with varied successional species. Table 3 below provides a description of the vegetation types depicted in Figure 16.

[44] Clarkson et al 2007, Indigenous Vegetation Types of Hamilton Ecological District.

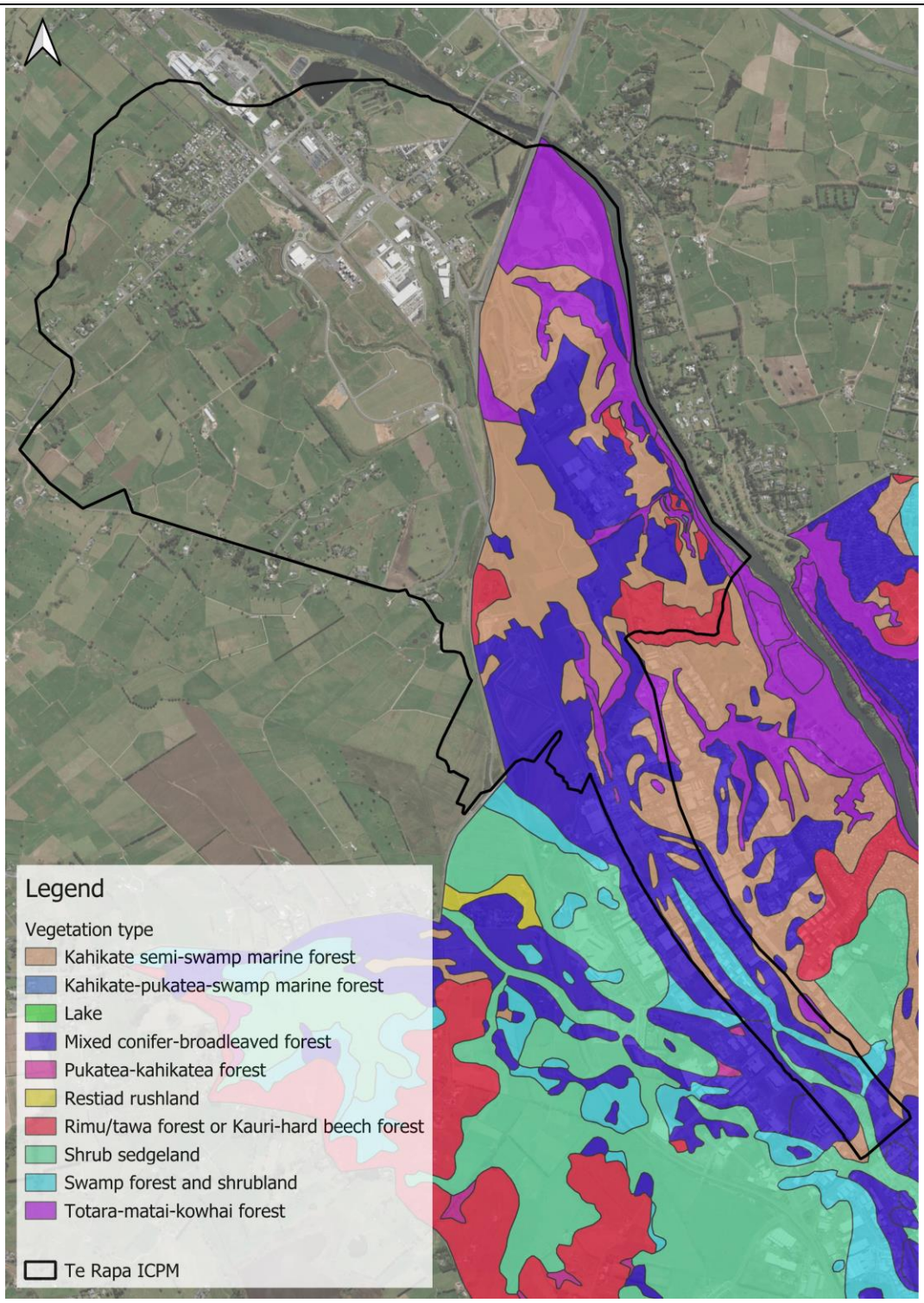


Figure 16: Indigenous vegetation cover types in the Hamilton area.

Table 3 summarises specific vegetation species likely to be present in each cover type shown in Figure 16.

Table 3: Descriptions of vegetation types depicted in Figure 16 [source: Clarkson et al, 2007[44]]

Vegetation Type	Description
Rimu/tawa forest	The low rolling hills throughout the Hamilton Ecological District (ED) and the hilly land and foothills of ranges at the margins of the district, to a height of approximately 100 m, were mostly covered in rimu/tawa forest. Typically, occasional rimu, and local miro, kahikatea, totara, and northern rata were emergent over a canopy dominated by tawa. Other widespread broadleaved species in the canopy included titoki, hinau, rewarewa, and pukatea. The understorey was characterised by a variety of small trees, shrubs, and tree ferns including mahoe, pigeonwood, raurekau, and silver fern. Ferns and grasses such as hen and chicken fern, crown fern, Hymenophyllum demissum, and Microlaena avenacea occurred in the ground layer. Remaining examples of this vegetation type are present on the foothills of the Karakariki Range and Mt Pirongia.
Kauri-hard beech forest	Kauri-hard beech forest had a limited distribution within the Hamilton ED (ED), restricted to the hills and foothills of ranges at the northern end of the district. Major canopy species were kauri, hard beech and tanekaha, with canopy associates of rimu, tawa, and rewarewa. The understorey was characterised by the presence of shrubs such as mingimingi and prickly mingimingi, and silver fern and wheki tree ferns. In the ground layer sedges, grasses, and ferns such as crown fern and Doodia media were common, with occasional kauri grass. This vegetation type is still represented within the Hamilton ED and accessible to the public at Pukemokemoke Reserve, north-east of Gordonton.
Pukatea-kahikatea forest	On the more poorly drained colluvial footslopes pukatea and kahikatea dominated the forest, with swamp maire as a common canopy associate. Common understorey and ground layer species were fuchsia, mahoe, supplejack, kiekie, hen and chicken fern, and Astelia fragrans. No intact remnants of this vegetation type remain in the Hamilton Ecological District.
Mixed conifer-broadleaved forest	Extensive areas of well-drained, broad low ridges of the plains were covered in a mixture of species including conifers such as totara, matai, rimu, and kahikatea, and broadleaved trees such as titoki, tawa, and rewarewa. Species common in the understorey and ground layers were mahoe, silver fern, hangehange, raurekau, lacebark, hen and chicken fern, and *Microlaena avenacea.* No intact remnants of this vegetation type remain in the Hamilton Ecological District.
Kahikatea semi-swamp forest	Semi-swamp forest dominated by kahikatea grew on the poorly drained shallow depressions. Several other species were present in varying amounts, including rimu, matai, pukatea, swamp maire, tawa, pokaka, and occasional cabbage tree. Prominent in the understorey were silver fern, mapou, hangehange, Coprosma areolata, and turepo, and tangles of kiekie and supplejack. The ground cover was dominated by ferns, herbs, grasses, and sedges including Hymenophyllum demissum, hen and chicken fern, Astelia fragrans, A. grandis, and Microlaena avenacea.
Totara-matai-kowhai forest	Totara, matai, kowhai, and kanuka dominated the low, narrow terraces associated with the Waikato River. Several divaricating shrubs such as *Coprosma rhamnoides* and *C. rigida*, and tree ferns such as wheki and wheki ponga occurred in the understorey, and ferns and grasses, e.g., *Blechnum* spp. And *Oplismenus imbecillis*, were common in the ground layer. No intact remnants of this vegetation type remain in the Hamilton Ecological District.

Table 3: Descriptions of vegetation types depicted in Figure 16 [source: Clarkson et al, 2007[44]]	
Totara-matai-kowhai forest	The scarps and steep gully side slopes were covered with forest dominated by totara, matai, and kowhai. Kanuka and kamahi were also present, and mahoe occurred in more poorly drained sites. The understorey included shrubs of mapou, mingimingi, and *Rhabdothamnus solandri*, and the ground was covered in a variety of ferns such as *Blechnum chambersii, Doodia media,* and *Polystichum richardii.* Slopes too steep for forest had herbaceous or shrubby vegetation including *Machaerina sinclairii*, whararikí, rangiora, koromiko, and heketara. No intact remnants of this vegetation type remain in the Hamilton Ecological District.
Kahikatea-pukatea-swamp maire forest	The poorly drained gully floors and their associated backswamps were dominated by kahikatea, pukatea, swamp maire, cabbage tree and pokaka. Understorey and ground cover species included mapou, fuchsia, lancewood, pate, *Coprosma rotundifolia, Cyathea cunninghamii, Astelia grandis,* kiekie, and supplejack. This type is represented in a small remnant, Hammond Bush, located alongside the Waikato River in southern Hamilton City. A larger remnant of this vegetation type is present on a private reserve near Temple View (Koromatua Bush).
Submerged and marginal herbaceous vegetation	The shallow peat lakes had submerged vegetation dominated by charophytes (*Nitella hookeri/cristata, Chara corallina*), pondweeds (*Potamogeton ochreatus, P. cheesemanii*), and milfoils (*Myriophyllum propinquum*). The emergent marginal vegetation typically comprised narrow monospecific zones of, from the lake shore outwards, raupo, *Baumea articulata*, and *Eleocharis sphacelata.*
Swamp forest and shrubland	Swamp forest and shrubland grew on shallow peat characteristic of the low-lying sites of the plains and the outer margins of the peat bogs. Kahikatea was the main species but individual trees were much smaller than on the better drained soils listed above. Cabbage tree, swamp coprosma, *Coprosma propinqua, manuka, flax, Dianella nigra,* and *Hypolepis distans were also relatively common. No intact remnants of this vegetation type remain in the Hamilton Ecological District.*
Shrub sedgeland	Mosaics and mixtures of low-growing shrubland and sedgeland covered extensive areas of peatland on the peat dome margins, around lakes, and in deeper depressions west of the Waikato River. The main species were manuka, cabbage tree, swamp coprosma, *Baumea teretifolia*, *B. rubiginosa*, *Carex secta*, *C. virgata*, and flax. This type is represented around parts of Lake Rotokauri, Lake Rotokaeo, Horseshoe Lake and at the margins of Moanatuatua peat bog within Moanatuatua Scientific Reserve.
Restiad “rushland”	The peat domes with deeper peat were very poorly drained with water tables close to the surface for most of the year. They comprised mainly herbaceous vegetation dominated by the peat forming species *Empodisma minus* and *Sporadanthus ferrugineus*, which are members of the jointed “rush” family (Restionaceae). Associated species included stunted shrubs of manuka and *Epacris pauciflora*, sedges such as *Baumea teretifolia* and *Schoenus brevifolius*, and mosses and liverworts such as *Sphagnum cristatum* and *Goebelobryum unguiculatus.* The best remaining example of this vegetation type in the Hamilton Ecological District occurs at Moanatuatua Scientific Reserve.

4.4.6 Hydrogeology and Groundwater Resources

Groundwater resources within the Te Rapa catchment will likely be confined to shallow/surficial alluvial deposits. Groundwater is expected to drain in an east-northeast direction towards the Waikato River. The Te Rapa Stream will intersect the shallower alluvial aquifers, with deeper flows reporting directly to the Waikato River. A number of soakage devices have been constructed within the existing industrial area, with the device associated with The Base being the largest of these.

In 2024 Tokin + Taylor were engaged by HCC to develop a citywide shallow groundwater mapping layer. This was produced based on fitting a 2D surface to available bore log data collated through various consents. Figure **17** shows median shallow groundwater levels for the Te Rapa catchment area.

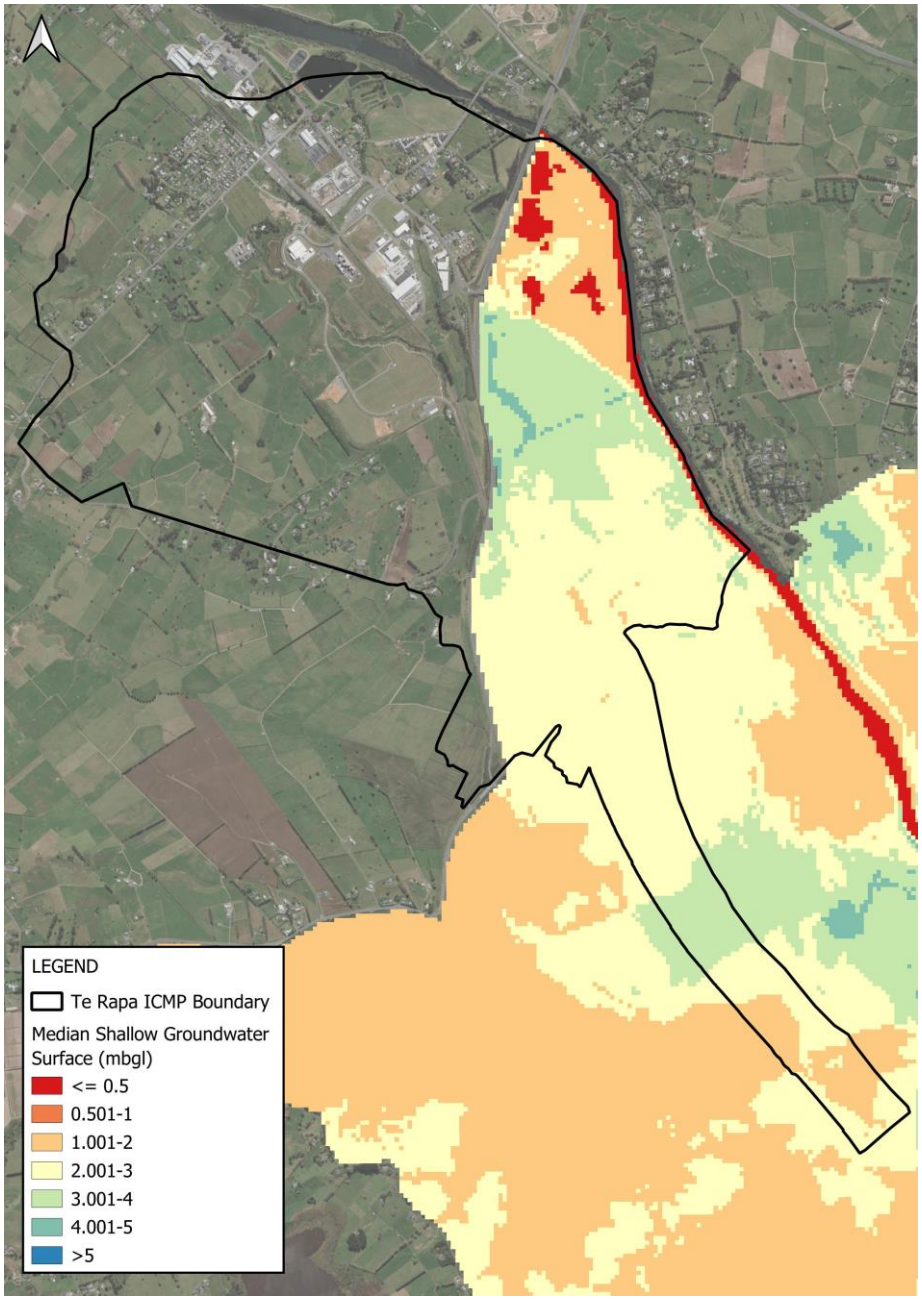


Figure 17 : Citywide median shallow groundwater levels (Te Rapa catchment)

4.4.7 Water Quality and Contaminants

Estimates of Water Quality in 1863

Likely water quality in 1863 has been assessed based on an understanding of likely landuse at that time and modelling presented in the WRC Technical Report *Prediction of water quality within the Waikato and Waipa River catchments in 1863*[45]. Sections of Waikato forest had been cleared prior to 1863, and parts of the catchment were likely in native fernland, scrubland, wetland or grassland rather than forest. It has been estimated that the impact of Maaori landuse on water quality was minimal, "largely as a result of their low population density and the nature of their traditional practices"[46] , although some agriculture was practiced, as evidenced by borrow pits.

Existing Water Quality

Catchment wide water quality sampling was undertaken as part of the ICMP investigation programme in March 2020. These data provide a dry weather snapshot of how water quality changes from headwater areas to the Waikato River. Six monitoring locations within the Te Rapa catchment were assessed. Sampling locations are shown in Figure **18**.

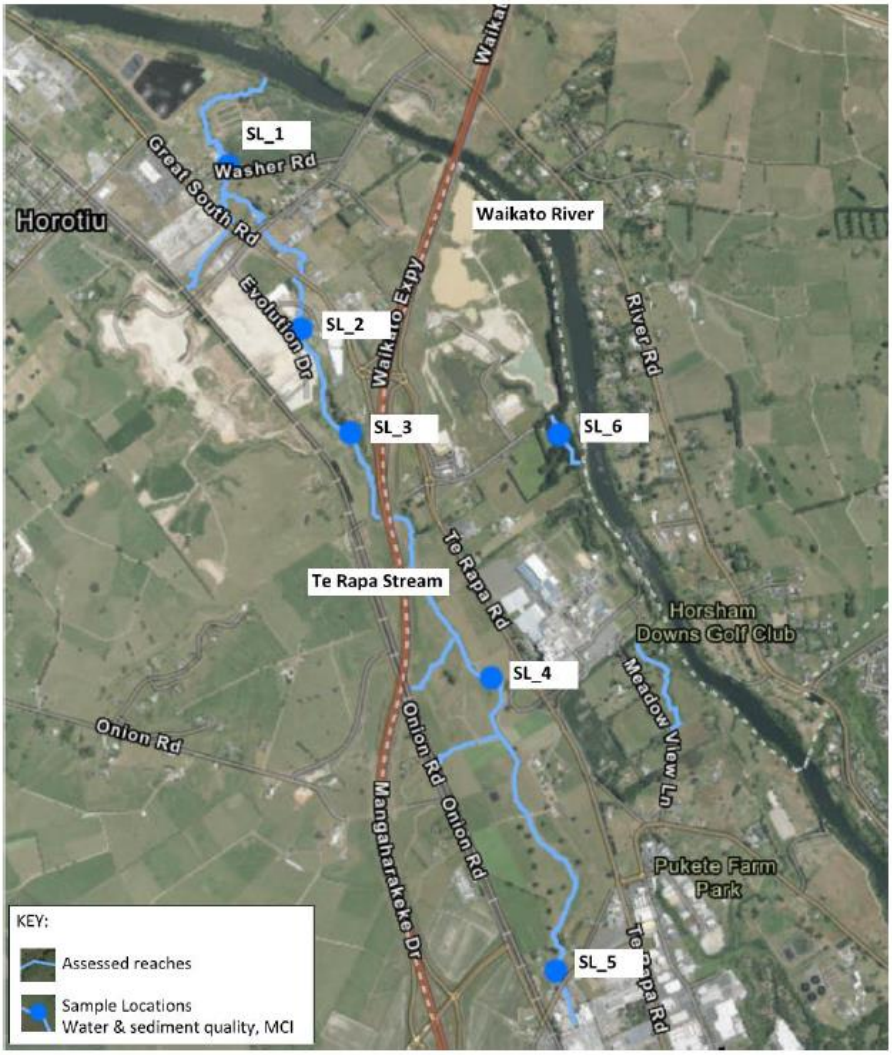


Figure 18 Water Quality Sampling Locations

[45] WRC, 2018, Prediction of water quality within the Waikato and Waipa River catchments in 1863, TR2018/54
[46] Ibid

Table 4 presents a summary of water quality sampling results captured as part of investigation for this ICMP (March 2020). Table 5 presents sediment quality sampling results. Observations on existing water quality for the Te Rapa Stream are as follows:

- Turbidity and suspended sediment results are elevated (compared to ANZG DGVs for PC stressors) along the enitre main stem of the Te Rapa Stream. Results are similar to water quality observations captured as part of the Mangaheka and Mangakootukutuku ICMPs.
- E.Coli levels are observed to generally increase moving downstream along the main stream. Recorded values in sampling locations downstream of the existing urbanised area are in exceedance of NPS-FM bottom-line values. It is noted that the sampling undertaken represents insufficient data to establish an attribute state, so it cannot be concluded at this stage that ambient E.Coli levels are in exceedance of NPS-FM targets.
- Dissolved oxygen was low in most locations with the percentage saturation falling below the WRC guideline values and ANZG DGVs in most sampling locations. This is not unexpected in slow flowing lowland streams with poor riparian shading and abundant macrophytes, as observed in much of the Te Rapa catchment.
- Nitrogen levels (total N and ammoniacal N) vary along the main stream. Total N exceeds ANZG DGVs at all sampling location and exceeds WRC guideline values for half of the sampling locations. ANZG toxicant levels are not exceeded at any of the sampling locations.
- Phosphorus levels (total P and DRP) show similar patterns to results for nitrogen with variation along the Te Rapa Stream but show are similar to Plan Change 1 short-term targets for the middle-Waikato.
- Heavy metal results from sediment sampling show metal contaminants generally being below ANZD DGV 'Low' values, with the exception of;
    - elevated levels of Zinc detected at SL2. This may be due to facial eczema treatment which is a common source of rural zinc contamination; and
    - elevated levels of Arsenic detected at SL2 and SL5. Both of these locations are adjacent to industrialised land use which may suggest this as the source, however it is noted that Arsenic can be naturally forming in areas of volcanic lithologies.

Ongoing water and sediment quality monitoring is included in the city wide Stormwater Receiving Environment Monitoring Plan (SREMP) to continue to monitor and respond to trends in quality.

Overall, water quality in the Te Rapa Stream has been degraded from likely natural states. However, observed sampling results are similar to those found in other local waterways that have been impacted by farming and urbanisation with the Te Rapa Stream not indicating any outlier results for any specific contaminant.

Table 4: Water quality sampling results

Surface water quality results – 6 March 2020 (1 of 2)

Contaminant	Unit	WQ_1	WQ_2	WQ_3	ANZG PC Stressor DGV [1]	ANZG Toxicant DGV[2]	WRC[7]
pH		7.3	7	6.9	7.7	-	6.5 – 9
Temperature	°C	19	18.1	17.7	-	-	20
Dissolved Oxygen	mg/L	10.51	5.55	6.87	-	-	-
Dissolved Oxygen	% Sat	114.1	59.5	73.6	103	-	>80
Suspended Sediment (TSS)	mg/L	11	10	8	8.8	-	-
Turbidity	NTU	8.8	9.4	11.6	5.2	-	5
Total Nitrogen	µg/L	410	520	390	292	-	500
Ammoniacal Nitrogen	mg/L	< 0.010	0.025	0.035	0.90	2.18	0.88
Total Phosphorus	µg/L	70	59	64	24	-	40
Dissolved reactive phosphorus	µg/L	16	11	14	14	-	-
Iron	µg/L	2200	2900	2800	-	-	-
Nickel	µg/L	< 0.5	< 0.5	< 0.5	-	11	-
Dissolved Lead	µg/L	< 0.1	< 0.1	< 0.1	-	3.4	-
Total Lead	µg/L	0.23	0.3	0.12	-	-	-
Dissolved Copper	µg/L	0.7	0.6	0.7	-	1.4	-
Total Copper	µg/L	0.85	1.02	0.9	-	-	-
Dissolved Zinc	µg/L	1.9	3.6	4.8	-	8	-
Total Zinc	µg/L	4.9	8.9	6.5	-	-	-
PAH's	µg/L	ND	ND	ND	-	-	-
E.coli	E.coli/100ml	517	1,733	1,120	-	-	-
BOD	Mg/L	< 2	< 2	< 2	-	-	-

Surface water quality results – 6 March 2020 (2 of 2)							
Contaminant	**Unit**	**WQ_4**	**WQ_5**	**WQ_6**	**ANZG PC Stressor DGV [1]**	**ANZG Toxicant DGV[2]**	**WRC[7]**
pH		7	6.7	7.2	7.7		6.5 – 9
Temperature	°C	17.2	18.2	16.8			20
Dissolved Oxygen	mg/L	5.7	7.48	3.65			-
Dissolved Oxygen	% Saturation	60	79.5	37.5	103		80
Suspended Sediment (TSS)	mg/L	8	10	8	8.8		-
Turbidity	NTU	3.7	32	11.8	5.2		5
Total Nitrogen	µg/L	370	690	620	292		500
Ammoniacal Nitrogen	mg/L	0.039	0.173	0.26	0.90	2.18	0.88
Total Phosphorus	µg/L	29	45	115	24		40
Dissolved reactive phosphorus	µg/L	7	9	34	14		-
Iron	µg/L	2000	4600	3700			-
Nickel	µg/L	< 0.5	< 0.5	< 0.5		11	-
Dissolved Lead	µg/L	< 0.1	< 0.1	< 0.1		3.4	-
Total Lead	µg/L	0.14	<0.11	0.12			-
Dissolved Copper	µg/L	1	0.7	<0.5		1.4	-
Total Copper	µg/L	1.19	1.01	<0.53			-
Dissolved Zinc	µg/L	5.9	**9.7**	1.4		8	-
Total Zinc	µg/L	9.3	11.3	2.1			-
PAH's	µg/L	ND	ND	ND			-
E.coli	E.coli/100ml	921	261	488			-
BOD	Mg/L	ND	ND	ND			-

[1]80th percentile DGV

[2]95th percentile toxicant DGV

Results in bold exceed ANZG toxicant DGVs

Results underlined exceed ANZG PC stressor DGVs

Table 5: Sediment quality sampling results

Sediment Quality Results								
Contaminant mg/kg dry wt	**SQ_1**	**SQ_2**	**SQ_3**	**SQ_4**	**SQ_5**	**SQ_6**	**ANZG Low**	**ANZG High**
Arsenic	14	**89**	12	10	8	**60**	20	70
Cadmium	0.23	0.78	<0.1	<0.1	<0.1	0.22	1.5	10
Chromium	6	13	4	6	7	5	80	370
Copper	9	34	5	6	6	12	65	270

Table 5: Sediment quality sampling results								
Sediment Quality Results								
Contaminant mg/kg dry wt	**SQ_1**	**SQ_2**	**SQ_3**	**SQ_4**	**SQ_5**	**SQ_6**	**ANZG Low**	**ANZG High**
Lead	9.9	16.9	5.1	6.4	4	7.4	50	220
Nickel	4	0.11	2	3	3	5	21	52
Zinc	157	**480**	81	127	59	101	200	410

4.4.8 Contaminated Land

HCC and WRC Hazardous Activities and Industries Lists (HAIL) databases were quired to identify potential containment sources within the catchment. A snapshot of this is shown on Figure 19. HAIL sites may have had historic or current activities taking place which create a risk to the health of humans or the environment. HAIL sites that are developed are managed under the NES, which is primarily concerned with human health.

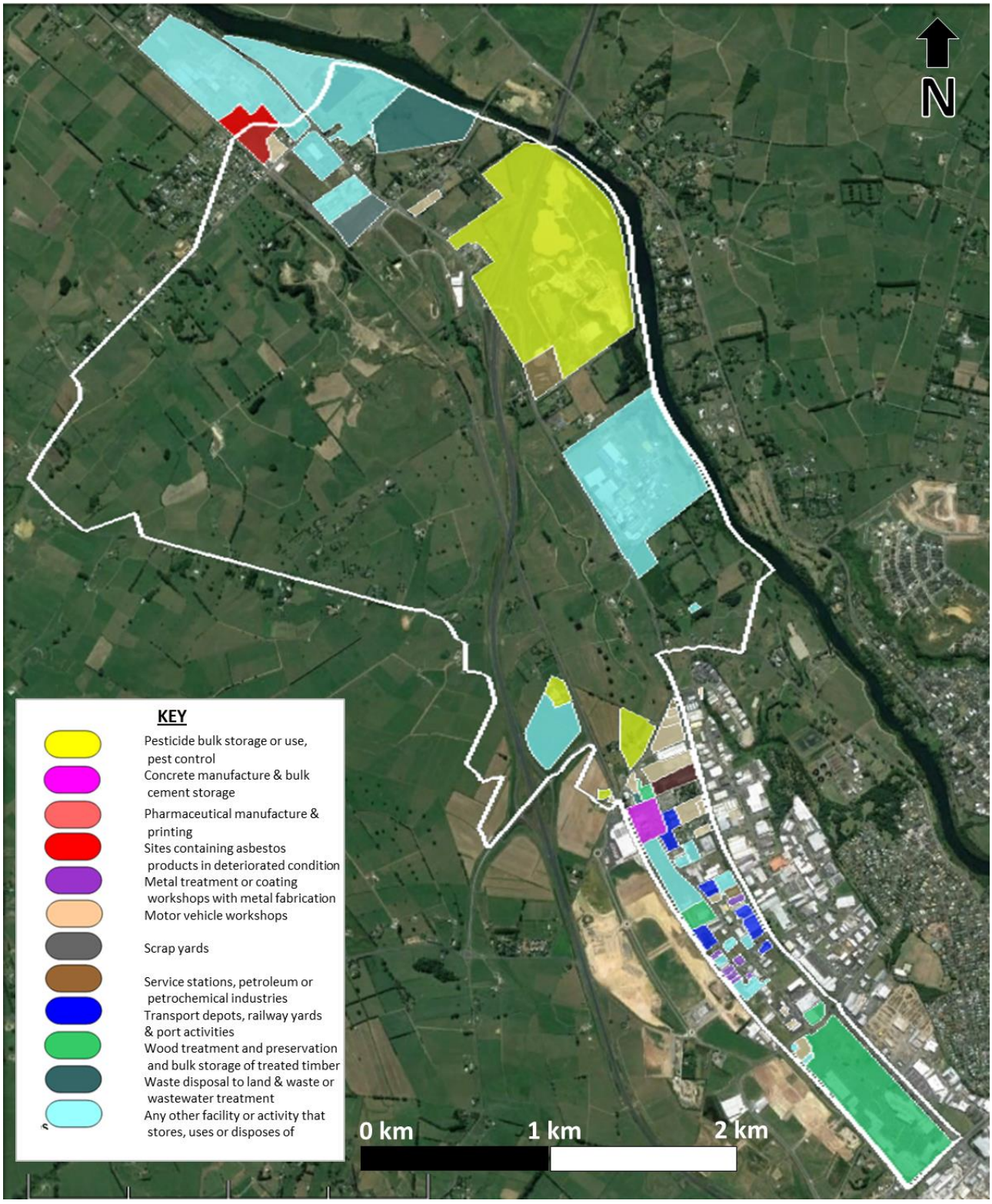


Figure 19: HAIL Sites

4.5 Values

4.5.1 Aquatic Biodiversity

The Te Rapa catchment provides habitat for several indigenous fish species, including species identified as Nationally at Risk. A catchment-wide survey was conducted in 2019 and included 7 locations within the catchment (Appendix C). This survey identified the presence of six indigenous species in total, comprising shortfin eel (*Anguilla australis*), longfin eel (*Anguilla dieffenbachii*), inanga (*Galaxias maculatus*), banded kookopu (Galaxias fasciatus), common smelt (*Retropinna retropinna*) and Black mudfish (*Neochanna diversus*).

The 2019 fish surveys indicated the most abundant of the indigenous species present to be the longfin and shortfin eel. Of the species caught, longfin eel, black mudfish and inanga are classified as Nationally at Risk; Declining (Goodman *et al.* 2014). Longfin eel were identified over the entire length of the main channel. Inanga were identified within the central reaches of the main channel, and black mudfish were identified within the farm drainage system upstream of Onion Road.

Introduced fish species were also identified within the Te Rapa catchment and in the immediate vicinity of the Waikato River (NZFFD). Of these species, the mosquitofish (*Gambusia affinis*) has the highest abundance with large numbers present within the Te Rapa catchment.

Fish passage within the main Te Rapa Stream for indigenous species is generally good with a small number of partial or temporary barriers to fish passage identified.

Benthic macroinvertebrate communities present within the wider Te Rapa catchment are generally indicative of poor water quality due to the dominance of species tolerant of poor habitat and water quality. Marginally higher quality macroinvertebrate communities within the catchment were identified within the very upper and lower reaches, however, results generally indicate moderate to severe pollution within the catchment.

4.5.2 Terrestrial Biodiversity Values

Significant natural areas (SNAs), are areas identified as having significant ecological character or value using criteria defined in the Hamilton City District Plan (2017; Cornes, Thomson, and Clarkson, 2012a, 2012b). The ODP lists two significant natural areas (SNAs) identified and described within the Te Rapa catchment. Both areas are remnant kahikatea stands within the small gully system to the south of the Fonterra processing site.

The SNAs referenced above were identified solely based on the basis of vegetation. Survey for habitat of any fauna species was not undertaken (Cornes, Thomson, and Clarkson, 2012a, 2012b). The Waikato District Plan does not list any SNAs within the lower Te Rapa catchment. Outside of the listed SNA's, effectively all the terrestrial vegetation has been cleared for pasture.

The catchment as a whole falls within the 'Acutely Threatened' environment classification where less than 10% indigenous vegetation cover is left nationally. This means that any remaining indigenous vegetation cover is a high priority for protection due to its rarity (Ministry for the Environment and Department of Conservation, 2007).

4.5.3 Cultural Value to Iwi and Archaeological significance

The Waikato River, streams, lakes, and extensive wetlands in the district would have teemed with life. Tuna (eels), whitebait species (inanga, banded kookopu and giant kookopu), smelt, piiharau (lamprey eels), kanae (mullet – yellow-eyed and grey), paatiki (flounder), kaakahi/kaaeo (freshwater mussels) and koura (freshwater crayfish)[47] lived in one or more of these several types of water body.

[47] Waikato-Tainui Te Kauhanganui Incorporated, 2013, s.22.1.5, p.186

Some of these species are still found in the Te Rapa catchment today. The photos of the fish included in this chapter were taken during a survey in the catchment on 7 November 2019. The fish were captured, photographed, and returned live to the stream.

Figure 21: Banded Kookopu (indigenous)

Figure 20: Koi carp (introduced)

Figure 23: Rudd (introduced)

Figure 22: Inanga (indigenous)

Figure 24: Smelt (indigenous)

.

Mangaharakeke Paa Complex

The Mangaharakeke Paa complex comprises 4 paa sites (S14/18, S14/17, S14/113 and S14/112) located on headlands associated with the Mangaharakeke gully system. It extends from the riverside of Fonterra's Te Rapa Dairy Manufacturing Site in the south to near Hutchinson Road in the north.

Mangaharakeke Paa (S14/18) was temporarily abandoned when musket armed Ngaapuhi invaded the area and set fire to the paa. Last known occupants were Te Roore Tatangi of Ngaati Koura, who resettled the

paa and surrounding lands about 1824 and occupied the area until the 1860s when British troops invaded the Waikato.[48]

In 2001, the site was restored: native plants were established, an access track formed, and 6 pou, a niu pole and interpretative panel were erected.[49] The southernmost defensive ditch was partially restored, and a low bund placed on the northern side.[50] During excavations in 2001, borrow pits and garden soils were noted. It was estimated that up to 100 hectares of garden soils were associated with the paa.[51]

A spring on the south-western side was probably the paa's source of drinking water. Another spring or series of seepages on the eastern side may have been used as puna paru for dying garments. Canoe landings probably existed in the Mangaharakeke Stream and Waikato River adjacent to the paa.

Other paa sites

Other paa sites existed outside and near Te Rapa Catchment – see Figure *1***Error! Reference source not found.**. Closest are Te Raratuna o Tutumua Paa (S14/97) and Pukete Paa (S14/30), which are upstream on the western side of the river, and Te Owhango Paa (S14/25) on the eastern side. Puke-i-aahua Paa (S14/2) is located about 6km downstream of Hutchinson Road, on the south-eastern outskirts of Ngaaruawaahia.

[48] Cable, 2020, p.2 re Mangaharakeke Paa (S14/18)
[49] Ibid
[50] Cable, 2020, p.2 re Mangaharakeke Paa (S14/18)
[51] Gumbley, 2013, p.40 cited in Cable, 2020, p.1 re Mangaharakeke Paa (S14/18)

Table 6: Recorded archaeological sites within Te Rapa Catchment				
NZAA Site No	**District Plan Site No[52]**	**Site types**	**Original site features[53]**	**Site condition in 2021[54]**
	SS54	Maaori gardens[55]	Borrow pits and gardening soils	
	SS62			
S14/17	A126	Paa (part of Mangaharakeke Paa complex)	Rectangular storage pits, defensive ditch, house platforms	The basic form is still visible, but most surface features have been damaged or destroyed. [56]
S14/18	A127	Mangaharakeke Paa	Ditches, platform, defensive scarp, terraces, gardening soils, borrow pits	The site is owned and maintained by Fonterra and is in good condition. Some features have been modified.[57]
S14/112	A124	Paa (part of Mangaharakeke Paa complex)	A headland paa divided into 4 distinct platforms separated by large ditch and bank defence. Numerous pits and house floors.	Poor – almost all site features have been destroyed.
S14/113	A125	Paa (part of Mangaharakeke Paa complex)	A small satellite paa site encompassing a small promontory terrace with 10 rectangular food storage pits	Poor – no visible features remain.
S14/114	A128	Artefact findspot	Artefact - adze	Not applicable.
S14/203	A129	Maaori horticulture	Four oven scoops, an intact oven, 7 post holes (possibly associated with raised storage houses and shelters), oven-stones, gardening soils covering about 3.3 to 3.7 hectare, and 4 borrow pits	Features were destroyed during development on the Te Rapa Dairy Manufacturing Site.
S14/284	A29	Middens/Oven	12 cooking pits (umu), postholes (possibly associated with drying racks for shellfish), hangi stones, midden comprising cockle, pipi, freshwater mussels, and tawa seed. The site was dated to about 1600AD and was possibly a campsite associated with movement of Maaori along the Waikato River.	Destroyed during construction of the Te Awa River Ride Cycleway in 2013.

Campsite

In 2013, during construction of Te Awa River Ride cycleway, a campsite containing 12 cooking pits backfilled with shell midden were discovered on a natural river terrace 530m north of Hutchinson Road. This site (S14/284) was dated to about 1600AD and was possibly a campsite associated with movement of Maaori along the Waikato River.

Maaori horticulture

[52] Operative *Hamilton City District Plan* (2017) and *Proposed Waikato District Plan* (2018)

[53] Original site features were identified by past site inspections and aerial photographs. Sites S14/203 and s14/284 were subject to archaeological investigations.

[54] Most sites have the potential to contain sub-surface archaeological remains (Cable, 2020).

[55] These sites are within Waikato District.

[56] Cable, 2020, p.2 re S14/17

[57] Cable, 2020, p.3 re S14/18

Maaori modified topsoil by mixing sands, gravels, and charcoal with it to create a suitable and fertile medium for growing their preferred cultivars – kumara, taro and hue. This practice affected extensive areas along the river corridor in the Hamilton Basin, including within Te Rapa catchment, and left multiple depressions called "borrow pits" where the sands and gravel were excavated, and human-made soils – see Figure 12 and Table 6.

Artefact find sites

Artefact find sites are further evidence of mana whenua occupation and use of the catchment (see Figure 12 and Table 6). More artefacts, koiwi (human remains), urupaa (burial grounds), borrow pits and human-made soils may be discovered as Te Rapa catchment is developed.

Maaori Place Names

Maaori place names within Te Rapa catchment are another legacy of those who once occupied the territory. Names already mentioned above include the Mangaharakeke Stream, Mangaharakeke Paa and the eel weir named Te Raratuna o Tutumua.

The name, Te Rapa, which is now applied to the catchment and suburb, was assigned to the area, not by mana whenua, but by early European surveyors. Te Rapa was originally the name of a fortified paa beside the Waikato River near the present site of Waikato Hospital.[58]

4.5.4 Amenity, Recreational and Aesthetic Values

The Te Rapa Stream system falls within private property for most of its length and access to the stream system is generally very limited. A section of the Te Awa cycleway and walking path is located within the Te Rapa ICMP area along the Waikato River from the Horotiu Bridge through to Pukete Road.

The overall aesthetic value of gully vegetation varies. Some re-vegetation work was observed along the central main channel within in the Fonterra farming land, however this is of limited lateral extent. More extensive re-vegetation is noted within the smaller gully systems which discharge directly to the Waikato River between the proposed Te Awa Lakes development and Fonterra Processing facility. For the most part much of the stream system remains in a cleared state with introduced species being the dominant vegetation type.

4.6 Existing Infrastructure

4.6.1 Stormwater

Existing stormwater infrastructure within the Te Rapa catchment is shown in Figure. In the upper catchment, the existing stormwater system consists of a reticulated network with a central trunk main running along the Boulevard. Reticulation in the Te Rapa catchment was generally installed at a time when the level of service for industrial stormwater reticulation serviced the 5-year ARI. The standard increased to the 10-year ARI under the RITS in 2018. The pipe is supported by on-lot detention requirements, which are implemented at the time of Building Consent.

Downstream of the existing reticulation network within the Te Rapa industrial area, stormwater is conveyed primarily by the Te Rapa Stream network and farm drainage systems.

[58] Puke, 2004, p.3 cited in Te Haa o Te Whenua o Kirikiriroa, 2021, cover page

Figure 25: Existing Stormwater Infrastructure

4.6.2 Wastewater

The Hamilton City wastewater system currently services the Te Rapa catchment (existing development) through a combination of pump stations, rising mains and gravity mains (see Figure 26) which discharge to the Pukete Wastewater Treatment Plant which is located close to the eastern boundary of the catchment.

No existing wastewater capacity issues were identified as part of the latest HCC Wastewater Masterplan (Version 4).

Figure 26: Existing Wastewater Infrastructure

4.6.3 Water supply

Existing potable water infrastructure within the Te Rapa catchment is shown in Figure 28. The Te Rapa area sits within the 'Blue Zone' water supply zone. The Blue zone consists of 4 reservoirs and associated pump stations and several (21) supply points and spans the majority of Hamilton City (see Figure 27). Within the existing Te Rapa industrial area truck supply mains run along The Boulevard and Te Rapa Road. In the downstream deferred industrial zone, truck mains currently run along Meadow View Lane (Te Araroa Trail) servicing the Fonterra processing facility and along Te Rapa Road servicing the Te Awa Lakes development area.

HCC's 2020 Water Supply Masterplan (Version 4) does not identify any current pressure issues in the Te Rapa area.

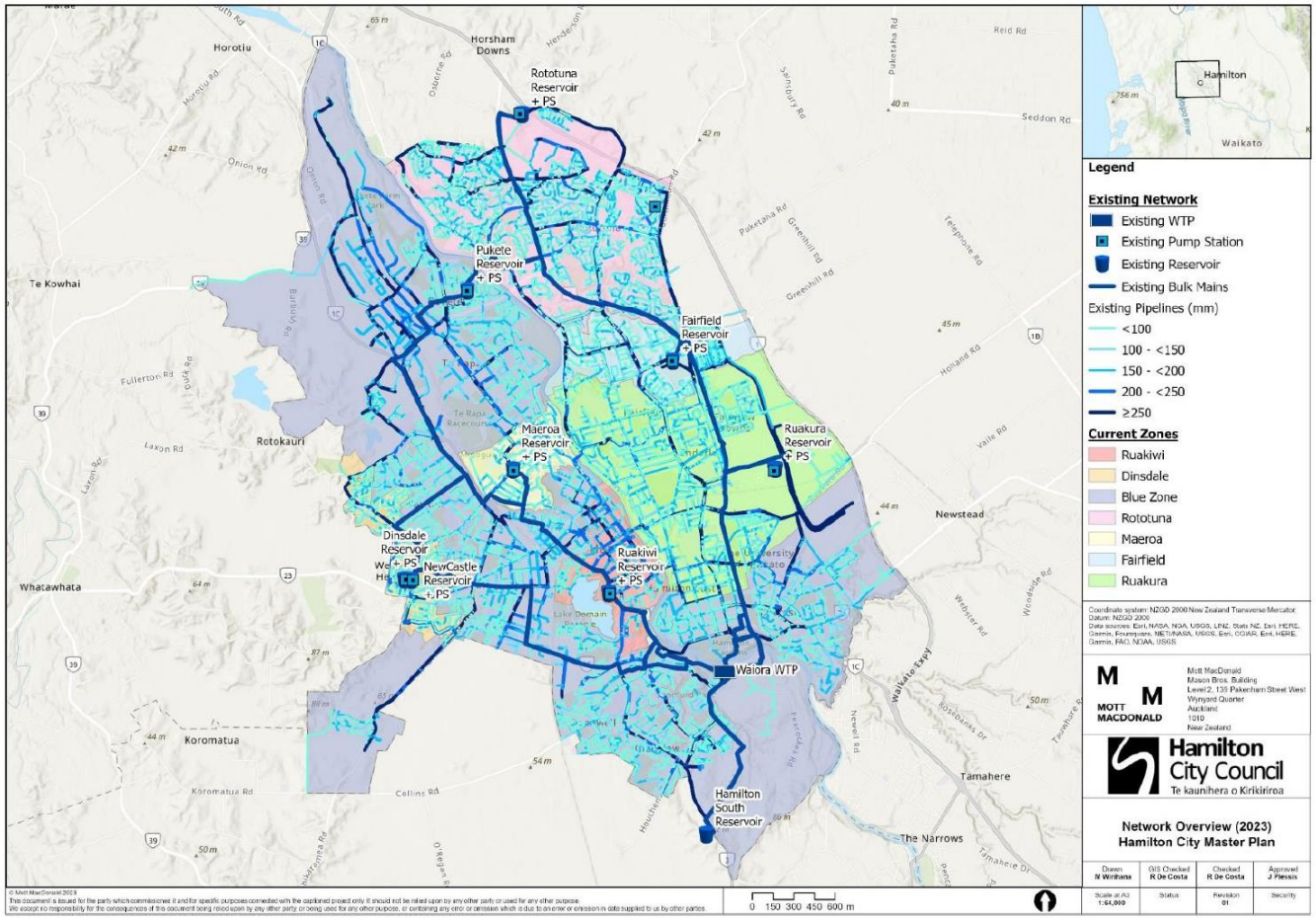


Figure 27: Existing Water Supply Network Overview.

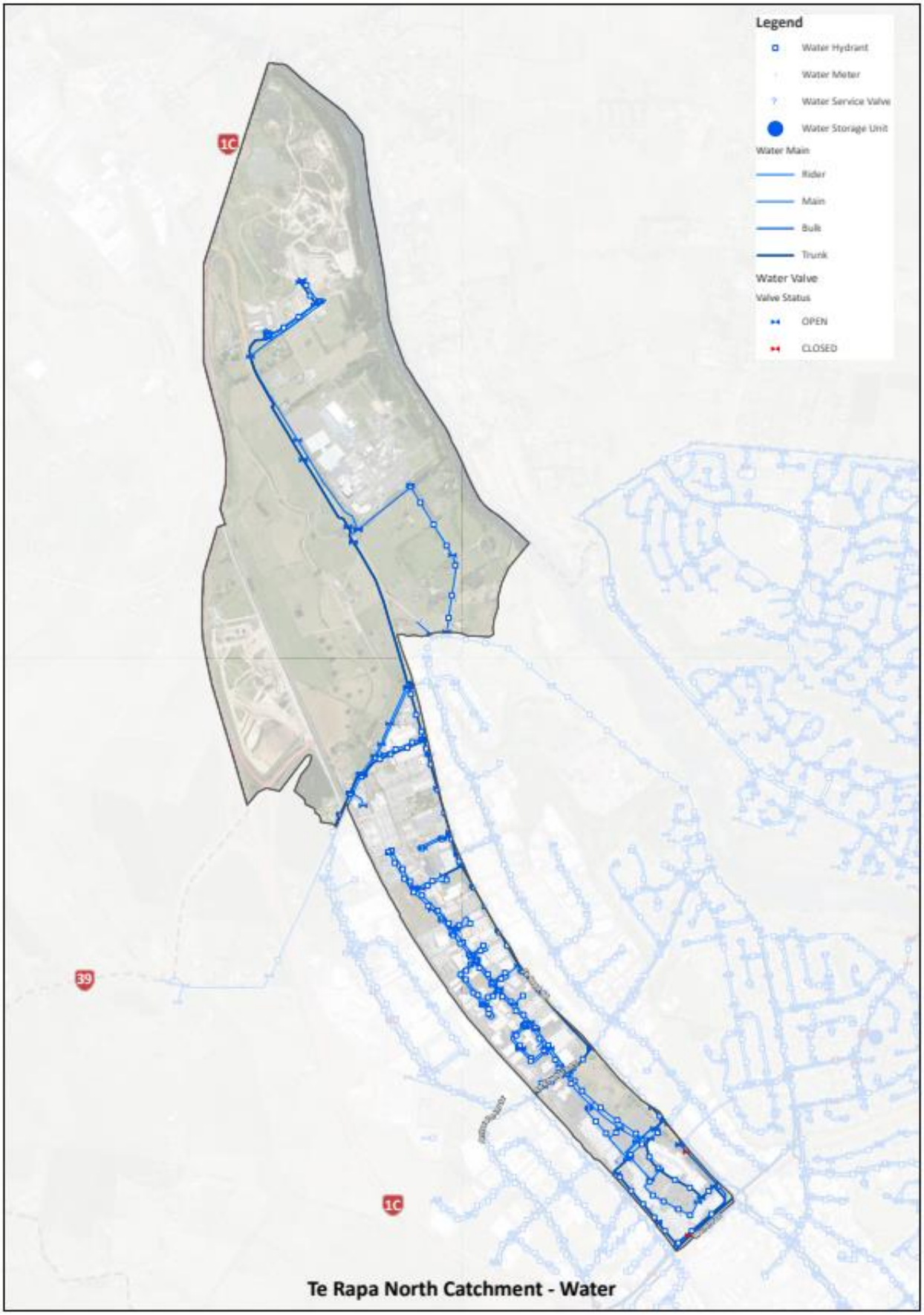


Figure 28: Existing Water Supply Infrastructure

5. PLANNING FRAMEWORK

5.1 Introduction

This chapter provides an overview of the key statutes, planning documents and consents that have informed this ICMP. Table 7 lists the key documents, and Figure 29 illustrates the relationships between them. The remainder of the chapter summarises key requirements and implications of each document for the ICMP.

Table 7: Key strategic and regulatory documents

Document Type	Document Title	Date/Version	Abbreviation
National Legislation	Resource Management Act 1991	1991	RMA
	Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act	2010	
	Local Government 1974	1974	LGA 1974
	Local Government Act 2002	2002	LGA 2002
	Water Services Act 2021	2021	
National Policy Statements	Te Ture Whaimana (Vision & Strategy for the Waikato River)	2010 (Updated 2012[59])	
	National Policy Statement for Indigenous Biodiversity	Updated October 2024	NPS-IB
	National Policy Statement for Freshwater Management	Updated October 2024	NPS-FM
	National Policy Statement on Urban Development	August 2020 (Updated May 2022)	NPS-UD
National Environment Standard – Contaminants in Soil	National Environment Standard for Assessing and Managing Contaminants in Soil to Protect Human Health	2011	NES-CS
National Environment Standard - Freshwater	National Environment Standard for Freshwater	2023	NES-FW
Iwi/Hapuu Environmental Management Plans	Waikato-Tainui Environmental Management Plan	September 2013	WTEMP
	Ngaati Hauaa Environmental Management Plan	September 2018	NHEMP
	Ngaati Tamainupoo Iwi Management Plan	December 2021	NTIMP
Regional Policy Statement	Waikato Regional Policy Statement	May 2016 (Updated November 2023)	WRPS

[59] Boundaries extended to include all the Waipa River catchment (Waikato River Authority, n.d., p.3)

Table 7: Key strategic and regulatory documents

Document Type	Document Title	Date/Version	Abbreviation
Regional and District Plans	Waikato Regional Plan	December 2024	WRP
	Proposed Waikato Regional Plan Change 1 – Waikato and Waipa River Catchments including Variation 1	April 2018	PC1
	Hamilton City Operative District Plan	Operative October 2017 (Updated February 2025)	ODP
	Waikato District Operative Plan	August 2017	WDP
	Proposed Waikato District Plan – Operative in Part	December 2024	PWDP
Hamilton City Council bylaws and policies	Stormwater Bylaw	2021	
	Water Supply Bylaw	2013 (updated 2024)	
	Trade Waste and Wastewater Bylaw	2016 (updated 2023)	
	Three Waters Connection Policy	2020	
	Hamilton Open Space Provision Policy	2018	
Waikato Regional Council Resource Consents	Hamilton City Council Comprehensive Stormwater Discharge Consent (105279)	June 2011	CSDC
	Hamilton City Council Surface Water Take and Use Consent (113941.01.02)	March 2009	
	Hamilton City Council Wastewater Discharge Consent (114674.01.02)	October 2016	
Subdivision consents granted by Hamilton City Council	See Section 5.10		
Sub-catchment ICMPs (SICMPs)	Empire Onion Road Sub-division	September 2021	
Regional and Sub-Regional Strategies and documents			
Hamilton City Council Strategic Documents			

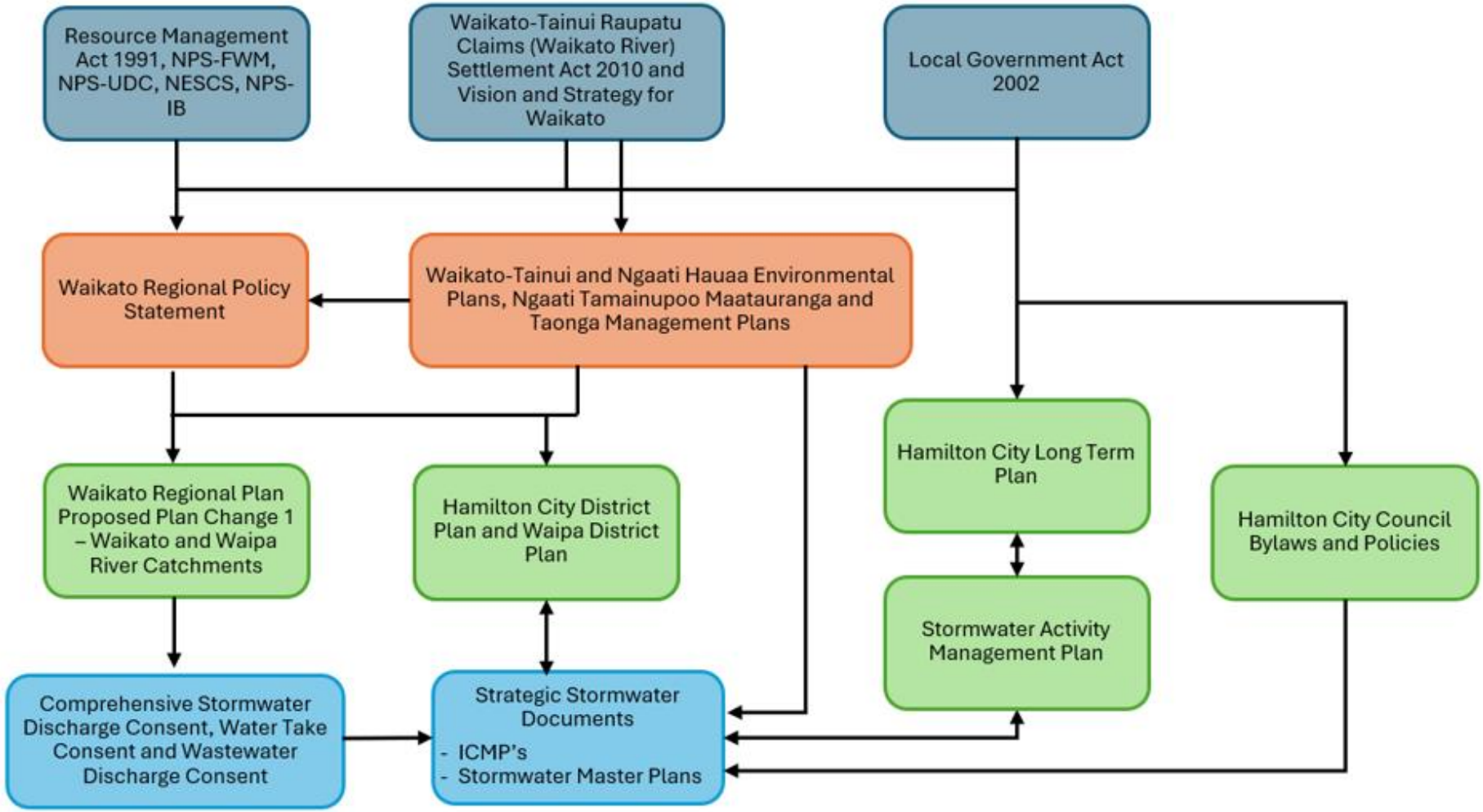


Figure 29: Key Strategic and Regulatory Documents - Hierarchy and Linkages

5.1.1 Relationships between documents

The relationships between the key legislation and documents are summarised as follows:

- National policy statements, national environmental standards, regional policy statements, regional plans and district plans are prepared under the Resource Management Act 1991.
- Te Ture Whaimana, the Vision and Strategy for the Waikato River, is a primary direction-setting document for the Waikato and Waipa Rivers and their catchments. In general terms, Te Ture Whaimana is deemed to be part of planning documents prepared under the Resource Management Act that impact the aforementioned catchments. Additionally, Te Ture Whaimana prevails over any inconsistencies between it and national policy statements (including the New Zealand Coastal Policy Statement).
- A regional policy statement must give effect to any national policy statement .
- Regional and district plans must give effect to any national policy statement and regional policy statement.
- Hamilton City Council's Comprehensive Stormwater Discharge Consent (CSDC) was issued in accordance with the requirements of the Waikato Regional Plan and sets conditions for stormwater diversion and discharge activities in the catchment. It informs development of ICMPs. ICMPs are be provided to Waikato Regional Council for certification of the stormwater component under the CSDC.
- The Hamilton District Plan informs ICMPs and includes rules that give effect to the ICMP once it is certified by Waikato Regional Council and approved by HCC.
- The Local Government Act 2002 requires the Council to prepare the Hamilton City Long Term Plan (LTP).
- The LTP sets levels of service to be achieved for infrastructure, and this informs the ICMP.
- The ICMP identifies the three waters infrastructure required to develop the catchment, and this informs the Council's LTP.

Table 8: Other Hamilton City Council and WRC Documents that inform the ICMP

Document Title	Date/Version	Source	Abbreviation used for reference
Future Proof Strategy: Planning for Growth	October 2024	Future Proof Website	Future Proof
Sub-Regional Three Waters Strategy	September 2012	Future Proof Website	SRTWS
Sub-Regional Three Waters Action Plan	January 2017, Version 7	Future Proof Website	
The Hamilton Urban Growth Strategy	April 2023	Hamilton City Council Website	HUGS
Hamilton City River Plan	October 2014	Hamilton City Council Website	
Local Indigenous Biodiversity Strategy	September, 2018	D-2800285	LIBS
Hamilton City Bat Management Plan	November 2024		

Table 8: Other Hamilton City Council and WRC Documents that inform the ICMP

Document Title	Date/Version	Source	Abbreviation used for reference
Nature in the City Strategy	2020 - 2050	Hamilton City Council Website	
Our Climate Future – Te Pae Tawhiti o Kirikiriroa	2020 - 2050	Hamilton City Council Website	
He Pou Manawa Ora – Pillars of Wellbeing Strategy	August 2021	Hamilton City Council Website	
Central Waikato Zone Plan	November 2017	Waikato Regional Council Website	
WRC Technical Report 2014/13 –Managing land use change and Council's administered drainage area	February 2014	Waikato Regional Council Website	
Hamilton City Council Stormwater Master Plan	Version 1 - December 2016	D-2274157	SMPv1
	Version 2 – Dec 2020	SMPv2 LINK	SMPv2
	Version 3 – Nov 2024	SMPv3 LINK	SMPv3
Hamilton City Council Water Master Plan	Version 3 – June 2020	WMPv3	WMPv3
	Version 4 – Oct 2023	WMPv4	WMPv4
Hamilton City Council Wastewater Master Plan	Version 3 – June 2020	WWMPv3	WWMPv3
	Version 4 – Nov 2024		WWMPv4
Hamilton City Council Activity Management Plan-Stormwater	2021-2051		
	2024-2054 – Feb 2024 (Final draft for Audit)	SWAMP 24	
Hamilton City Council Activity Management Plan-Water	2021 -2051		
	2024-2054 – Feb 2024 (Final draft for Audit)	WAMP 24	
Hamilton City Council 2021-2051 Activity Management Plan-Wastewater	2021 - 2051		
	2024-2054 – Feb 2024 (Final draft for Audit)	WWAMP 24	
2024-2034 Mahere Whaanui Long Term Plan	June 2024	Waikato Regional Council Website	

Table 8: Other Hamilton City Council and WRC Documents that inform the ICMP

Document Title	Date/Version	Source	Abbreviation used for reference
2024-2034 Hamilton City Council Long Term Plan (also, 2024-2054 Infrastructure Strategy)	July 2024	Hamilton City Council Website	
Waikato and Waipa River Restoration Strategy: Volume 1: Report and references	June 2018	Waikato Regional Council Website	
Waikato and Waipa River Restoration Strategy: Volume 2:	June 2018	NIWA Website	
Project Watershed Service Level Agreement between Waikato Regional Council and Hamilton City Council	March 2016	D-2083257	
Regional Infrastructure Technical Specifications	May 2018	Waikato Local Authority Shared Services	RITS
Waikato Stormwater Management Guideline	2020	Waikato Regional Council Website	
Waikato Stormwater Runoff Modelling Guideline	2020	Waikato Regional Council Website	
Hamilton City Council Standard Stormwater Modelling Methodology Version 2 (draft)	July 2017	D-2455376	
Three Water Management Practice Notes	2016	Hamilton City Council Website	
Access Hamilton: Ara Kootuitui Kirikiriroa	August 2022	https://hamilton.govt.nz/strategies-plans-and-projects/strategies/access-hamilton/	
Hamilton City Council Business Case for ICMPs	April 2016	D-2099339	

5.2 National Legislation

5.2.1 Resource Management Act 1991

The Resource Management Act (RMA) provides the statutory framework for managing natural and physical resources. It prescribes restrictions on some resource uses, for example, the discharge of contaminants into the environment. It sets out the resource management functions, powers and duties of the Environment Court, central, regional and local government and provides for the preparation and

implementation of statutory planning documents, national environmental and planning standards, national and regional policy statements and regional and district plans. It also provides for subdivision and the granting of consents to use resources and for establishing heritage orders and designations over land.

The purpose of the RMA is to promote the sustainable management of natural and physical resources. This means managing the use, development, and protection of these resources in a way, or at a rate which enables people and communities to provide for their social, economic and cultural well-being and for their health and safety while:

1. Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and
2. Safeguarding the life-supporting capacity of air, water, soil and ecosystems; and
3. Avoiding, remedying, or mitigating any adverse effects of activities on the environment.

The statutory planning documents prepared under the RMA inform the ICMP, which identifies how potable water supply, wastewater and stormwater will be managed in the Te Rapa Catchment in an integrated way to promote sustainable management of the environment.

5.2.2 Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010

The overarching purpose of the settlement is to restore and protect the health and wellbeing of the Waikato River for future generations. The purpose of this Act includes, inter alia, to recognise Te Ture Whaimana, establish the Waikato River Authority and Waikato River Clean-up Trust and provide for Waikato-Tainui's involvement in co-managing the Waikato River from the Karapiro Dam to the mouth of the Waikato River. Inter alia, the ICMP focuses on restoring and protecting the health and wellbeing of Te Rapa Stream, a tributary of the Waikato River.

5.2.3 Local Government Act 2002

The purpose of the Local Government Act 2002 (LGA 2002) is to provide for democratic and effective local government. LGA 2002 sets out the purpose of local government: "to enable democratic local decision-making and action by, and on behalf of, communities, and to promote the social, economic, environmental, and cultural well-being of communities in the present and for the future".[60] It provides a framework and powers for the Council to function and requires it to, inter alia:

1. Ensure prudent stewardship and the efficient and effective use of its resources in the interests of the City, including by planning effectively for the future management of its assets;[61]
2. Take a sustainable development approach and consider the need to maintain and enhance the quality of the environment;[62]
3. Prepare and adopt a long-term plan and an annual plan;[63] and
4. Provide opportunities for Maaori to contribute to decision-making processes.[64]

The LGA 2002 enables the preparation and implementation of the ICMP. The ICMP will inform the Council's long-term and annual plans and assist the Council to exercise prudent stewardship of its assets. It represents a sustainable development approach that will maintain and enhance the quality of the environment, and THaWK and Waikato-Tainui were involved in its preparation.

[60] LGA 2002 s.10
[61] LGA 2002 s.14 (1) (g)
[62] LGA 2002 s.14 (1) (h) (ii)
[63] LGA 2002 Sections 93 and 95
[64] LGA 2002 Sections 4 and 14(d), Parts 2 and 6

5.2.4 Water Services Act 2021

The purpose of the Water Services Act 2021 is to ensure that all drinking water suppliers provide safe and reliable drinking water to consumers. This is achieved by mandating all drinking water suppliers in New Zealand (including Council) develop safety plans, register with Taumata Arowai, comply with water quality standards, and regularly monitor and report water quality to ensure safe and reliable drinking water for consumers.

5.3 National Policy Statements

5.3.1 Te Ture Whaimana o Te Awa o Waikato

The Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act establishes Te Ture Whaimana o Te Awa o Waikato, which is the primary direction-setting document for the Waikato River and activities within its catchment affecting the Waikato River.[65] Te Ture Whaimana is deemed part of the Waikato Regional Policy Statement and prevails over any inconsistent provision in any national policy statement. A full assessment against Te Ture Whaimana and its objectives are in the Assessment of Environmental Effects (AEE) in Appendix D and have concluded that the ICMP aligns with Te Ture Whaimana as it is anticipated that over time the change in land use and the targeted reduction in nutrients and sediment coupled with measures to remove heavy metal contaminants at source in the Te Rapa Stream catchment will contribute to the restoration of the Waikato River.

5.3.2 National Policy Statement for Indigenous Biodiversity

The NPS-IB came into effect on 4 August 2023. The objective of the NPS-IB is to maintain indigenous biodiversity across Aotearoa New Zealand so that there is at least no overall loss in indigenous biodiversity after the commencement date. The NPS-IB sets out four ways to achieve the objective, including by protecting and restoring indigenous biodiversity as necessary to achieve the overall maintenance of indigenous biodiversity, while providing for the social, economic, and cultural wellbeing of people and communities now and in the future. The NPS includes policies maintain and manage indigenous biodiversity, including through the identification of Significant Natural Areas (SNA). No SNA identified within the ICMP area. Accordingly, the SNA-related provisions of the NPS-IB are not relevant. Clause 3.16 of the NPS-IB requires any significant adverse effects of a new subdivision, use or development outside SNA and not on specified Maaori land to be managed by the effects management hierarchy. All other adverse effects of any activities that may adversely affect indigenous biodiversity must be managed to give effect to the objective and policies of the NPS-IB.

5.3.3 National Policy Statement for Freshwater Management

The National Policy Statement for Freshwater Management (NPS-FM, 2020) provides direction on how local government is to improve freshwater management. It directs regional councils to identify, in consultation with their communities, what is valued about each water body and to set freshwater objectives to provide for those values. For example, freshwater objectives could be about the water quality needed to enable people to gather food or swim safely. It requires councils to work out what needs to be managed (for example, contaminants, flow, habitat or land use) to achieve the objectives. The Regional Council includes requirements in its Regional Plan to give effect to the NPS-FM.

The NPS-FM requires the Council to involve iwi and hapuu in the management of freshwater and its ecosystems, including identifying tangata whenua values and interests in these matters, and reflecting those values and interests in the relevant resource management and decision-making.

The ICMP will give effect to the NPS-FM by identifying how land use and development activities in the Te Rapa Catchment will be managed to achieve the requirements in the Waikato Regional Plan. In addition,

[65] S.5(1) of the Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010

the Council has involved THaWK and Waikato-Tainui in the development of the ICMP, and the final document is intended to reflect their values and interests in the catchment.

5.3.4 National Policy Statement on Urban Development

The NPS-UD requires the Council to meet demand for work and business places and dwellings[66]. It defines Hamilton City as a "tier 1 urban environment" and requires the Council to provide at least sufficient development capacity to meet expected demand for housing and for business land over the short, medium and long terms. Furthermore, it requires the Council be responsive to plan changes that would add significantly to development capacity, even if the development capacity is unanticipated by RMA planning documents or out-of-sequence with planned land release, to consider all practicable options for providing sufficient, feasible development capacity and enabling development to meet demand.[67]

5.4 National Environmental Standards

5.4.1 National Environment Standard for Assessing and Managing Contaminants in Soil to Protect Human Health

The National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS) is a nationally consistent set of planning controls and soil contaminant values. It ensures that land affected by contaminants in soil is appropriately identified and assessed before it is developed – and if necessary, the land is remediated, or the contaminants contained to make the land safe for human use.

The ICMP has assumed any contaminated soils on a site will be managed through the NESCS process when the site is developed. Contaminated sites are considered in Section 4.4.8.

5.4.2 National Environmental Standards for Freshwater

The Freshwater NES set requirements for carrying out certain activities that pose risks to freshwater and freshwater ecosystems. Anyone carrying out these activities will need to comply with the standards.

The standards are designed to:

- protect existing inland and coastal wetlands
- protect urban and rural streams from in-filling
- ensure connectivity of fish habitat (fish passage)
- set minimum requirements for feedlots and other stockholding areas
- improve poor practice intensive winter grazing of forage crops
- restrict further agricultural intensification until the end of 2024
- limit the discharge of synthetic nitrogen fertiliser to land and require reporting of fertiliser use.

The ICMP has undertaken initial work to identify streams, fish passage barriers and natural wetlands within the catchment.

5.5 Iwi/Hapuu Management Plans

Below provides a brief overview of each of the three iwi/hapuu management plans relevant to the Te Rapa ICMP. A full assessment of the ICMP against these plans and their objectives and policies is in Section 3.5 of the AEE in Appendix D.

[66] See Objective 2 and 6 and Policy 2 on p.10 and p.11 of NPS-UD.
[67] Policy 8 of NPS-UD (p.12)

5.5.1 Waikato-Tainui Environmental Plan

In addition to the objectives in Te Ture Whaimana, the Waikato-Tainui Environmental Plan, Tai Tumu Tai Pari Tai Ao (Waikato-Tainui Te Kauhanganui Incorporated, 2013), sets out Waikato-Tainui's aspiration for the environment to be restored to the state that existed at the time Kiingi Taawhiao composed his maimai aroha, nominally 1863. This lament expresses his longing and adoration for the treasured natural resources of his homeland[68].

5.5.2 Ngaati Hauaa Environmental Management Plan

This plan, Te Rautaki Taamata Ao Turoa o Hauaa (Ngaati Hauaa Iwi Trust, 2018), sets out Ngaati Hauaa's values, aspirations, and positions on environmental management. In brief, Ngaati Hauaa aspires to restore the environment's mauri and to be able to swim in, and drink and gather food from, the rivers and streams in their tribal area, which includes Te Rapa Stream[69].
The tribe aims for more sustainable land use, development, and management to provide for population growth without compromising the productive capacity of the environment[70]. It wishes to be involved in catchment management, planning and decision-making[71].

5.5.3 Ngaati Tamainupoo Maatauranga and Taonga Management Plan

Te Mata Herenga: Ngaati Tamainupoo Maatauranga and Taonga Management Plan 2021 (Ngaa Uri o Tamainupoo ki Whaaingaroa Trust, 2021) aims to "minimise the impacts of the Aotearoa New Zealand's resource management system on Ngaati Tamainupoo rangatiratanga and kaitiakitanga", including through improving understanding of Ngaati Tamainupoo's culture and traditions and its relationship with its taonga[7273]Ngaati Tamainupoo aspires to exercise its rangatiratanga and kaitiakitanga in New Zealand's resource management system to actively protect the mauri of its taonga.[74] Te Mata Herenga sets out policy positions, including (amongst others)[7576]

- Ngaati Tamainupoo regards all natural resources as taonga.[77]
- Sites and resources of significance to Ngaati Tamainupoo will be protected from further modification, destruction, or degradation.[78]
- Ngaati Tamainupoo will seek restoration, enhancement, and protection of its taonga.[79]
- Developers and resource users will engage with Ngaati Tamainupoo about proposed activities that affect the latter's taonga.[80]

Te Mata Herenga identifies the following within the Te Rapa catchment as areas of significance to Ngaati Tamainupoo:

- any land within 500m of the Waikato River margins[81]

[68] Waikato-Tainui Te Kauhanganui Incorporated, 2013, p.1
[69] Ngāti Hauā Iwi Trust, 2018, p.35
[70] Ibid, p.37, Objective 9.2 (1)
[71] Ibid, p.38, Objective 9.2 (3)
[72] Ngaa Uri o Tamainupoo ki Whaaingaroa Trust, 2021, p9.

[74] Ibid, pp10 and 13
[75] Ibid, p28

[77] Ibid, p9
[78] Ibid
[79] Ibid, p28
[80] Ibid, p30
[81] Ibid, p48

- Horotiu Bridge[82].

5.6 Waikato Regional Policy Statement

The Waikato Regional Policy Statement (WRPS) identifies the significant resource management issues of the region and sets out the objectives, policies and methods to address them and achieve integrated management of the region's natural and physical resources. It informs the regional and district plans and consideration of resource consents. A full assessment against the WRPS has been undertaken with Section 3.2 of the AEE in Appendix D.

5.7 Regional and District Plans

5.7.1 Waikato Regional Plan

The purpose of the Waikato Regional Plan (WRP) is to help Waikato Regional Council to carry out its functions to achieve sustainable management. The WRP comprises modules of which the following are relevant to the ICMP: matters of significance to Maori, water, river and lake beds, land and soil, and air. Each module provides an overview of the environmental problems the Regional Council seeks to manage, the objectives to be achieved, policies (actions to be taken) to achieve them, and methods and rules to implement the objectives and policies. A full assessment of the ICMP against the WRP objectives and policies is in Section 3.3 of the AEE in Appendix D.

Each module also describes the environmental results anticipated and how they will be monitored. Resource consent will be required for any activity that will not comply with permitted activity standards listed in the plan.

People undertaking development in the Catchment are likely to require resource consents from Waikato Regional Council under the WRP for the following activities:

- Vegetation clearance and earthworks – including for management of sediment-laden runoff and dust;
- Works in a stream bed – such as for culvert, bridge, pipeline or stormwater pipeline outfall construction or any stream diversion; and
- Diversion and discharge of stormwater into water or onto or into land, including management of contaminants.

The Council holds several resource consents granted under the Waikato Regional Plan – see 5.9 below.

5.7.2 Proposed Waikato Regional Plan Change 1

The Healthy Rivers proposed Waikato Regional Plan Change 1 (PC1) seeks to reduce the amount of contaminants entering into the Waikato and Waipaa catchments to achieve our Vision and Strategy / Te Ture Whaimana o Te Awa o Waikato of making the river swimmable and viable for food collection along the entire length of the river. An assessment against PC1 is provided within Section 3.4 of the AEE in Appendix D.

5.7.3 Operative Hamilton City District Plan

The purpose of the Operative Hamilton City District Plan (ODP) is to help the Council carry out its functions to achieve sustainable management of the environment and comply with the principles of the RMA. It provides a framework of resource management objectives, policies and implementation methods to, inter alia:

- Achieve the integrated management of the effects of the use, development or protection of land and associated natural and physical resources in the city;

[82] Ibid, p73

- Implement the Hamilton Urban Growth Strategy and ensure there is enough development capacity in respect of housing and business land to meet expected demands;
- Avoid or mitigate natural hazards;
- Prevent or mitigate the adverse effects of development, subdivision or use of land;
- Maintain indigenous biological diversity; and
- Inform consideration of resource consent applications.

The ODP includes the following requirements, which have informed the ICMP:

- The information required to be included in a full ICMP;[83]
- Maximum site coverage and minimum permeable surface coverage;
- Stormwater is to be managed as part of subdivision or development to ensure that the rate of stormwater discharge offsite is at or below pre-development rates;[84]
- In addition to low-flow fixtures, at least one water sensitive technique for stormwater is to be incorporated as part of any new development;[85]
- Preparation of Water Impact Assessments to consider effects on, and integration of, the three waters. Also, these assessments are required to demonstrate how they comply with the ICMP.[86]

The ODP also includes the Rotokauri and Rotokauri North Structure Plan areas, as well as the Te Rapa North Industrial Structure Plan, which all set out a vision for development of the Structure Plan areas, objectives and policies to guide the development, and proposed staging of the development. They includes maps showing the proposed layout of the Structure Plan areas, including the land uses, higher hierarchy roads, three waters infrastructure, community facilities and public space. Rules that control development are contained within the ODP zone chapters. The Te Rapa North Industrial Structure Plan is proposed as part of Private Plan Change 17, currently being progressed through the statutory RMA process, and will be a key mechanism for implementing the ICMP.

Plan Change 12: Enabling Housing Supply and Plan Change 14: Flooding have amended Rule 25.13 Three Waters of the ODP. In particular amendments have been made that require retention on lot of at least 10mm run-off depth for new and redeveloped impermeable surfaces. Specific requirements vary between new/amended definitions and additional controls for low, medium and high flood hazards, overland flow paths, depression areas, and flood extent areas; and amending stormwater management rules. This ICMP has been formulated to ensure the outcomes achieved within the catchment are aligned with the ODP

Once this ICMP has been finalised and Waikato Regional Council has certified it, the ODP[87] requires any development of three waters infrastructure in the Catchment to be undertaken in accordance with this ICMP.

5.7.4 Waikato District Plan

The Waikato District Plan serves the same purpose for Waikato District Council (WDC) as the ODP serves for Hamilton City Council[88].

A large portion of the Te Rapa catchment in the Waikato district area is subject to a Strategic Agreement (updated in 2020) that will see a boundary change transferring it into Hamilton City Council's jurisdiction at a future date to be agreed. This land is included within an Urban Expansion Area restricting urbanisation to

[83] Volume 2, Appendix 1, Table 1.2.2.6b
[84] Rule 25.13.4.2 b
[85] Rule 25.13.4.5 a
[86] Volume 2, Appendix 1, Table 1.2.2.5b
[87] Rule 25.13.4.1
[88] See 5.7.3 above.

prevent fragmentation that would hinder future urbanisation. It is expected that this would need to be informed by an updated ICMP.

Waikato District Council notified its decisions on the Proposed Waikato District Plan (PWDP) on Monday 17January 2022, and has since published an annotated version dated 18 December 2024 called the "Waikato District Plan - Operative in Part". The Waikato District Plan - Operative in Part identifies the provisions that are operative, and those provisions that are the subject of appeals which are still being progressed. The PWDP shows the area is zoned "General Rural", except for small pockets of "General Residential" zone and "Heavy Industrial" and "General Industrial" zones just north of the Te Rapa bypass. Accordingly, no significant land-use changes are expected in the part of the catchment lying within Waikato District that need to be considered when developing the ICMP.

5.8 Hamilton City Council Bylaws

The Council has adopted the following bylaws to help fulfil its obligations under the Local Government Act 2002 and the Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act:

- *Hamilton Stormwater Bylaw 2021;*
- *Hamilton City Water Supply Bylaw 2013 (revised 2024); and*
- *Hamilton Trade Waste and Wastewater Bylaw 2016 (revised 2023).*

5.8.1 Hamilton Stormwater Bylaw 2021

This bylaw enables the Council to manage and protect waterways and the Council's stormwater infrastructure, including to ensure they remain unobstructed, to manage the entry of contaminants, and to protect public health and safety. Of relevance to this ICMP is the definition of 'high risk' stormwater producing facilities, and the production of Stormwater Pollution Control Plans.

5.8.2 Hamilton City Water Supply Bylaw 2013 (revised 2024)

This bylaw enables the Council to protect the public water supply and associated infrastructure, including from damage and contamination, to protect, promote and maintain public health and safety. It also promotes efficient use of water and protects against waste or misuse of water. Schedule 2 to the bylaw sets out the required levels of service the water supply system is to achieve.

5.8.3 Hamilton Trade Waste and Wastewater Bylaw 2016 (revised 2023)

The Council uses this bylaw to manage private, commercial and industrial wastewater entering the Council's wastewater system. The bylaw aims to prevent sewer overflows, blockages, flooding, infrastructure damage and adverse effects on the wastewater system, treatment process, receiving environment and the health and safety of the Council's workers and the public. It also aims to achieve a consistent standard of bio-solids and encourage waste minimisation, cleaner production and efficient recycling and reuse of waste streams by businesses. Schedule 1B to the bylaw lists chemicals and hazardous substances that must not be discharged to the Council's wastewater system. The bylaw requires businesses, including pharmacies, wishing to discharge waste to the Council's wastewater system to obtain a Trade Waste Consent from the Council; this enables the Council to control the quality and quantity of trade waste and recover the additional costs of collection and treatment.

5.9 Resource Consents Waikato Regional Council has Granted Hamilton City Council

The Council holds a comprehensive city-wide stormwater consent which allows for multiple discharges in multiple catchments. This consent has stringent conditions relating to stormwater quality and quantity effects. This ICMP is a means of complying with the Council's CSDC; it directs stormwater management to ensure any new stormwater discharges in the catchment meet the conditions of, and can be authorised under, this consent. The CSDC authorises the diversion and discharge of stormwater from developed areas

within Hamilton City existing at the commencement of the consent in 2012[89]. The CSDC will authorise any new stormwater diversion and discharge activities established after 2012, if the Waikato Regional Council certifies they comply with the consent's conditions.

To achieve such certification, any new stormwater diversion and discharge activity in the Te Rapa Catchment must meet these two tests:

1) It must be consistent with the conditions of the CSDC; and
2) Either:
    a) Where it is in a greenfield area, it must be consistent with this ICMP; or
    b) Where it is to be established in an existing urbanised area, it must not increase peak discharge rates or flow volumes in the receiving water body above those that would have occurred when the CSDC was granted in 2012, unless it is demonstrated that any such increases will have no adverse effects.

New stormwater diversion and discharge activities established in developing catchments that are not consistent with Catchment Management Plans will remain as single site resource consents; the Council's CSDC will not authorise them.

The Council is committed to having as many consents as possible managed under its CSDC. If developers wish to transfer consents to the Council, or vest stormwater structures in the Council, the consented activities must comply with this ICMP.

The Council's CSDC does not authorise structures in the bed of any waterway. Separate resource consents for such structures are required and will need to meet Regional Infrastructure Technical Specifications and Waikato Regional Plan requirements.

This ICMP is also a means of complying with the Council's water take and wastewater discharge consents. For example, the ICMP includes measures to manage water demand and to avoid wastewater overflows, which are required by these consents respectively.

5.10 Existing Consents

Hamilton City Council has granted resource numerous consents in the catchment. Figure 30 illustrates the location resource consents granted by HCC which are deemed to be linked to stormwater. In summary, as at September 2024:

- A total of 11 subdivision consents were granted in the area subject to this ICMP. These ranged from simple two lot subdivisions to large scale comprehensive developments (i.e. Te Awa Lakes, Empire Corporation), and included both brownfield and greenfield sites.
- Two earthworks consents were granted within the area subject to this ICMP.
- A total of 10 resource consents were granted for activities which could generate stormwater from high-risk facilities.

A sub-catchment ICMP for the Empire development has been accepted by HCC/WRC within the Te Rapa ICMP area. The sub-catchment ICMP sets-out the following stormwater management approach:

- At-source retention of the initial abstraction volume
- Pre-treatment of high contaminant load surfaces (industrial)
- Water quality treatment within a centralised wetland devices

[89] CSDC Condition 2

- Extended detention (including WRC rural drainage attenuation), 2y-ARI, 10-year ARI and 100-year ARI attenuation.
- A financial contribution was required through the resource consent process to mitigate volume increases beyond initial abstraction requirements.

Once Waikato Regional Council certifies the Te Rapa ICMP, the latter will be deemed to supersede the sub-catchment ICMP. However, until the stormwater diversion and discharge consent for a subdivision is surrendered under the CSDC, the Sub-catchment ICMPs will still be in effect through the conditions of that consent.

	Consent Number	Address	Consent holder
1	010.2019.00010185.001	143 Maui Street	Micheal Gillum
2	010.2019.00010525.001	25 Norman Hayward Place	Carpri Developments
3	010.2019.00010587.001	1006 Te Rapa Road	The Wash Club Limited
4	010.2019.00010596.001	157 Maui Street	Maui Trust Limited
5	010.2019.00010631.001	16 Redoaks Close	AP Construction Limited
6	010.2020.00010898.001	175 Maui Street	Downey Construction Limited
7	010.2020.00011086.001	410A Onion Road	Delegat Limited
8	010.2020.00011087.001	1018 Te Rapa Road	NPD Limited
9	010.2020.00011132.001	181 Maui Street	Downey Construction Limited
10	010.2021.00011468.001	Te Rapa Road /Te Awa Lak	Perry Group
11	010.2022.00012190.001	195 Maui Street	Downey Construction Limited
12	010.2022.00012343.001	105 Maui Street	DHE Holdings Limited
13	010.2023.00012611.001	33 Norman Hayward Place	Riverside Studio Limited
14	010.2024.00013005.001	1219 Te Rapa Road	Statesman Project Management Limited
15	010.2024.00013164.001	62 The Boulevard	Crown Worldwide NZ Ltd
16	011.2019.00007117.001	1018 Te Rapa Road	Old HQ Development Limited
17	011.2019.00007131.001	80 Ruffell Road	Empire Corporation Ltd
18	011.2020.00007270.001	1006 Te Rapa Road	Foodstuffs North Island Limited
19	011.2021.00007449.001	181 Maui Street	Downey Construction Limited
20	011.2021.00007777.001	1428 Te Rapa Road	Te Awa Lakes Unincorporated Joint Venture
21	011.2021.00007784.001	1397 Pukete Road	Downey Construction Limited
22	011.2022.00007925.001	195 Maui Street	Downey Construction Limited
23	011.2024.00008344.001	86 The Boulevard	Pukeko (NZ) Limited
24	011.2024.00008482.001	62 The Boulevard	Crown Worldwide NZ Ltd

Print Size: A3 Portrait

Hamilton City Council
Te kaunihera o Kirikiriroa

Scale: 1:36,112

0 175 350 700 1,050 1,400 1,750 2,100 2,450 2,800 3,150 3,500 Meters

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Print Date:13-09-2024

Figure 30: Existing Consents

5.11 Future Proof Growth Strategy and Implementation Plan

The Future Proof Strategy is a 30-year growth management and implementation plan for the Hamilton, Waipa, Waikato and Matamata-Piako sub-region. The Future Proof partners are Tangata Whenua, Waikato Regional Council, Hamilton City Council, Waikato District Council, Waipa District Council, Matamata-Piako District Council and NZ Transport Agency Waka Kotahi. The Strategy sets out where, how, and when the area should be developed in the future. The Strategy was updated in 2024 to incorporate the Matamata-Piako district, and to reflect changes in legislation and government policy direction. The strategy was also updated to reflect the work that has progressed on waters, transport and climate change; to identify the critical infrastructure required to enable the development planned for under the Strategy; and to reflect the updated Housing and Business Development Capacity Assessments. The strategy is embedded in the WRPS and district plans.

Key features of the Strategy include:

- Growth and density targets and urban limits;
- Allocation of staging and growth for residential, commercial and industrial areas;
- Protection of the natural environment;
- Providing housing choice and supporting opportunities to address housing affordability;
- Green spaces;
- Protection of future infrastructure corridors; and
- Coordinating and integrating transport, land-use and infrastructure planning, provision and funding.

The Strategy and Plan identifies Te Rapa North as a growth area in the long term (10-30 years), highlighting the area to be a strategic industrial location within the region and to be implemented via structure plan process. Council has initiated some technical studies to inform a future structure plan and associated plan change for the Te Rapa North industrial growth cell. The Te Rapa ICMP will aid in informing this process and will ultimately release land in this area for development.

5.12 Sub-Regional Three Waters Strategy

The Future Proof partners developed this strategy in 2012 to set out how water, wastewater and stormwater will be managed over a 50-year period. Building on the direction of Future Proof, the Three Waters Strategy sets a long-term strategic vision for three waters in the sub-region.

The vision of the Three Waters Strategy is:

"The delivery of integrated, sustainable and well managed three waters services for the sub-region which ensures the cultural, social and economic needs of the community are met and the quality of the Waikato River is improved."

The following nine strategic issues have been identified in the Strategy:

1) Ensuring the protection and improvement of public health and safety and providing appropriate water sanitary services and hazard management practices;
2) Meeting future anticipated and planned growth demands;
3) Planning for and adapting to climate change;
4) Ensuring that decisions relating to the three waters are underpinned by best practice, research and knowledge;
5) Ensuring quality, efficient and sustainable infrastructure;

6) The need for integration of relevant council functions, inter-council departments, the three waters, and land use and water planning and management ;

7) The availability and allocation of water;

8) Ensuring that iwi and hapuu are involved in the management of three waters and tangata whenua values, aspirations and interests are identified and reflected; and

9) Ensuring protection and where possible the enhancement of the natural environment.

This ICMP aligns with the Sub-Regional Three Waters Strategy.

5.12.1 Sub-Regional Three Waters – The Blue-green Networks

The Waikato Sub-Regional Three Waters Strategic Business Case (Future Proof, 2019) identified four key problems in the management of three waters in the sub-region; lack of integrated management, historic decisions resulting in degraded environment and relationships, inadequate infrastructure planning, and infrastructure deficit.

Because of these issues the sub-region faces underperforming and ageing three-waters infrastructure to service increased issues of population growth and climate change. To reverse this trend and to restore functional and healthy environments with abundant natural resources, three waters infrastructure will require a paradigm shift toward nature-based solutions to service our future urban and rural landscapes. These systems will need to be protected, enhanced, and optimised to provide sufficient capacity and quality to function with resilience.

There is a significant investment required to maintain and upgrade three waters, and the draft Blue-green Network study[90] provides a means to rebuild these natural systems in a way that provides for multiple and cumulative benefits from nature-based solutions for our communities and the ecosystems that support them.

The report uses Te Horotiu/Te Rapa area as one of three case studies, as this is primarily an industrial land use area with residential nearby. Te Horotiu study provided an opportunity to apply blue-green principles across a mixture of developed and undeveloped areas, including a review of the appropriateness of historic zoning when considering blue-green networks. It illustrates how ecological corridors could be re-established in the catchment, together with a network of riparian corridors and awa habitat nodes.

The case study provides an interesting representation of how applying a best for river / blue-green principles, in the absence of other conflicting constraints, might mean for development in the region. It identified the retention of the freshwater ecosystems and the restoration of wetlands with remnant footprints, where the ecology value may have already been compromised through current land use. The resulting approach results in a dendritic network of freshwater ecosystems enhanced and supported by a network of habitat nodes and terrestrial connections.

Given this area is intended to be used for industrial purposes it does raise the apparent conflict of the needs of development and the habitats protected through the application of the principles. The resulting land available for development may constrain this use considerably. One outcome is how the implementation of the blue-green principles would have to consider / justify the subtractive process of removing proposed habitat and protections to allow for development.

Opportunities to reflect the outcomes and recommendations of the Study should be considered at the time of the draft Te Rapa Structure Plan and subsequent land development plans. The ICMP reflects aspirations to develop a riparian corridor along the length of the Te Rapa Stream and tributaries. A number of artificial wetland areas (for the treatment of stormwater) are incorporated in the ICMP.

[90] Sub-Regional Three Waters: The Blue-green Networks, Hamilton City Council, July 2022 (DRAFT).

5.13 Hamilton – Auckland (H2A) Corridor Plan

The H2A Corridor Plan is about creating communities in the corridor between Auckland and Hamilton where current and future residents will want to live. It encompasses the settlements along the transport corridor between Papakura and Cambridge/Te Awamutu. The plan's vision is to support sustainable growth and increase connectivity between Hamilton and Auckland. It provides a framework for development to help manage growth in a way that provides access to the services people need, while protecting and enhancing the corridor's natural and cultural assets. It aims to achieve fast and effective delivery of agreed outcomes using innovative, joined-up thinking and new ways of working together, planning and financing development. It aims to plan in an integrated way based on communities of interest rather than existing council boundaries.

Cabinet approved the initiative in May 2018 and a year later endorsed the new project partnership of central and local government organisation and iwi. The project steering group includes representatives from the Ministry of Transport, NZ Transport Agency Waka Kotahi, Treasury, Ministry of Housing and Urban Development, Ministry of Business, Innovation and Employment, Department of Internal Affairs, Waikato-Tainui, Hamilton City Council, Waikato District Council, Waikato Regional Council, Auckland Council and Waipa District Council. The plan for the corridor was completed in December 2018 and updated in November 2020.

Te Rapa North is identified in the H2A Corridor Plan as a strategic development in the northern corridor, playing a significant role due to its positions as a key industrial and employment hub. The H2A Plan focus on unlocking the development potential in the north part of Hamilton, and Te Rapa is considered crucial to the economic growth objectives.

5.14 Sub-Regional Three Waters Action Plan

The Sub-Regional Three Waters Action Plan (2017) sets out how the Sub-regional Three Waters Strategy will be implemented. It identifies 11 actions. Action 7 is to use ICMPs to help achieve integrated and cost-effective management of landuse and the three waters. Preparation of the Te Rapa ICMP is consistent with this action.

5.15 Hamilton Urban Growth Strategy

The Hamilton Urban Growth Strategy (HUGS) guides where, when and how the City will grow over the next 50 years. The new Strategy was adopted in April 2023. The Strategy sets out the long-term strategy that helps inform other Council plans, such as the Long Term-Plan and 30-year Infrastructure Strategy, and helps guide Council's timing, and the order, of infrastructure investment.

The Te Rapa ICMP plays a crucial role in the HUGS by addressing environmental sustainability, water management, and the health of natural resources, which are central to urban development. The Te Rapa ICMP complements the HUGS by making sure water resources and environmental health are prioritised alongside urban development.

5.16 Local Indigenous Biodiversity Strategy

The Local Indigenous Biodiversity Strategy (LIBS) is a pilot strategy project that sets a course to restore local indigenous biodiversity coverage in Hamilton City from 2% to 10% over time. It was produced in partnership by Hamilton City Council and Waikato Regional Council and progresses HCC's response to the National Policy Statement for Indigenous Biodiversity (2023). The LIBS makes extensive use of mapping and proposes mechanisms to enhance biodiversity to achieve the objective. Among its recommendations are that ICMPs "be developed/updated to reflect this strategy". By integrating the Te Rapa ICMP into the LIBS, Council can make sure that water and land use planning supports both the protection of indigenous species and the wider environmental goals of sustainable urban growth.

5.17 Nature in the City Strategy

The Nature in the City Strategy focuses on restoring and protecting biodiversity within the city by increasing native vegetation cover from the current 2% to 10% by 2050. The strategy emphasizes ecological restoration, community engagement, and the integration of kaitiakitanga, the Maaori principle of environmental stewardship. Its vision is to foster a harmonious relationship between people and nature, with thriving ecosystems connecting natural spaces from mountains to the sea. Key goals include investing in green infrastructure, promoting long-term ecological resilience, elevating cultural values through maatauranga Maaori, and ensuring that nature flourishes across urban areas.

The strategy aligns with the ICMP by supporting shared goals of ecological connectivity, stormwater management and community involvement. Both emphasize restoring native vegetation and creating corridors to link fragmented habitats, thereby enhancing biodiversity and improving water quality. The strategy's focus on vegetated gullies and natural water systems complements the ICMP's principles of sustainable urban stormwater management. Additionally, the incorporation of kaitiakitanga in the Nature in the City Strategy reinforces the cultural and environmental priorities of the ICMP, particularly regarding the health and wellbeing of the Waikato River and its tributaries. Together, these plans promote integrated ecological networks, biodiversity, and long-term community and environmental resilience.

5.18 Hamilton City Bat Management Plan

The Hamilton City Bat Management Plan focuses on achieving better monitoring and management, and better ecological outcomes across the city for the long-tailed bat. The Plan provides a guiding framework for key actions that will promote bat conservation across the city, with specific management steps and priority actions set out. These actions relate to tree felling management, pest control, lighting and noise management, corridors and buffers to provide for bat habitat, artificial roosts, management of freshwater habitats and invertebrate diversity, monitoring, stakeholder management, integration of mataauranga Maori, and geospatial planning across the city and adjoining districts.

The Plan (along with the Nature in the City Strategy vegetation cover goals) aligns with the ICMP, as it identifies priority actions for management of bat habitat areas, including freshwater and wetland habitats and vegetation management within these areas. The Plan identifies the importance of restoring indigenous vegetation cover as buffers and creating corridors to link fragmented habitats, enabling enhancement of biodiversity and habitat for bats. These actions will also support improving water quality outcomes and this complements the ICMP's principles of sustainable urban stormwater management. The integration within the Plan of mataauranga Maori also reinforces the cultural and environmental priorities of the ICMP.

5.19 Our Climate Future – Te Pae Tawhiti o Kirikiriroa

The Climate Change Strategy – Our Climate Future: Te Pae Tawhiti o Kirikiriroa outlines a vision for Hamilton to become a thriving, low-carbon city that adapts to climate change. The strategy prioritizes reducing city-wide emissions, enabling low-carbon living, and building resilience to climate impacts. Key actions include transitioning to sustainable transport, embedding circular economy principles, future-proofing infrastructure, and restoring natural areas such as the Waikato River and gullies. Central to the strategy is integrating te ao Maaori (the Maaori worldview), ensuring equitable outcomes, and partnering with iwi, hapuu, and the broader community to implement climate initiatives.

The strategy works closely with the ICMP by supporting shared goals of ecological restoration and resilience. Both emphasize sustainable water management, enhancing native biodiversity, and protecting critical natural assets like gullies and waterways. The Climate Change Strategy's focus on using nature-based solutions to mitigate flooding and heat aligns with the ICMP's aim to manage stormwater sustainably. Furthermore, its commitment to improving the Waikato River's health reflects the ICMP's objectives of preserving water quality and ecosystem integrity. Together, these strategies work towards a holistic, climate-resilient approach for Hamilton's urban and natural environments.

5.20 He Pou Manawa Ora – Pillars of Wellbeing Strategy

The He Pou Manawa Ora – Pillars of Wellbeing Strategy provides a framework for integrating Maaori perspectives into the city's governance, planning, and community wellbeing. Guided by the principles of Te Tiriti o Waitangi—Partnership, Protection, Participation, and Prosperity—it outlines four key pillars: History, Unity, Prosperity, and Restoration. The strategy seeks to celebrate Maaori heritage, enhance participation in decision-making, promote economic and social equity, and restore the natural environment through collaborative kaitiakitanga (guardianship). This partnership-driven approach aims to create a more inclusive, sustainable, and culturally enriched city.

The strategy aligns with the ICMP by reinforcing shared environmental goals. Both emphasize restoring ecological health, particularly through native planting, water quality improvement, and the protection of natural habitats like gullies and wetlands. The Pillar of Restoration specifically highlights collaborative efforts with iwi, mana whenua, and the Waikato River Authority to restore the health and mauri (spiritual essence) of the Waikato River and its catchment. By embedding Maatauranga Maaori (Maaori knowledge) and fostering co-management practices, the strategy complements the ICMP's aims to balance urban development with environmental sustainability and cultural values. Together, these initiatives drive integrated approaches to ecological restoration and community wellbeing.

5.21 Central Waikato Zone Plan

The Central Waikato Zone Plan (CWZP) is a non-statutory, strategic plan outlining the Waikato Regional Council's Integrated Catchment Management Directorate's activities in the Central Waikato Zone, which extends from Karapiro Dam to Ngaaruawaahia and includes the Te Rapa Catchment.

The Plan has the following 30-year goals:

1) Contribute to improving water quality within priority catchments in the zone;
2) Maintain and enhance indigenous biodiversity associated with the Waikato River, its tributaries, wetland and lakes across the zone;
3) Manage the instream impacts of urban development and land use intensification in association with territorial authorities and other partners; and
4) Work collaboratively with iwi, territorial authorities and communities to align and integrate projects and priorities within the zone.

The Plan includes a high-level programme of actions that informs more detailed annual works programmes. Within Hamilton City, the Council undertakes much of the work provided for in the Plan under a Project Watershed-related service level agreement (p.8). Figure 3 of the Plan shows "new works/clean stream compartment" in Te Rapa Catchment. Appendix One of the Plan notes that the *Waikato River and Waipa River Restoration Strategy* lists "fencing wetlands and ephemeral streams" as a medium priority focus issue in the Te Rapa Catchment. Other actions identified in the Plan include:

1) Progressing the Central Waikato River Stability Management Strategy (p.31);
2) Supporting and funding where appropriate, development of ICMPs (p.31);
3) Erosion control, flood mitigation, and stormwater quantity and quality initiatives (p.32);
4) Incorporating outcomes of the Local Indigenous Biodiversity Strategy (p.36); and
5) Restoration of streams, best practice riparian management, and removal of barriers to native fish passage whilst maintaining the exclusion of pest fish (p.36).

The Te Rapa ICMP and CWZP are interconnected in their goals and approaches to managing natural resources, particularly water and land. The Te Rapa ICMP has been developed to align with the CWZP by providing detailed water and land management strategies, aligning with the broader environmental and community goals of the region.

5.22 Managing Land Use Change and Waikato Regional Council's Administered Drainage Areas

The Te Rapa Stream is part of WRC's Central Waikato - Ngaaruawaahia Drainage Scheme (CWNDS) which carries additional design criteria. The drainage schemes have a rural, pastural drainage purpose and are maintained by WRC. The Te Rapa ICMP and the CWNDS have a shared focus on managing water flows, mitigating flood risks and improving environmental outcomes in the region.

This Te Rapa ICMP comprehensively addresses water management to improve flooding risks and water quality and overall enhances the resilience of the local environment and complementing the CWNDS.

As part of the urbanisation process these rural drainage schemes would be expected to transition into the control of the relevant territorial authority (in this case HCC). As urbanisation occurs in the Te Rapa North deferred industrial zone, the Te Rapa Stream within the HCC jurisdictional area will need to be transitioned to the control of HCC such that an urban level of service can be provided. This would likely occur as part of a structure planning process or subsequent subdivision.

For the purpose of developing ICMP solutions it has been assumed that the drainage scheme criteria (which is based around drainage of pastures) will not be required post-urbanisation (as land use is no longer pastures). This will require the changing of the drainage scheme area boundary as discussed above, or a similar mechanism to transfer operation and maintenance of the stream to HCC (within HCC jurisdiction) as the land use changes.

5.23 Master Plans

The Council has a separate master plan for each of the three waters: water supply, wastewater and stormwater. These are high-level, city-wide strategic plans for management of each water to meet the City's future needs including accommodating predicted growth and delivering agreed levels of service. The current versions were finalised in 2023 and reflect actual growth rates and revised growth projections and development timings. These versions identify prioritised programmes of works to inform the 10-Year Plan (2024 to 2034) funding request, including the setting of development contributions, and the 30-Year Infrastructure Strategy (2024 to 2054). Additional content of each master plan is outlined below.

The Master Plans will inform the preparation of ICMPs, including this one. The ICMP will be the instrument for implementing the Master Plans because the District Plan[91] requires activities in a catchment to comply with the relevant ICMP, not the Master Plans.

5.24 Activity Management Plans

A separate Activity Management Plan (AMP) exists for each of the three waters. The AMPs set out how the Council manages activities relating to each water. Their purpose is to ensure the relevant infrastructure and services are efficient, effective and appropriate and to inform and implement the Long Term Plan. Each AMP sets out the Council's responsibilities and activities and the legislation and the environmental considerations that drive them. The activities include capital project delivery, operation, maintenance and asset management of the respective three-water network, emergency and recovery planning and implementation, compliance reporting, and bylaw enforcement. Asset management includes assessment of the condition, capacity and performance of the major assets, data collection, infrastructure demand and financial forecasting, and renewal planning. An AMP identifies the levels of service the Council will deliver, the cost of the Council's activities, how they will be funded, and any planned improvements to activity management practices. Each AMP is reviewed every three years and informs development of the Council's Long Term Plan and vice versa.

The ICMP must recognise the existing levels of service defined in each AMP. The ICMP's recommendations regarding capital projects and any changes to levels of service, business processes, operations or

[91] Rule 25.13.4.1 a

maintenance will inform discussions with the Council about the Long Term Plan and any changes to the AMPs. Together, the Long term Plan and the AMPs are mechanisms by which particular ICMP recommendations will be given effect.

5.24.1 Activity Management Plan - Stormwater

The Stormwater AMP was updated in 2024. In addition to the general matters describe in 5.24 above, it covers stormwater management activities associated with drainage reserves, natural lakes, the Waikato River and their tributaries, including management of flora, fauna and erosion within them, and road corridors. Stormwater assets include service connections, reticulation pipes, manholes, treatment/detention/flood management devices, lined open watercourses, pipeline inlets and outlets, soakage, fish passage and erosion control devices. The Stormwater AMP does not cover private, on-lot stormwater devices.

5.24.2 Activity Management Plan - Water

The Water AMP was updated in 2024. It covers the abstraction of water from the Waikato River, its treatment at the Water Treatment Plant to achieve a high standard drinking water, its storage and distribution at appropriate pressure for its intended use, including firefighting. Water supply assets include the Water Treatment Plant, reservoirs, service connections, reticulation pipes, values, hydrants, meters (for commercial and industrial users and bulk water supply), backflow preventers and bulk-main chambers.

5.24.3 Activity Management Plan - Wastewater

The Water AMP was updated in 2024. It covers collection of wastewater from properties, including trade-waste from commercial and industrial premises, and its conveyance via pipelines and pump stations to the Pukete Wastewater Treatment Plant. The resulting effluent is discharged via a multi-port outlet to the Waikato River, and the biosolids extracted during the treatment are treated on site and then composted off-site for reuse. The Wastewater AMP addresses wastewater overflow management. Wastewater assets include service connections, reticulation pipes, manholes, valves, pump stations, storage, biofilters and the Pukete Wastewater Treatment Plant.

5.25 Hamilton City Council Long-Term Plan

The HCC Long Term Plan (LTP) sets out the Council's direction, priorities and funding for the next 10 years.

No urbanisation (beyond that previously consented) within the Te Rapa North area was expected/planned for in the 2024-2034 planning horizon. No three waters infrastructure is currently forecast for the 2024-2034 LTP.

5.26 Waikato and Waipaa River Restoration Strategy

The *Waikato and Waipaa River Restoration Strategy* (Bradley, N. et al, 2018) identifies 31 specific, technically achievable and prioritised projects to restore the health and wellbeing of the Waikato and Waipa catchments. No specific projects were identified within the Te Rapa catchment.

5.27 Project Watershed

Under the Project Watershed Service Level Agreement between Waikato Regional Council and Hamilton City Council (2016), Waikato Regional Council funds Hamilton City Council to manage the Waikato River main channel and tributaries within Hamilton City. The councils work together to prioritise and agree outcomes, which include:

- Ensuring streams and rivers remain free flowing, to reduce the effects of flooding;
- Management of flood protection and erosion management assets, including provision of new assets;
- Protection of riverbank and stream stability; and

- Erosion remedial works.

The Waikato Regional Council's *2018-2028 Long-Term Plan* made financial provision for an erosion management programme across the Region, including Hamilton. This may result in a contribution towards erosion management measures.

Hamilton City Council has an erosion programme of works in the Long Term Plan. Since 2018 developers have been contributing towards the costs of these works, through financial contributions, to mitigate downstream effects of developments. From 2021 these have generally been through Development Contributions. However, since the growth forecast is outside the 10yr planning horizon, development contributions do not apply in this catchment.

5.28 Three waters infrastructure guidance

Public and private stormwater infrastructure within the Catchment must be designed and constructed in accordance with:

- *Regional Infrastructure Technical Specifications* (Waikato Local Authority Shared Services), the "RITS".
- *Waikato Stormwater Management Guideline: TR2020/06*; and
- *Waikato Stormwater Runoff Modelling Guideline: TR2020/07*;

Where relevant, infrastructure within Hamilton City should also comply with the Hamilton City Three Waters Practice Notes. Where there is overlap or conflict between the documents, the more conservative requirement should be used.

5.28.1 Regional Infrastructure Technical Specifications

The RITS (Waikato Local Authority Shared Services) set standards for design and construction of earthworks, transportation, water, wastewater and stormwater infrastructure, landscapes, and accepted materials. Resource consents for subdivisions and developments in the Catchment will require developers to comply with the RITS when constructing such infrastructure.

The RITS[92] and Hamilton District Plan[93] require stormwater to be managed according to a hierarchy, which is based on sustainability and efficiency principles. Preference is given to disposing of stormwater by a method that is higher in the following hierarchy – "a" is higher than "b", which is higher than "c", which is higher than "d":

a) Retention of rainwater/stormwater for reuse on site.

b) Soakage techniques.

c) Treatment and detention and gradual release to a watercourse.

d) Treatment and detention and gradual release to a piped stormwater system.

Although both the RITS and the Hamilton City District Plan ascribe the term "hierarchy" to this list of measures, neither document provides criteria for determining when adoption of a lower hierarchy measure is justified.

5.28.2 Waikato Stormwater Management Guideline

The *Waikato stormwater management guideline* sets out how stormwater runoff from existing and proposed development should be managed within the Waikato Region. It addresses the design, construction, operation and maintenance of stormwater devices and systems.

[92] RITS, s.4.2.3.1 (p.296)
[93] Rule 25.13.4.2 b

5.28.3 Waikato Stormwater Runoff Modelling Guideline

Waikato stormwater runoff modelling guideline sets out the hydrological design methodology to be used in modelling stormwater runoff in the Waikato Region.

5.28.4 Hamilton City Council Standard Stormwater Modelling Methodology Version 2 (draft)

Standard Stormwater Modelling Methodology Version 2 (Watershed Engineering, currently draft) provides a standardised modelling methodology to be used for the development of flood hazard maps, infrastructure design and identification of environmental effects associated with land development in Hamilton City. It aims to achieve a consistent approach to modelling stormwater and presenting the model outputs. It includes guidance on the software, modelling approach, hydrological method and model building, testing and validation to be used and the deliverables.

5.28.5 Three Waters Management Practice Notes

These notes (Hamilton City Council) provide technical information about how to comply with the water efficiency measure rule[94] in the Hamilton District Plan and clarify other stormwater management requirements for individual sites.

5.29 The Council Business Case for ICMPs

This business case supported the request for financial approval of a $9M prioritised programme to develop ICMPs for each catchment in Hamilton City between 2015 and 2025, including the Te Rapa catchment. It updated the original business case for ICMPs approved in 2013. It reflects the Council's experience preparing the City's first ICMPs, which led to the Council revising its ICMP Standard Operating Procedure (SOP) and developing ICMP technical modules and a Flood Hazard Mapping SOP. The Business Case assesses several alternative approaches to preparing ICMPs and recommends the Council leads their delivery following the SOPs and modules; the more structured and defined ICMP development process is expected to achieve better management of time, cost and risk.

5.30 Review

From time to time, existing statutes are amended, new ones enacted, existing planning documents are reviewed and amended, and new planning instruments are created. The ICMP may need to be updated from time to time to reflect these changes.

[94] Rule 25.13.4.5

6. OBJECTIVES

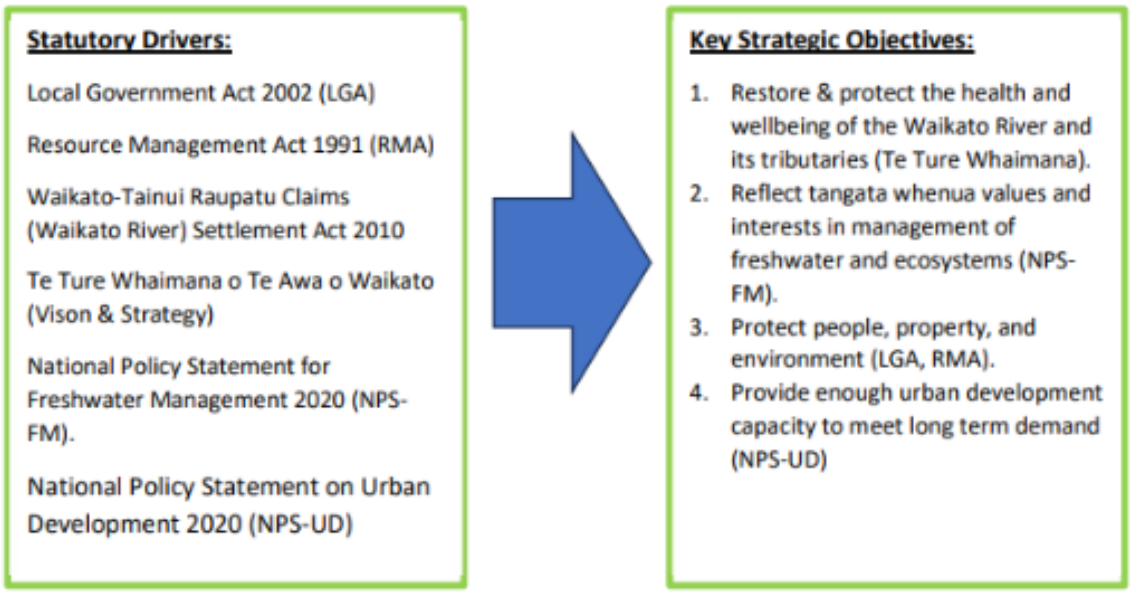
6.1 Strategic Stormwater Vision and Objectives

Key legislation has informed a vision statement, objectives and strategic objectives for various strategic stormwater documents. These should be used as appropriate for future strategic documents (as explained below) and updates made to this document if required.

A vision for stormwater management was created within the Stormwater Master Plan v2:

> *The vision for stormwater management is to accommodate growth and ensure compliance with regulatory requirements. The aim is to restore and protect the health and wellbeing of waterways and minimise natural hazards.*

High level drivers and objectives were recorded and updated as part of Stormwater Master Plan v3 as:



Strategic objectives for integrated catchment management planning have been developed to guide decision making as a catchment develops and evolves. These high-level objectives will be supported by levels of service requirements, measurable assessment criteria, triggers/thresholds and in some cases catchment specific objectives.

6.2 Strategic Objectives

Objectives have been developed for the ICMP and are listed in Table 9. They capture the obligations set out in regulatory and planning documents listed in Section 5. The objectives provide a framework for all ICMP decisions to ensure the ICMP complies with statutory obligations. In some cases, ICMP specific objectives have been adopted based on physical characteristics or constraints of the catchment.

Te Ture Whaimana is acknowledged as having a unique and overarching status in the management of watercourses and the Waikato River. It has therefore been given precedence in setting objectives.

Table 9: Strategic Objectives		
Ref no.	**Strategic Objective**	**Source Document References**
SO1	Protect freshwater systems Maintain, protect and enhance freshwater ecosystems and habitats, natural drainage systems and amenity by safeguarding the life-supporting capacity, improving water quality where degraded and protecting significant values of wetlands and freshwater bodies. Provide for connectivity, buffering and enhancement of and between terrestrial and aquatic habitats and ecosystems.	Te Ture Whaimana NPS-FM Objective 1, Policies 1, 3, 4, 5, 6, 8, 9 NPS-IB Objective 1 NES-FW WRPS IM-O2, IM-O4, IM-O6, LF-O1, LF-O3, ECO-O1 WRP 3.1.2, 3.2, 3.7 SRTWS - section 7 Issue 9 ODP Objectives 20.2.1,20.2.5, 21.2.1, 21.2.4, section 25.13 WTEMP CSDC
SO2	Protect terrestrial systems Maintain, protect and enhance indigenous biodiversity values, functions and amenity for terrestrial ecosystems and habitat of indigenous fauna. Provide for connectivity, buffering and enhancement of and between terrestrial and aquatic habitats and ecosystems.	Te Ture Whaimana NPS-FM Objective 1, Policy 3 NPS-IB Objective 1, Policy 2 WRPS LF-O3, ECO-O1 SRTWS-section 7, Issue 9 ODP Objectives 20.2.1, 20.2.2, 21.2.1, 21.2.4 WTEMP
SO3	Kaitiakitanga Give effect to the relationship of tangata whenua as kaitiaki of receiving water bodies and including the relationship of Waikato-Tainui with the Waikato River.	Te Ture Whaimana NPS-FM Objective 1, Policy 2 WRPS IM-O3, IM-O4, IM-O7 WRP 2.3 SRTWS section 7, Issue 8 ODP section 25.13 WTEMP NHEMP
SO4	Stormwater Management Stormwater management related to land use and development shall encourage and enable low impact design and incorporate best practicable mitigation measures to minimise actual and potential adverse effects on: • Receiving water bodies in terms of quantity and quality of stormwater discharges, • Locations and communities subject to flood hazards, • Natural groundwater levels, Baseflows for freshwater systems.	Te Ture Whaimana NPS-FM Objective 1, Policy 3 WRPS LF-O1 WRP Objective 3.1.2 SRTWS section 7 Issues 2 to 6 ODP Objectives 25.13.2.1, 25.13.2.2, 25.13.2.5 CSDC
SO5	Wastewater Management Wastewater management shall incorporate best practicable options and be managed so that: • Conveyed network volumes are minimised, (e.g. by demand management and management of stormwater infiltration) Dry weather overflows are prevented and wet weather overflows are minimised.	Te Ture Whaimana NPS-FM Objective 1, Policy 3 WRPS LF-O1 WRP Objective 3.1.2 SRTWS section 7 Issues 2 to 6 ODP Objectives 25.13.2.1, 25.13.2.5

Table 9: Strategic Objectives		
Ref no.	**Strategic Objective**	**Source Document References**
SO6	Potable Water Management Provision for potable water is planned and provided for in a way that meets existing and future requirements to: • Provide firefighting water supply (flow and pressure) by conforming to the Code of Practice for Fire Fighting Water Supplies. • Meet domestic, commercial and industrial water demand. Ensure water consumption is managed to minimise peak and total demand.	Te Ture Whaimana NPS-FM Objective 1, Policies 3 and 11 WRPS IM-O2, IM-O8, LF-O2 WRP Objective 3.1.2 SRTWS section 7 Issues 2 to 6 ODP Objective 25.13.2.3
SO7	Three Waters Management Three waters networks are planned, managed and operated in an integrated manner to: • Meet existing and future development requirements whilst maintaining human and ecosystem health. • Meet design standards, consent conditions and regulatory levels of service. • Ensure assets, technology and resources have capacity, redundancy (n+1), knowledge and plans to prevent or cope with unplanned events. • Minimise the need for new infrastructure including by optimising the use, operation, and maintenance of existing assets. Protect people and property.	Te Ture Whaimana WRPS – IM-O1 ODP Objectives 3.3.2, 25.13.2.4 WTEMP CSDC
SO8	Enabling Development Determine three waters infrastructure requirements to: • Ensure sufficient capacity to meet expected demand for housing and employment; • Support overall urban development capacity; and Maximise benefits of infrastructure investment through optimising land development yield including to support the provision of affordable housing without compromising environmental outcomes.	NPS-UD

6.2.1 Catchment Specific Objectives

TABLE 10 summarises identified catchment-specific objectives. These objectives have been defined where catchment-specific activities or actions are required to achieve the strategic objectives defined in TABLE **10**.

Table 10: Catchment Specific Objectives	
Ref no.	**Objective**
CS1	Protect downstream geomorphologic integrity Development and stormwater management infrastructure is designed, constructed and operated in such a way that recognises and protects the geomorphic integrity of Te Rapa Stream. The current condition of the Te Rapa watercourse has been severely impacted by existing land use activities and will be particularly susceptible to changes in flow regimes.
CS2	Cross-boundary stakeholder engagement Engagement and collaboration between territorial authorities, land owners and other stakeholders is implemented through the ICMP, structure planning and subsequent consenting

Table 10: Catchment Specific Objectives	
Ref no.	**Objective**
	processes to ensure stormwater (and three waters) infrastructure is delivered in an integrated way. This includes; i. Volume control measures are implemented in an integrated way that considers current and future discharges to the Te Rapa Stream along its entire length. ii. Flood mitigation is implemented in such a way that protecting existing key infrastructure (such as the Waikato Expressway) and achieves required level of service along the entire watercourse.

6.3 Levels of Service

The Te Rapa ICMP has generally adopted the infrastructure level of service determined by the RITS and other key documents. Where levels of service under the ICMP vary from these, or where documents identify multiple possible levels of service, ICMP levels of service have been identified as Design Parameters in Section 8.3.

7. TECHNICAL ASSESSMENT, ISSUES AND MITIGATIONS

This section provides high level summaries of technical assessments (which are appended to the ICMP), identifies key issues and opportunities relating to each technical assessment, and identifies options to mitigate issues or leverage opportunities. It recommends programmes of works that will be updated or proposed as part of a citywide programme by the Stormwater, Water, and Wastewater Master Plans to the 2027 Long Term Plan and 30-year Infrastructure Strategy (or equivalent). Programmes of works seek to address issues identified under technical work streams via feasible projects with suitable cost-benefit. They are based on technical studies presented in appendices, but in some cases programme costs have been updated or modified from those in technical assessments where better information became available after the assessment was completed. All programmes proposed in the ICMP will be phased based on expected growth forecasts, and may be modified, during LTP planning. The full programme of works proposed under the ICMP is summarised in Section 0, including existing and proposed funding. It also recommends actions and additional recommendations that may fall outside LTP programmes or Councils sole responsibility.

7.1 Issues and Opportunities Process

A standardised, repeatable process to assess and prioritise issues and opportunities, and to develop and prioritise projects and mitigation approaches has been developed through Council's Stormwater Modules, ICMPs and stormwater master plans. The current process is documented in the Stormwater Module – Modules Overview and Prioritisation Principles (draft). This process was used by the ICMP and enables prioritisation of issues ahead of project identification in order to focus efforts.

Prioritisation principles are guided by the following hierarchy (in priority order):

- Protecting critical infrastructure;
- Protecting people and property;
- Protecting and restoring existing waterways; and
- Mitigating the adverse effects of growth.

The hierarchy puts safety of people first, and also broadly aligns with feedback from iwi. Information relating to issues and opportunities are integrated into city-wide registers for each workstream. Information relating to projects was similarly recorded in a projects database for each workstream (if projects were sufficiently developed). Both registers are associated with spatial GIS layers where appropriate.

A multi criteria analysis (MCA) has been applied to the issues if the MCA process was sufficiently developed at the time assessments were being carried out for each workstream. In all other cases, issues are based on technical judgement.

The steps of the process (based on MCA) are summarised below:

1. The ICMP was divided into modules, and further divided into workstreams for analysis.
2. For each workstream, existing or new technical information was collated, and spatially referenced GIS data was obtained where available.
3. A set of issue ranking criteria was created for each workstream (in some cases within the ICMP this used the judgement of a technical professional rather than set criteria) and applied to rank each issue in order of significance or priority.
4. Mitigation options were developed for high ranking issues.
5. Mitigation options were ranked and added as projects to a proposed programme of works.

Technical assessments using this process are described in the following sections.

7.2 Values

This section describes how values have been incorporated into the ICMP in line with the values module. Consideration of mana whenua and iwi values has informed the technical assessments that follow. Most of the ICMP's responses to issues and opportunities related to values are provided for in the programmes of work identified under other technical workstreams. However, others inform a separate values programme of works. This section provides an assessment of how values have been incorporated into the ICMP in line with the values module. It informs the remainder of the technical assessments that follow, rather than outlining a programme of works.

A major component of Te Ture Whaimana and the Waikato-Tainui Environmental Plan is an aspiration to restore the environment to the state it was in prior to land confiscation. It is recognised in the period since the land confiscation that occurred in 1863, Hamilton, and parts of the Te Rapa catchment, have been urbanised and will continue to be as the growth cell develops. Short of fully de-urbanising the catchment, no strategy will exactly reinstate the environment to what it was in 1863. However, steps towards this aspiration can be taken and are proposed.

Te Rapa North Cultural Values Assessment (THaWK, 2021) ("the CVA" - see Appendix A) should be referred to for full details. It identifies:

- The five hapuu who exercise mana whenua over the catchment;
- Sites and environmental features of significance to mana whenua – these are mapped in Figure 24, which is from the CVA;
- Histories of the area as recalled by hapuu members;
- Mana whenua aspirations for Te Rapa North; and
- Maatauranga Maaori, traditional Maaori knowledge and practice, which mana whenua want recognised when Te Rapa North is developed.

7.2.1 Methodology

The NPS-FM 2020 (s3.4(1) and Policy 2) requires Council to actively involve tangata whenua in freshwater management, including in decision-making processes and identifying the local approach to giving effect to Te Mana o te Wai. It requires Maaori freshwater values to be identified and provided for.

To identify the local approach to giving effect to Te Mana o te Wai, Council engaged with Waikato-Tainui, Te Haa o Te Whenua o Kirikiriroa (THaWK), and Ngaati Wairere. These engagements are summarised in the Table 11.

Table 11: Engagement with mana whenua and iwi in relation to preparation of the ICMP

Date	Group			Focus of engagement
	Waikato-Tainui	THaWK	Ngaati Wairere	
13/8/2020		✓	✓	Project Introduction - Issues and Opportunities Workshop
07/10/2020	✓	✓	✓	Stormwater Management Options
29/02/2024	✓	✓	✓	ICMP Update - Key Technical Document Outputs
18/04/2024	✓	✓	✓	Iwi (Wai Waanga) - Presented and circulated technical documents and mana whenua chapter for comment

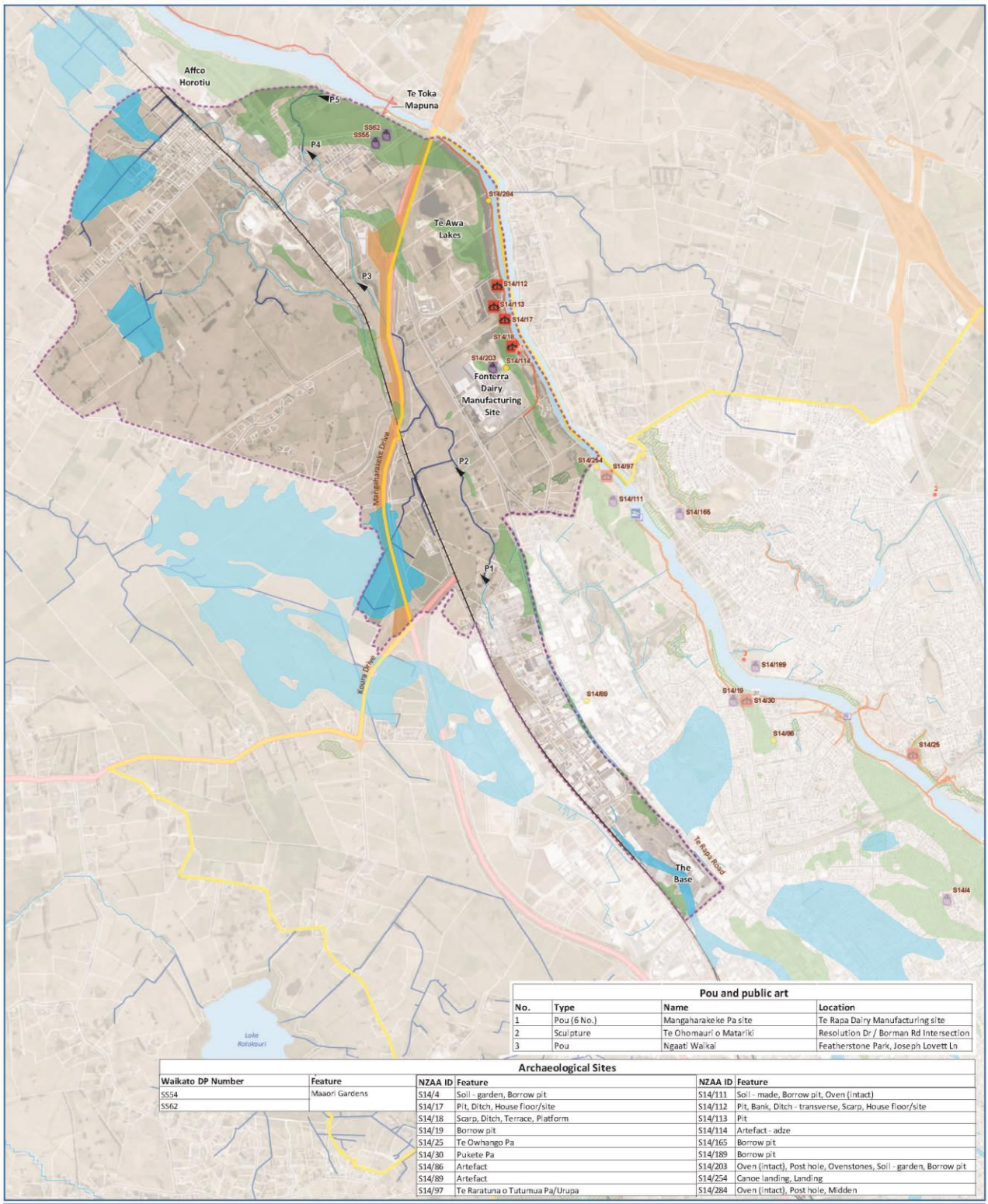
In addition to the meetings and workshops listed in Table 11, Council engaged THaWK to undertake a cultural values assessment of Te Rapa catchment. Ngaati Wairere were part of THaWK during earlier engagement.

7.2.2 Values Assessment

In support of the Te Rapa North ICMP the CVA has been used to inform values-related issues in the catchment.

As part of this, a map was developed which builds on previous city-wide data collection undertaken "Recognising Te Mana o Te Wai" (Figure 31). It plots the following:

- Waikato River, lakes, streams, farm drains and lined drains;
- Archaeological sites: Paa, urupaa, Maaori horticulture and other;
- Pou, public art and gardens;
- Jetties and boat ramps and facilities;
- Swimming locations;
- Existing and proposed paths providing access to and along lakes, rivers and streams;
- Significant Natural Areas; and
- Reserves.



Pou and public art

No.	Type	Name	Location
1	Pou (6 No.)	Mangaharakeke Pa site	Te Rapa Dairy Manufacturing site
2	Sculpture	Te Ohomauri o Matariki	Resolution Dr / Borman Rd Intersection
3	Pou	Ngaati Waikai	Featherstone Park, Joseph Lovett Ln

Archaeological Sites

Waikato DP Number	Feature	NZAA ID	Feature	NZAA ID	Feature
SS54	Maaori Gardens	S14/4	Soil - garden, Borrow pit	S14/111	Soil - made, Borrow pit, Oven (intact)
SS62		S14/17	Pit, Ditch, House floor/site	S14/112	Pit, Bank, Ditch - transverse, Scarp, House floor/site
		S14/18	Scarp, Ditch, Terrace, Platform	S14/113	Pit
		S14/19	Borrow pit	S14/114	Artefact - adze
		S14/25	Te Owhango Pa	S14/165	Borrow pit
		S14/30	Pukete Pa	S14/189	Borrow pit
		S14/86	Artefact	S14/203	Oven (intact), Post hole, Ovenstones, Soil - garden, Borrow pit
		S14/89	Artefact	S14/254	Canoe landing, Landing
		S14/97	Te Raratuna o Tutumua Pa/Urupa	S14/284	Oven (intact), Post hole, Midden

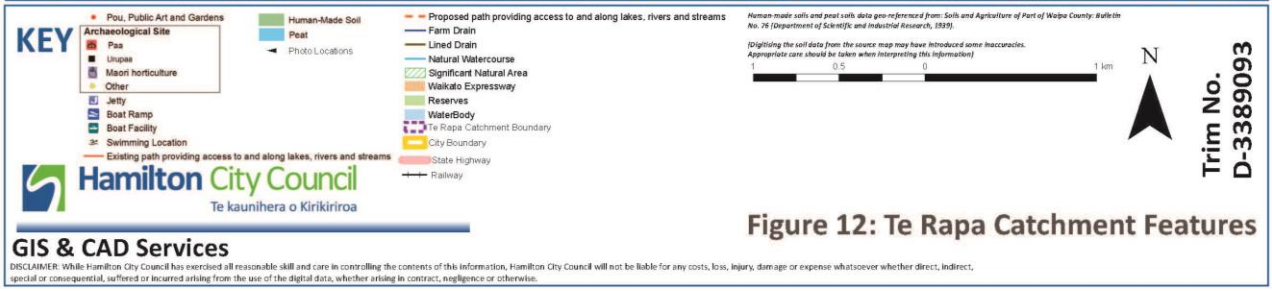


Figure 31: Te Rapa Catchment Features Map

7.2.3 Values Issues, Opportunities and Mitigations

The CVA covers an area significantly larger than the Te Rapa catchment which includes area of Pukete, Mangaheka and other areas to the north and west of the catchment. Rather than focus on spatially locating specific issues within the area considered, the CVA proposes mitigations that can be incorporated into development outcomes to address wider issues.

The CVA outlines the fundamental Mana Whenua aspirations for the Te Rapa area, which are;

- Kaitiaki (protection and guardianship) of the Whenua and Awa
- Living on their traditional whenua
- Recognising and commemorating the Maaori history of the land.

The CVA acknowledges that a Mitigating and Balancing approach is the only option available for this area as much of the area has been already degraded and land ownership passed into private possession. The CVA outlines the broad mitigation categories and has proposed a number of more specific mitigations measures that allow more practicable achievement of the broader mitigation strategies.

The mitigation of cultural impacts arising from the ICMP is summarised in Table 12 below:

Table 12: ICMP response to specific mitigations proposed by the CVA

	Key Opportunities	Implementation Approaches
On-lot controls	• Protecting any/all sites of significance to Maaori (Waahi Tapu), including those currently identified and any that might be unearthed during the development.	• Site specific Cultural Impact Assessments are undertaken as part of any site development planning and resource consent application. • Archaeological sites are protected by the Heritage New Zealand Pouhere Taonga Act 2014.
Watercourse restoration	• Protecting the Waikato River and all local waterways from any damage during and after the development phases. • Enhancing the water quality in the area so that it meets the Waikato Tainui defined A+ scorecard. • Incorporating native and indigenous plants into all planting schemes and setting aside areas of land as reserves in which the pre-European flora of the area can be regenerated. • Incorporating surveys of land fauna (bats, birds, molluscs etc.), water fauna (fish, crustacea, molluscs) and flora (land and water) as part of the planning and implementation of the development. • Based on survey results, develop "environmental" enhancement and protection strategies. One such strategy should address removing "exotic", introduced fish species and reintroducing challenged or "at risk" indigenous fish species into the waterways in the area.	• A water quality treatment train approach to protect the Waikato River and tributaries during construction and after development on an on-going basis. • Identification of stream and riparian restoration areas, and a programme of erosion restoration works. • Requirements for ecological investigations and mitigations have been included in the ICMP means of compliance. • The ICMP support seeking of an esplanade corridor along the Te Rapa Stream. This would allow for establishment of a healthy riparian corridor which would support terrestrial & aquatic communities, and provide water quality outcomes.

Table 12: ICMP response to specific mitigations proposed by the CVA		
	• Reconstruct the environment in the gullies in the area to remove exotic flora and replace them with indigenous species previously endemic to the area. Remove detrital and decaying vegetation. Repair slumped and collapsed stream banks and repair/protect the stream banks to prevent future erosion and slumping.	
Catchment Wide	• Incorporating Maaori ceremonies before, during and after any physical work done on the area. • Ki te ora te wai, ka ora te whenua, ka ora te tangata – If the water is healthy, the land and the people will be nourished. The water quality and flora and fauna in the gullies and streams of the area have been progressively degraded by the drainage of local wetlands, spread of exotic species like alligator weed, over allocation and use of water, the removal of native vegetation from stream banks, sedimentation, erosion and contaminants entering the waterways. This should be urgently addressed by developing and implement programmes of riparian planting and preventing inflow of contaminants to protect and significantly improve water quality. • Create a wetland inventory for the area and from that identify locations in which to restore up to three wetlands of significance to Mana Whenua. They should be developed to replicate traditional wetlands, which in pre-European times were vibrant habitats and paataka (food store), rich with water life and waterfowl, including ducks, puukeko, weka and other birds.	• The ICMP recommends HCC incorporate Maaori ceremonies into Council-led construction works. Developers should be encouraged to adopt the same. • The ICMP recommends programmes of works to restore watercourses and manage erosion. • As part of preparing the ICMP, an investigation has identified potential natural wetland areas within Te Rapa North.

7.3 Contaminant Load & Treatment

7.3.1 Catchment-Specific Targets

Table 13 and Table 14 summarise the relevant stormwater discharge quality targets and guidance for best practicable stormwater management approaches respectively.

Table 13: Documented water quality targets

Document	Water quality targets
CSDC	Discharges shall not result in the following triggers being exceeded: • Dissolved oxygen below 80% saturation; • pH below 6 or above 9; • Suspended sediments sufficient to smother benthic organisms; • Undesirable biological growths; • Water temperature changes in excess of 3C or exceeding 25C; • Turbidity levels to exceed 25 NTU between August and December; • Ammoniacal nitrogen concentrations to exceed 0.88 g/m^3; and • Other contaminant concentrations to exceed United States Environmental Protection Agency National Recommended Water quality Criteria – Criteria Maximum Concentration. *(CSDC Advice Note): The above identify various adverse effects that the CSDC is seeking to avoid or minimise through improvements in the management of the stormwater network and the stormwater diversion and discharge activities authorised by this consent. Compliance with these conditions will therefore be determined through the establishment and implementation of best practicable stormwater management measures that are adopted by, and implemented through, the Stormwater Management Plan.*
WRC Plan Change 1 (*not operative at time of writing*)	• Considers short-term (10-year) and long-term (80 year) water quality states for river and stream catchments. • Based on analysis of 5-yearly monitoring data at observation sites. • Seeks to achieve improvements in attribute states from an existing baseline. • Attribute states are quantified in concentrations rather than load reductions.

Table 14: Current frameworks for managing water quality

Document	Approach to water quality treatment/load reduction
District Plan	• Requires identification and mitigation of effects on water quality through either a Water Impact Assessment (WIA) or sub-catchment ICMP.
RITS	• Requires water quality treatment for all new development • Requires minimum removal of 75% TSS • Requires maximum practicable removal of nutrients & metals • Requires at-source pre-treatment of high contaminant load land uses (including industrial).

Table 14: Current frameworks for managing water quality	
WRC 2020/07	• Requires water quality treatment for all new development • Recommends a multi-barrier, treatment train approach.

Table 15 summarises Plan Change 1 short-term and long-term attribute states for phosphorus and nitrogen contaminants at four different locations; the Waikato River at Horotiu, which is the closest identified monitoring location to the Te Rapa Stream, and the outlets of the Mangakootukutuku, Waitawhiriwhiri and Kirikiriroa Streams. Currently there is no monitoring location defined for the Te Rapa Stream outlet in the Plan Change 1 document. It is noted that the Te Rapa Stream catchment is actually part of the Ohote Freshwater Management Unit (FMU) as defined in the Plan Change 1 document, which discharges to the Waipa River. Targets for this FMU have not been included in Table 15 as these are not considered relevant to the Te Rapa catchment, which discharges to the Waikato River.

Both short-term and long-term target attribute states for the Waikato River reflect 'no-change' for all contaminants except for Total Phosphorus (TP). Median TP values reduce by 3% in the short-term horizon and 14% in the long-term horizon.

Contaminant attribute states for Hamilton streams are variable. No targets are given for TP or Total Nitrogen (TN). The Plan Change 1 document specifically notes that the values in Table 15 are not intended to be used as discharge limits for receiving waters in the context of the consenting process. These values have been provided to give an indication of the overall intent of Plan Change 1 for the Hamilton area.

Table 15: Plan Change 1 attribute states for various monitoring locations throughout Hamilton.

Contaminant	Median												95th Percentile/max											
	Waikato at Horotiu			Mangakootukutuku			Waitawhiriwhiri			Kirikiriroa			Waikato at Horotiu			Mangakootukutuku			Waitawhiriwhiri			Kirikiriroa		
	Current	Short	80-year	Current	Short	80-year	Current	Short	80-year	Current	Short	80-year	Current	Short	80-year	Current	Short	80-year	Current	Short	80-year	Current	Short	80-year
Clarity * *10th%ile (m)*													0.85	1.00	1.6	0.23	0.38	1.0	0.24	0.39	1.0	0.23	0.38	1.0
E.Coli (cfu/100/mL)	90	90	90	500	426	130	605	510	130	570	482	130	650	628	540	13,025	10,528	540	6,520	5,324	540	3,620	3,004	540
Phosphorus (P)	36	35	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrogen (N)	441	441	441	1,875	-	-	2,110	-	-	1,490	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate (mg/L)	0.26	0.26	0.26	0.8	0.8	0.8	0.88	0.88	0.88	0.815	0.815	0.815	0.55	0.55	0.55	2.350	2.180	1.500	1.265	1.265	1.265	1.975	1.880	1.500
Ammonia (mg/L)	0.007	0.007	0.007	0.082	0.072	0.030	0.258	0.254	0.240	0.104	0.089	0.030	0.029	0.029	0.029	0.020	0.020	0.020	0.346	0.346	0.346	0.198	0.168	0.050
Dissolved Reactive Phosphorus (DRP) (mg/L)	0.019	0.019	0.019	0.213	0.213	0.213	0.031	0.031	0.031	0.014	0.014	0.014	-	-	-	-	-	-	-	-	-	-	-	-

7.3.2 City-Wide Contaminant Load Model

A city-wide CLM has been developed by Morphum Environmental Ltd as part of HCC's Stormwater Master Plan (version 1 and then updated for the version 2 masterplan). The city-wide CLM has been developed to consider both the Existing Development (ED) and Maximum Probable Development (MPD) scenarios. The MPD scenario incorporates treatment in-line with current RITS standards. Table 16 summarises results from the city-wide CLM.

Table 16: Specific yields from HCC citywide CLM, Te Rapa Stream.

Contaminant	CLM ED (kg/ha/yr)	CLM MPD Mitigated (kg/ha/yr)	Change (%)
Total Suspended Solids (TSS)	353	218	-38
Total Copper (TC)	0.03	0.03	0
Total Zinc (TZ)	0.31	0.65	+109
Total Phosphorus (TP)	2.4	14	+483
Total Nitrogen (TN)	12.3	4	-68

Results of the citywide CLM are broadly as expected, with the exception of the very large increase in post-development mitigated TP values. Table 17 summarises specific yields based on a selection of other sources as follows:

- 2015/16 Monitoring Report for the HCC CSDC[95], prepared by Tonkin + Taylor. This assessment calculated contaminant loads for four (4) urbanised catchments within Hamilton based on water quality sampling captured during six (6) rainfall events. The Northway St catchment is representative of industrial land use.
- Auckland City Council Contaminant Load Model[96] (values from this source are also used in WRC guidance TR2020/06) & TP10[97].
- Lake Managers' Handbook Land-Water Interactions[98], published by the MfE.

In addition to the above sources, contaminant yields from a neighbouring undeveloped catchment to show typical rural/pastoral contaminant yields from the citywide CLM.

Comparison of the citywide CLM results with other sources of contaminant load data shows broad correlation. Similar to above the exception being TP results, with both the ED and MPD results generally being higher than other data sources.

[95] CSDC Report
[96] ARC 2010
[97] TP10
[98] MfE

Table 17: Specific yield data from various sources.						
Contaminant	Pre-Development (rural pastural) (kg/ha/yr)			Post-Development (unmitigated or partially mitigated) (kg/ha/yr)		
	ARC/WRC/TP10	MfE	HCC CLM	ARC/WRC/TP10	T+T (Northway)	T+T (All catchments)
TSS	152 - 923		456	242 - 1369	393	111 – 501
Total Phosphorus (TP)[1]	0 – 0.25	0.46 – 1.98	1.2	0.69 – 9.1	0.71	0.26 – 0.76
Total Nitrogen (TN)[2]	1.2 – 7.1	5.2 – 25.0	11.9	1.6 - 8.8	8.1	3.8 – 10.7
Zinc	0.005 – 0.03		0.05	1.7 – 4.9	6.3	0.6 – 6.3
Copper	0.001 – 0.007		0.01	0.11 – 0.32	0.09	0.01 – 0.09

1. *Combined ARC & TP10 values*
2. *TP10 values*

Based on the results of the HCC citywide CLM, and consideration of other contaminant load data presented in Table 17, the following summary of likely contaminant load trends are made:

- Reductions in TSS loads compared to the existing scenario is expected under a mitigated developed scenario.
- Reductions in TN loads compared to the existing scenario is expected under a mitigated developed scenario.
- It is likely that post-development (mitigated) TP loads will either remain broadly consistent with the pre-development scenario, or potentially some increases may be observed. Additional measures beyond a single treatment step should be implemented to achieve overall load reductions between pre and post-development scenarios. RITS requires use-specific pre-treatment of runoff for industrial land use (including roads) and proposed district plan measures also require at-source retention.
- Total Zn and total Cu annual loads will increase in the post-development scenario; notwithstanding potential high ED Zn loads due to legacy sheep farming practices. While reduction in current loads from the developed areas of the catchment can be achieved through stormwater interventions, the existing pastural land use in the Te Rapa greenfield area is unlikely to be generating significant amounts of heavy metals, thus urbanisation will alter the overall contaminant profile.

Overall, it is considered that the stormwater quality management approaches (i.e. infrastructure) presented in the RITS and WRC stormwater management guideline provide a practicable approach to water quality treatment that is likely to achieve some measure of improvement in existing discharge quality in relation to nutrient concentrations and TSS/clarity. While this is the case, achievement of long-term water quality targets will require measures in addition to the treatment

train approaches recommended by these documents. Additional supporting water quality measures supported by the ICMP are:

- Adoption of an adaptive management approach (with supported funding) to stormwater management within the catchment post-development. The Plan Change 1 document recognises that achievement of long-term targets will require technologies or practices that are not yet available or feasible.
- Protection of existing waterways and open channel drainage where possible, and promotion of the use of open channels as part of development.
- Promotion of establishment of naturalised riparian corridors along existing waterways. This will increase the capacity of the natural environment reduce contaminant loads.

7.3.3 Water Quality Approaches

Existing Brownfield Area

Treatment of existing public domain roading corridors using a treatment device (such as raingarden or wetland) designed in accordance with the RITS would likely achieve the Plan Change 1 short-term targets as the roading corridors represent more than 20% of residual un-treated areas. This is based on achieving or exceeding the short-term load reduction targets set out in the Joint Witness Statement Report[99].

Providing at-source treatment, or treatment in downstream centralised devices for existing un-treated development within the brownfield area will provide a significant step in working towards 80-year targets.

Based on the discussion above, Table 18 summarises proposed short-term longer-term water quality actions for existing brownfield areas.

Table 18: Water Quality Actions

Short-term actions	**Longer-term actions**
1. Increase sediment removal from roading corridor discharge. 2. Inspect all high-risk sites within the existing Te Rapa brownfield area. 3. Incorporate Te Rapa into ongoing on-lot monitoring programme. 4. Implementation of best practice stormwater management for all new and re-development.	1. Provide water quality treatment for all roading corridors. 2. Implementation of best practice stormwater management for all new and re-development.

Infrastructure options for achieving water quality targets in the existing brownfield area in Te Rapa are discussed further in Section 7.10.2.

Greenfield Areas

Based on the above observations on contaminant load yields, it is considered that stormwater quality management practices in-line with the RITS will be appropriate for the greenfield areas of the

[99] JWS

Te Rapa catchment. Where higher levels of sediment generation are expected, at-source sediment management should be applied to support higher levels of Phosphorus and heavy metal removal. It is noted that these areas will overlap with the definition of 'high contaminant load profile' landuse as per the RITS (as zoning for Te Rapa is deferred industrial), so will be required to provide primary at-source treatment under the current RITS requirements, followed by a centralised water quality treatment device.

- On-lot pre-treatment
- At-source sediment removal for high trafficked or industrial land-use roading corridors
- Water quality treatment
- Re-establishment of riparian vegetation corridors

Management of stormwater discharge quality for both brownfield and greenfield sections of the Te Rapa catchment will need to be supported by ongoing monitoring and adaptive management approaches to ensure that trends can be quantified and long-term targets are being achieved.

7.4 Receiving Environment

This section summarises assessments in Appendix C (Receiving Environment Report).

7.4.1 Receiving Environment Description

The Te Rapa North receiving environment consists of the Waikato River, and the Te Rapa Stream. These are summarised below.

Waikato River

The Waikato River has a catchment that encompasses much of the Waikato Region, beginning from headwaters in the Central Plateau.

Waikato River flow rates are controlled upstream of Hamilton by the Karapiro Dam. The dam has a maximum consented discharge rate of 600 m^3/s. A sub-catchment drains to the river between the Karapiro Dam and Hamilton but is relatively small compared to the catchment upstream of the dam. As a result, river flow rates in Hamilton are mostly controlled by the operation of the Dam (and other upstream flow controls). Storage behind the dam is substantial, and long wet periods tend to result in the maximum flow rate of 600 m^3/s being sustained for longer periods, rather than higher flow rates. Climate change may increase the amount of time the dam discharges at a maximum flow rate.

Due to the size and long response time of the Waikato River catchment, typical urban stormwater storage practices have minor benefit in terms of effects on the river, while soakage and infiltration may have greater ability to attenuate flows to the river using groundwater storage.

Sediment starvation caused by dams upstream on the Waikato River has contributed to downcutting of the riverbed. This is potentially increasing grades and could result in bed degradation in the lower Te Rapa Stream and smaller gullies which discharge directly to the River.

Te Rapa Stream

A walkover was carried out by Beca in 2019 to assess the state of the Te Rapa Stream. The walkover identified stream classifications at a strategic level, which are shown in Figure 32. Further investigation will be required to define stream classifications to a level sufficient for resource consenting.

The walkover also identified existing erosion that is likely to have resulted from a combination of increased stormwater volumes from urbanisation, and reduced bank stability as a result of historic land clearance. In addition, future changes to hydrology in the catchment are expected to increase erosion, even after stormwater attenuation measures are applied. Concept erosion remediation

works have been proposed for areas of existing erosion, and additional projects have been allowed for to mitigate expected future erosion resulting from development hydrological changes. Figure 32 shows erosion information, and other information gathered during the stream walkover.

Technical assessment of erosion is discussed in detail in Appendix E.

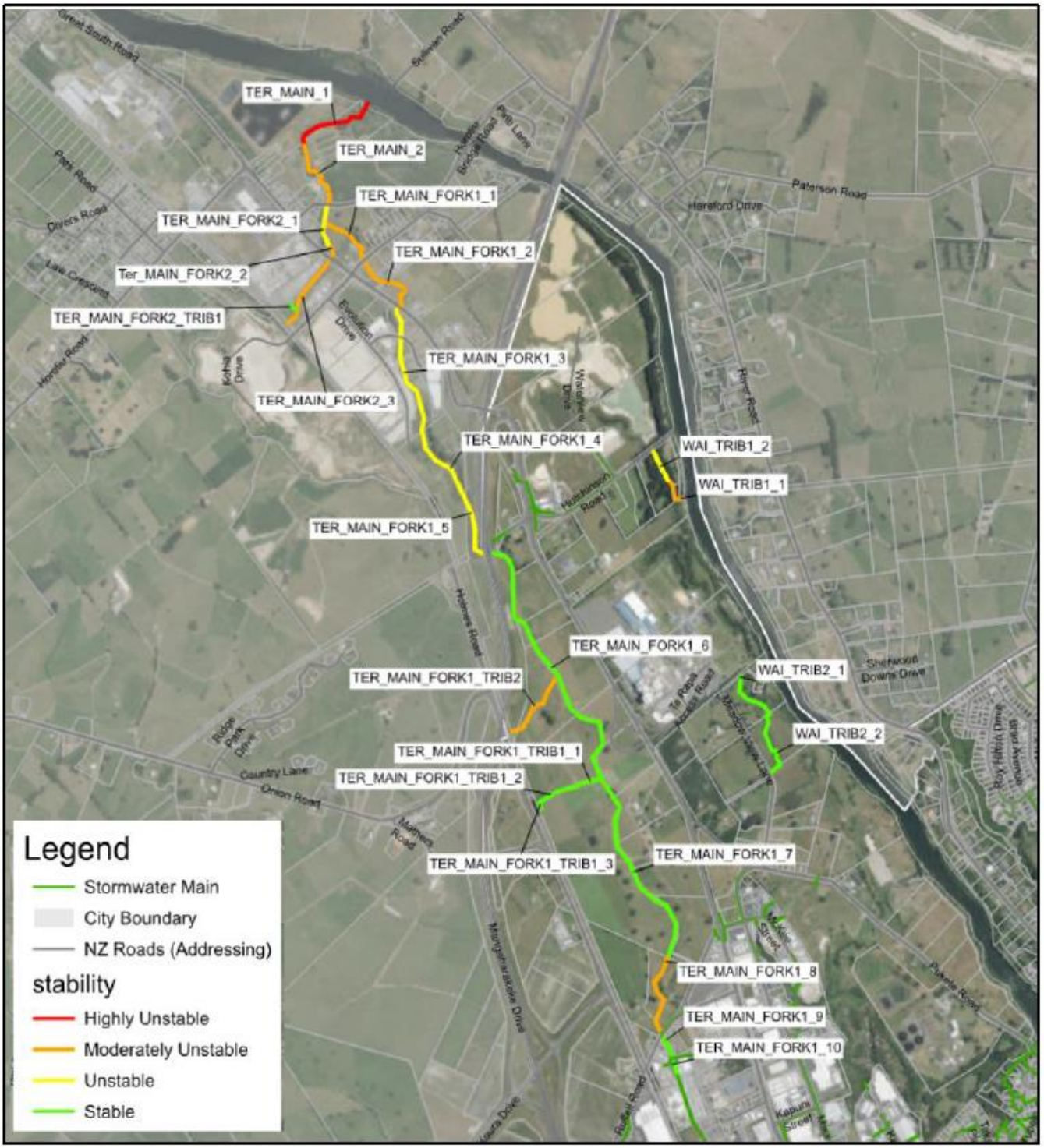


Figure 32: RGEA output showing observed channel stability

7.4.2 Aquatic Ecology

Figure 16 sampling (MCI) was undertaken in 2019 at each of the six (6) water quality sampling locations (shown in Figure **18**), with fish survey also undertaken at these locations, plus an additional location in farm drains north of Koura Drive. Table 19 summarises MCI results and Table 20 summarises fish survey results.

MCI results indicate moderate to severe pollution within the existing Te Rapa Stream. Results generally show a trend of degrading of the system from upstream to downstream. Fish survey results identified native species over the entire length of the main Te Rapa Stream including Inanga (*at-risk declining*) which were identified upstream and downstream of the WEX culverts. In addition to this, Black Mudfish (*at-risk declining*) were identified within the farm drain system north of Koura Drive.

Table 19: Te Rapa MCI results

Taxa	MCI_1	MCI_2	MCI_3	MCI_4	MCI_5	MCI_6
Number of Taxa	9	8	9	20	6	8
EPT Value	1	0	0	2	0	0
% EPT (taxa number)	11.11	0	0	10	0	0
MCI-sb Value	46.6	52.5	38.89	76	83.3	90
SQMCI-sb Value	5.18	1.93	3.94	3.8	4.17	4.5

Table 20: Fish survey results

Fish survey results (FS_ID)	Stream	Native						Exotic		
		Banded kokopu *Galaxias fasciatus*	Inanga *Galaxias maculatus*	Common smelt *Retropinna retropinna*	Shortfin eel *Anguilla australis*	Longfin eel *Anguilla dieffenbachii*	Black mudfish *Neochanna diversus*	Mosquito fish *Gambusia affinis*	Koi carp *Cyprinus carpio*	Rudd *Scardinius erythrophthalmus*
FS_1	TER_MAIN_2			1		5		TMTC	1	
FS_2	TER_MAIN_FORK1_3				6	2		10	1	
FS_3	TER_MAIN_FORK1_6		2			3		18	1	
FS_4	TER_MAIN_FORK1_6	3	1		1			19		2

Table 20: Fish survey results										
FS_5	TER_MAIN_FORK1_8				2			3		
FS_6	WAI_TRIB2_1	1				1				
FS_7	Farm drains						13			

7.4.3 Wetland Assessment

T+T were engaged to undertake an initial assessment of potential freshwater wetlands (Appendix F). The objective of this work was to identify any wetland areas that potentially meet the NPS-FM definition of a natural wetland. The purpose of including the watercourse and wetland map in the ICMP is to clearly signal where land development activities may need to consider the rules in the WRP and NES-FW.

The watercourse and wetland classification work has been undertaken in two stages. An initial desktop assessment (Stage 1) covered the wider Te Rapa North ICMP catchment, including the areas in the Waikato District to the north and northwest of the HCC boundary. Subsequent ground truthing work (Stage 2) focussed on the Te Rapa North Structure Plan area (SPA), including a small area to the south that is outside of the Te Rapa Catchment Boundary known as the Rotokauri Pocket.

A total of five (5) potential natural wetlands were identified by T+T within the Te Rapa ICMP area (all within the HCC jurisdictional area). Table 21 summarises the assessment of each potential wetland. Figure 33 shows the location of each of the seven sites.

Table 21: Summary of identifed potential natural wetlands in the Te Rapa North area	
Wetland ID	Description & Confidence Level
W1 	Exotic reed sweetgrass (*Glyceria maxima*) (OBL) – gypsywort (*Lycopus europaeus*) (OBL) swamp; riverine. This wetland is situated adjacent to a stream from which it receives regular silts from flood flows. • Obvious soil saturation. • Probable hydric soils. • Approximately 300 m^2. High confidence as a natural wetland due to presence of OBL species although WDP not undertaken.
W2	Exotic mercer grass (Paspalum distichum) (FACW) – Creeping buttercup (Ranunculus repens) (FAC) seep situated in a basin at the head of a watercourse; palustrine. • Obvious soil saturation. • Possible hydric soils. • Approximately 50 m^2. Moderate confidence as a natural wetland as WDP not undertaken.

Table 21: Summary of identifed potential natural wetlands in the Te Rapa North area	
W3 	Indigenous mature kahikatea (*Dacrycarpus dacrydioides*) (FAC) swamp situated on a mainly gley soil8 plain near the Waikato River that receives both surface and ground water from adjacent land; palustrine. • Wetland hydrology not obvious. Some dead and dying kahikatea. • Approximately 4470 m^2. Low to moderate confidence as a natural wetland as understorey vegetation is not obviously wetland species in composition and coverage (some arum lily (*Zantedeschia aethiopica*) (FAC) and water pepper (*Persicaria hydropiper*) (FACW). WDP and hydric soils test required.
W4 	Indigenous mature kahikatea (*Dacrycarpus dacrydioides*) swamp situated on a mainly gley soil plain near the Waikato River that receives both surface and groundwater from adjacent land; palustrine. • Approximately 4470 m^2. Not ground-truthed as no landowner access and WDP not undertaken. Kahikatea look to be in better health than in Wetland 3 (W3). Low to moderate confidence as a natural wetland.
W5 	Exotic mercer grass / reed sweetgrass grassland swamp situated on a slope; receiving surface water flows and groundwater; palustrine. • Obvious surface water and soil saturation. • Approximately 4700 m^2. High confidence that this area will be a natural wetland due to comparatively diverse wetland species composition and coverage including: • Sharp sike rush (Elecharis acuta) (OBL) • Gypsywort (OBL) • Several Juncus spp. (FACW) • Common marsh bedstraw (Galium palustre) (OBL) • Water pepper (FACW)

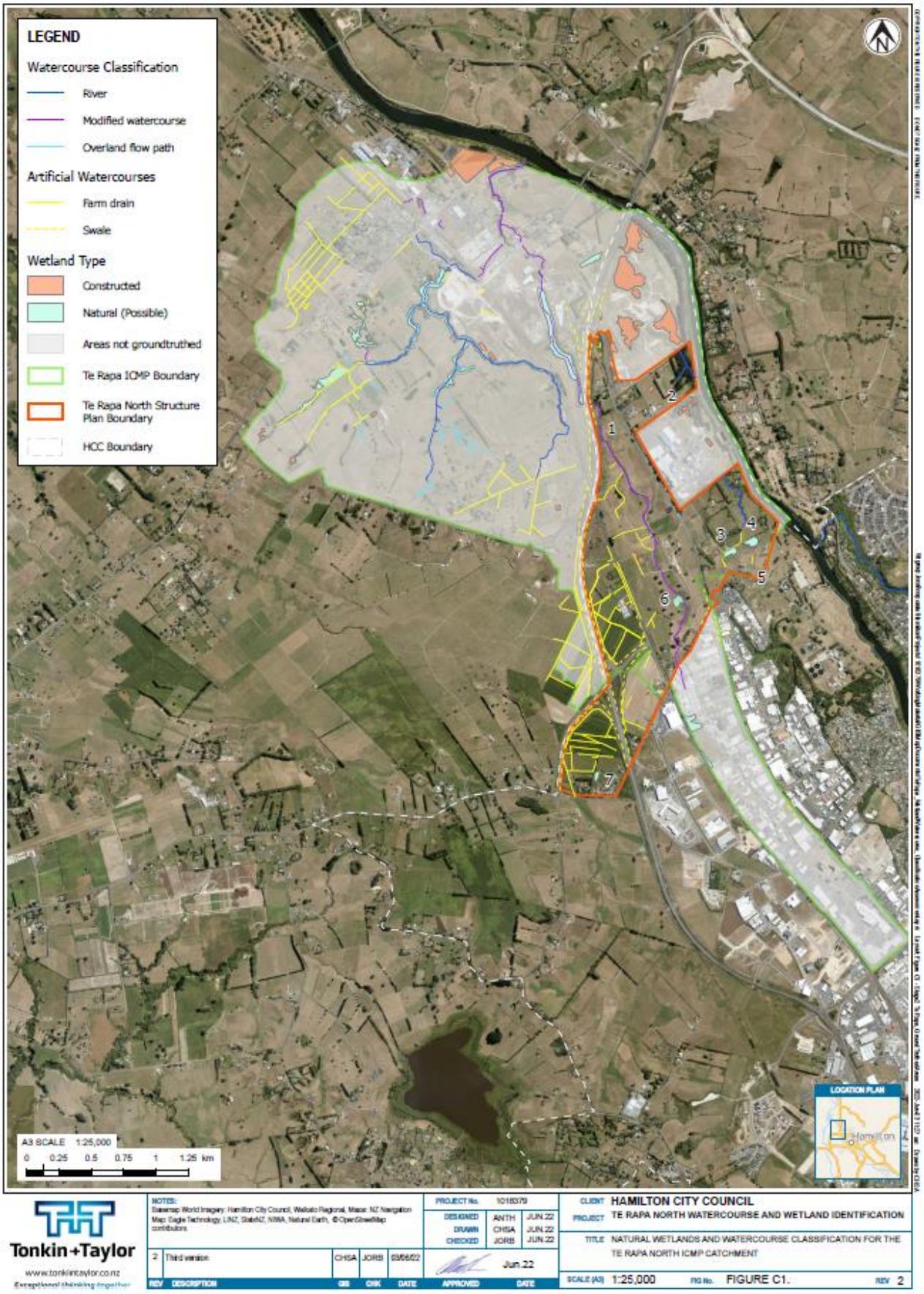


Figure 33: Map of identified potential natural wetlands and watercourse classifications

7.4.4 Watercourse Classification

Watercourse classification (in accordance with the Regional Plan) was undertaken by T+T at the same time as ground truthing of potential natural wetlands. Watercourse classification is shown in Figure 33.

7.4.5 Fish Passage

There are several culverts and other structures throughout the catchment which create fish barriers – a total of five (5), with four (4) occurring within the Hamilton jurisdictional area. These have been identified as part of the watercourse walkover documented in Appendix C (Receiving Environment Report). Identified fish barriers within the Te Rapa North area are shown in Figure 34. Two (2) of the four (4) identified fish barriers (FB_2, FB_5) are associated with farm access tracks and are expected to be removed as part of development. Barrier FB_3 has been caused by an erosion hotspot and will also likely be addressed through development. Barrier FB_4 occurs at the outlet of the culvert below Onion Road and the northern rail line. This should be considered as part of the citywide fish barrier removal programme. It is noted that black mudfish have been identified upstream of this location which will need to be taken into account when considering any alteration to this barrier.

Figure 34: Identified fish passage barrier locations, Te Rapa North.

7.4.6 Receiving Environment Issues and Opportunities

Issues and opportunities for Receiving Environment Ecology were assessed through SMPv3. Programmes of works were identified by SMPv3 to restore watercourses, remove fish barriers, and provide for watercourse resilience.

The Three Waters Blue-Green corridors report[100] has also considered opportunities to rebuild functional and healthy environments with abundant natural resources which requires a three-waters paradigm shift toward nature-based solutions. The report includes Horotiu/Te Rapa as a case study and its findings are consistent with the outcomes being sought through the ICMP.

Watercourse Resilience

Watercourse resilience issues for the Te Rapa catchment have been identified using an MCA approach based on spatial queries which has been developed in parallel with the latest version of the stormwater masterplan. Issues are scored based on reach stability, proximity to infrastructure

[100] Sub-Regional Three Waters; The Blue-green Networks (Hamilton City Council, 15 July 2022 DRAFT).

and likely upstream growth. Table 22 summarises the MCA criteria adopted to assess the relative priority of rectification of each stream reach identified in the stream walk-over. These are shown spatially on Figure 32.

Table 22: Watercourse resilience MCA

Criteria	Description	Scoring
Infrastructure (description)	Intersects Critical Infrastructure	5
	Intersects Building Footprints	4
	Intersects WW Pipe	4
	Intersects Non-Critical Road	2
	Intersects Footpath or Cycleway	1
	No intersect	0
Growth (Expected change in upstream impervious cover)	High – within growth cell or growth cell is significant proportion of upstream catchment.	5
	Medium – upstream catchment is developed with predominately low density residential landuse.	3
	Low – upstream catchment is developed with predominately med-high density residential or commercial/industrial.	0
Watercourse Quality	Result of watercourse quality MCA	0-4
Erosion susceptibility	Highly unstable or moderately unstable	5
	Unstable	3

Based on the observations made during the stream walkover, a programme of erosion control works for the Te Rapa catchment was developed. Watercourse resilience project scoping is documented in Appendix E. The programme of works consists of a set of rectification works projects addressing all stream reaches scoring a 9 or above. Cost estimates have been undertaken for two (2) scenarios (refer Section 7.11.5 for discussion of options):

- Option 1 (assumes construction of diversion pipeline in HCC area): The total cost of erosion works under this option has been calculated at $5.3M. This option assumes that a diversion pipeline mitigates all increases in flow volumes from development (within HCC area) up to at least the 2y ARI event. Estimated erosion costs address existing legacy issues only.
- Option 2 (no pipeline): The total cost of erosion works under this option has been calculated at $28.4M - $33.0M (depending on land acquisition assumptions). This option allows for all fully developed flows to be discharged to the Te Rapa Stream, with proposed works typically consisting of an armoured low-flow channel with bank battering to achieve a stable high-flow section.

Both options above include works in both HCC and WDC jurisdictional areas. Works within WDC jurisdiction are limited to those along the main stream which drains the HCC area. No assessment has been made of erosion issues and mitigations for areas that do not drain HCC administered land.

Implementation of these works is discussed further in Section 7.11, as channel resilience works will potentially form a key component of mitigating effects of development within the catchment.

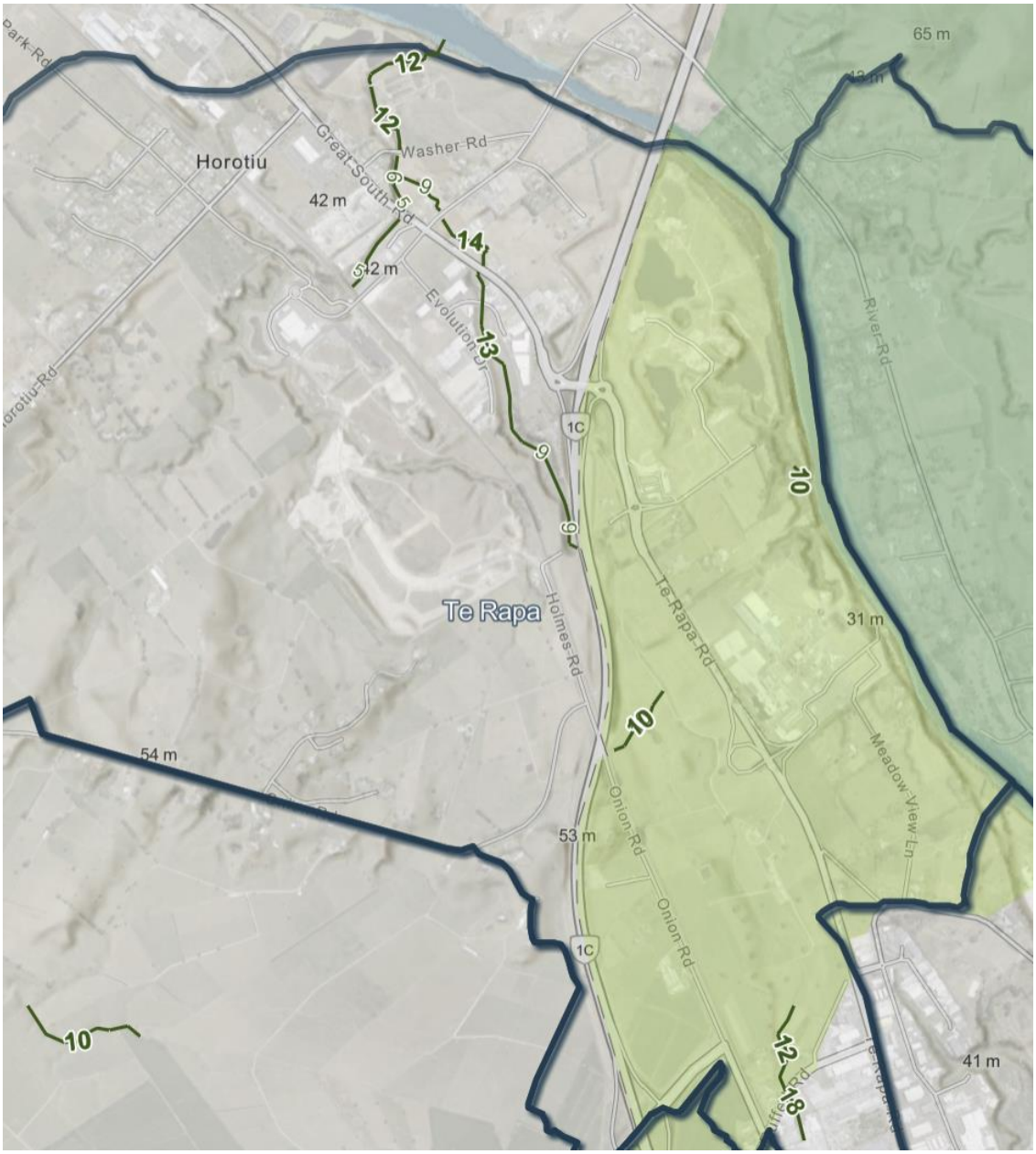


Figure 35: Distribution of erosion issue MCA scores for the Te Rapa catchment.

Watercourse Restoration & Enhancement

The watercourse walk-over identified that effectively all of the Te Rapa Stream has been historically cleared of native vegetation. In addition, walk-over observations suggest that the course of the stream has been artificially straightened or modified in several locations. While some riparian re-planting was observed through the Fonterra owned section of the main channel (between Ruffell Road and WEX), typically this does not extend far from top of bank. As such, restoration &

enhancement opportunities exist along the entire length of the Te Rapa Stream (including tributaries). Based on the findings of the stream walkover, the following restoration works recommendations are made:

- Along the main branch of the Te Rapa Stream, riparian planting/enhancement of a minimum width of 10 m (from top of both banks) has been recommended. This could be accommodated within an esplanade reserve area allowable under the RMA[101], or within the future floodplain area.
- Along tributaries of the main stream that are currently modified farm drains, riparian planting/enhancement of a minimum width of 5 m has been recommended (from top of both banks).
- In existing incised gully systems along the banks of the Waikato River and downstream of WEX, riparian planting/enhancement of the gully extent is recommended to restore the gully to a more naturalized state (irrespective of approaches to erosion mitigation).

Implementation of the above recommendations would contribute to achieving the minimum target of the ODP objective to return 10% of Hamilton to local indigenous biodiversity (in the order of 5% for the Te Rapa North area). A high-level cost estimate has been undertaken using standard planting unit rates, with a total capital estimate of $5.5M (allows for approximately 52,000m^2 of planting across both HCC and WDC jurisdictional areas – which corresponds to areas not identified as part of erosion projects identified in Option 1). It is noted that under the scenario where a volume diversion pipeline is constructed within the HCC jurisdictional area, an additional $2.5M of restoration planting is recommended along the Te Rapa Stream in the WDC area downstream of the WEX for the purpose of addressing residual legacy erosion issues. No estimates have been made for other watercourses within the WDC area. Planting areas under the different volume management scenarios considered are shown in Appendix E.

Fish barriers

Four fish passage barriers were identified within the HCC jurisdictional area as part of the stream walk-over. Three of these are located along the tributary which drains the Onion Road area, the other is due to a farm access crossing on the main stream branch, towards the upper extent of the catchment.

Black mudfish were identified upstream of the barrier at Onion Road and this may be playing a role in isolating this population from introduced predatory species migrating to these areas. Further sampling/survey would be required to determine if these barriers are serving a protection function for the identified Black Mudfish population.

7.4.7 Summary of Proposed Issues and Mitigations

Table 23 below summarises the issues, mitigations and implementation approaches for the receiving environment module.

[101] Resource Management Act, 1991

Table 23: Receiving Environment Actions		
Issue	**Mitigation**	**Implementation**
Watercourse resilience (erosion projects)	(Option 1): Identified programme of works - $5.3M over length of the Te Rapa Stream (main branch).	Integration of areas within HCC jurisdiction into city-wide prioritised watercourse resilience capital works programme.
	(Option 2): Identified programme of works - $28.4M to $33.0M over length of the Te Rapa Stream (main branch).	Downstream works required to mitigate growth impacts to be considered as part of growth cell capital programme (refer Section 7.11).
Te Rapa Stream restoration	Programme of works to restore/enhance existing watercourse. Total identified conceptual cost, $5.5M. (includes both WDC and HCC areas).	Recommend that Nature in the City (NITC) consider as part of citywide programme of native vegetation restoration.
Fish Barriers	No	No changes to citywide programmes – locations recorded in GIS database.
The ICMP has identified five (5) potential freshwater wetland locations.	Detailed assessment & protection/enhancement where required through development.	During resource consent

7.5 Flooding

This section summarises the assessments that are provided in Appendix G (Flood Model Build Report).

7.5.1 Flooding Technical Assessment

Detailed flood modelling was carried out by Beca as part of the ICMP investigations using the TUFLOW modelling software package. The model and results have been used to identify and assess flood issues, risks, and mitigation options. The model build report which describes flood modelling in detail is included in Appendix F.

The flood model extent covers the Te Rapa Stream catchment. Both pre and post-development scenarios were modelled for various rainfall events. The development scenarios included existing development and maximum probable development (MPD) within the city boundary with climate change. The MPD scenario considered assumed development as per the current WDC operative plan. Mitigation scenarios were also run where flood control requirements were considered likely to apply. Modelled scenarios are summarised in Table 24.

Flood extents for the 100-year ARI ED and 100-year ARI MPD unmitigated model scenarios are shown in Figure *36* (flood extent is displayed with no depth removed to show absolute extent changes). Flood hazard mapping is shown on the HCC Floodviewer portal (https://maps.hamilton.govt.nz/floodviewer/). Flood hazards within the HCC jurisdictional area are displayed with 100mm of depth removed as this is considered not to constitute a flood hazard under the adopted classification system.

Table 24 : Flood Modelling Scenarios	
Scenario	**Rainfall Events Simulated**
Existing Development (ED)	2-year RCP6.0, 10-year RCP6.0, 100-year, 100-year RCP6.0, 100y-year RCP8.5
Maximum Probable Development (MPD) – unmitigated	2-year RCP6.0, 10-year RCP6.0, 100-year, 100-year RCP6.0, 100y-year RCP8.5
Maximum Probable Development (MPD) – mitigated (flood relief pipeline)	2-year RCP6.0, 10-year RCP6.0, 100-year RCP6.0
Maximum Probable Development (MPD) – mitigated (stream channel armouring)	100-year RCP6.0

The following sections discuss results of the ED and MPD 100-year ARI unmitigated scenarios. MPD mitigation scenarios are discussed in Section 7.11 – Greenfield Stormwater Management.

Upper Catchment (Existing Brownfield Area)

Existing 100y ARI flooding in the existing Te Rapa industrial area is generally confined to The Boulevard roading corridor, with only minor encroachment predicted into the surrounding commercial properties. No above-floor flooding is likely in commercial properties along The Boulevard in the existing scenario. A single property (66-68 The Boulevard) is predicted to be impacted in the 100y ARI event, with maximum depths approximately 150mm. Two commercial properties (71 and 75 Ruffell Road) adjacent to the open channel section of the Te Rapa Stream in the upper catchment are predicted to be impacted by inundation in the 100y ARI event. The property at 75 Ruffell Road is affected by very shallow flooding only, while the property at 71 Ruffell Road is affected by deeper flooding (approximately 400mm depth). Street-view photography suggests this building is a storage shed.

As the upper catchment has been assumed to be fully developed in the existing scenario, MPD unmitigated scenario flood effects are identical to those identified in the existing scenario.

Mid-Catchment

Along the main Te Rapa channel flooding fluctuates between being relatively confined (where the steam is more incised) through to larger break-out areas where the stream floodplain becomes wider and flatter. Areas of confined floodplain are more prevalent immediately downstream of Ruffell Road and upstream of WEX, with the areas between exhibiting flatter topography.

Along the western extent of the catchment, upstream of Onion Road and the railway line topography is relatively flat with drainage characterised by modified farm drains. Where drain capacities are exceeded, the flood extents tend to 'spread-out' over the adjacent cropping land.

Overall, flood extents do not change significantly in the 100y ARI MPD unmitigated scenario. The largest changes in flood extent along the main channel are observed immediately upstream of WEX as differences in peak flood flow magnitudes are greatest here. Immediately upstream of the WEX culverts peak flood levels are predicted to increase by more than 600mm in the un-mitigated scenario. In addition to this increase within the main channel, it is predicted that the Te Rapa Road on-ramp will become affected by flooding in the un-mitigated scenario as well as levels within the WEX carriageway increasing by 60mm.

While changes in 100y ARI unmitigated flood extent are generally not significant within the mid-catchment, the assessment is based on existing topography. In reality, MPD development will

involve modification of parts of the floodplain which will potentially change flooding behaviour in the future. This will need to be managed as sub-divisions are developed.

Lower Catchment

Downstream of the WEX flooding in the existing scenario is generally confined to the Te Rapa Stream gully which becomes more incised in the lower catchment. The exception to this is the reach between Great South Road and Horotiu Bridge Road. In this location, the Te Rapa waterway has been piped (below the SD European auto parts business). This culvert does not have capacity to pass any of the 100y ARI scenarios considered (including the existing condition) and inundation of this property occurs once the culvert capacity is exceeded.

In the 100y RCP6 MPD unmitigated scenario, peak flood extents remain relatively unchanged, with flooding generally confined to the gully extent. Maximum increases in peak flood levels are observed immediately downstream of the WEX, in the reach to Innovation Way. In this area, the construction of Innovation Way has created a large detention volume upstream of the road crossing. Levels in this area are dictated by the 2,100mm culvert beneath Innovation Way. It is noted that the road formation level at this location is higher than WEX carriageway levels at the adjacent Te Rapa interchange, with culvert capacity at WEX also being greater than that of the downstream structure. This has created a risk whereby if the Innovation Way culvert becomes blocked (or partially blocked) or flood events with larger volumes (less frequent or longer duration) could cause backwater flooding of the WEX. Backwater impacts are not observed in the 100y RCP6 MPD (24h duration) unmitigated scenario, but are observed in the RCP8.5 scenario.

Downstream of Innovation Way 100-year peak flood level increases are typically 50mm – 100mm. The relatively low increases in peak flood levels in the lower Te Rapa catchment are driven by the attenuation upstream of Innovation Way.

Proposed Discharge Parameters

The modelled unmitigated flood flows do not significantly increase risk to downstream properties (downstream of WEX corridor). This is driven by the attenuation capacity of the section of channel between Innovation Way and WEX. While this is the case, there are appreciable increases in peak flows in the unmitigated scenario. Any future changes to the storage characteristics of the section of channel between Innovation Way and WEX or changes to downstream culvert capacities (outside of HCC territorial area) could result in flooding impacts due to the increased flow volumes. Given that this is the case and the fact that much of the downstream channel area is within private ownership, a precautionary approach of requiring flood control within the HCC jurisdictional area is considered practicable.

Structural mitigation scenarios to achieve the flood control discharge parameter are discussed as part of the Greenfield Stormwater Management Section (Section 7.11).

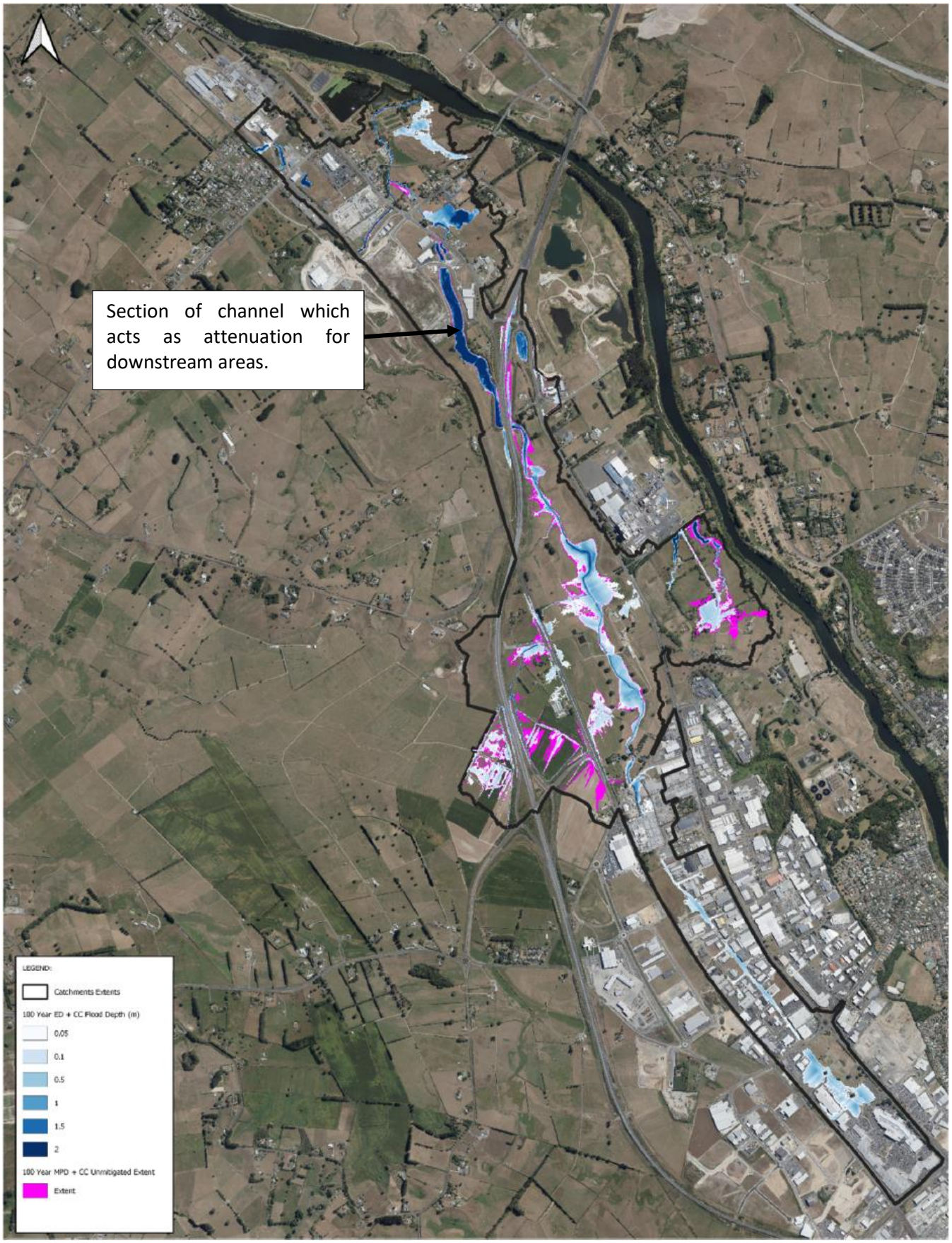


Figure 36: 100y ARI (RCP8.5) ED/MPD Flood Map

7.5.2 Flood Depressions

Flood depressions are areas that have a potential to 'fill up' with stormwater if the piped system is blocked or its capacity is exceeded when drainage networks are blocked. They are typically created through the construction of man-made features (e.g. roads) that can act inadvertently as a dam but can also include natural topographical features of the landscape.

HCC engaged WSP Ltd in 2023 (i.e after initial ICMP technical assessments were developed) to develop citywide flood depression data corresponding to a 10-year and 100-year (including climate change) volume of rainfall. These are now published publicly on HCC's Floodviewer portal (https://maps.hamilton.govt.nz/floodviewer/). These layers correspond to the depressions that could be expected to 'fill-up' under that particular rainfall depth.

Where a depression area is filled in a given volume of rainfall an additional water level is added to account for the hydraulic head required to allow flow out of the depression area. For depressions created behind culverts 850mm water level has been added, and where the depression is associated with ponding area is the primary network 250mm has been added.

An excerpt from Floodviewer showing extent of 100-year flood depressions in the greenfield areas of Te Rapa is shown in Figure *37*, brownfield areas are shown in Figure *38*. 10-year flood depressions are not shown as these are of lessor or equal extent than the 100-year layer.

There are several existing flood depressions in the Te Rapa greenfield development area. The majority of these are due to private farm drain crossings and will be removed as part of development. Key existing flood depressions that will remain after catchment development are the depression created by the Onion Road and rail embankment, and the depression created by the WEX. Table 25 summarises the predicted flood depression levels for each of these locations. Development upstream of these locations will need to consider these levels in line with prevailing Operative District Plan provisions. At the time of preparation of the ICMP the District Plan requires 150mm freeboard above 100-year flood depression levels.

Table 25: Summary of existing flood depressions (levels in Moturiki datum)

Location	**10-year ARI Depression Level (mRL)**	**100-year ARI Depression Level (mRL)**
Onion Road	29.82	30.69
Waikato Expressway	21.81	21.81

New development will also need to consider existing landform levels if constructing new waterway crossings within the greenfield zone. Any new waterway crossings are required to not create new flood depression risks for existing development.

Existing development within the Te Rapa catchment is not significantly affected by flood depressions, particularly land that is yet to be developed. Re-development will need to consider existing flood depressions, but it unlikely to be significantly impacted.

Figure 37: Current flood depression data, central Te Rapa catchment (blue hatched area shows extent of 100-year ARI flood depression).

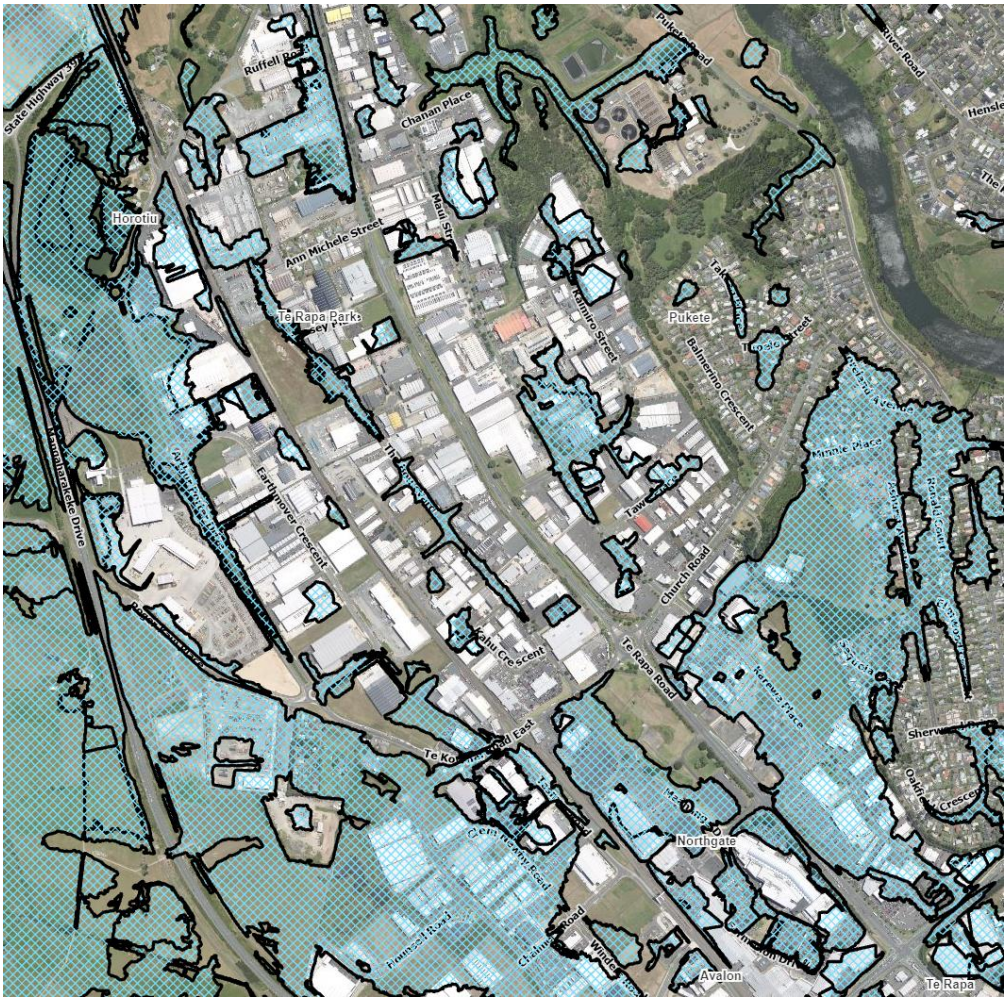


Figure 38: Current flood depression data, southern Te Rapa catchment. (blue hatched area shows extent of 100-year ARI flood depression).

7.5.3 Flooding & Flood depressions Issues and Opportunities

No specific opportunities to mitigate flooding (or flood depression) issues have been identified within the existing brownfield areas of the Te Rapa North catchment. This is due to it being a relatively new development area and having infrastructure generally in-line with existing standards.

Greenfield development within the catchment will need to manage developed runoff volumes and flows in line with District Plan and RITS provisions.

7.5.4 Summary of Proposed Issues and Mitigations

Table 26 below summarises the issues, mitigations and implementation approaches for the flooding module.

Table 26: Flooding Issues & Mitigations

Issue	Mitigation	Implementation
Future greenfield flood hazards	Ground levels of new development to be located above peak 100-year MPD flood levels.	Through resource consenting.
Potential downstream flooding issues due to increases in flows & volumes from greenfield development.	A means of compliance has been set through the ICMP. Flood attenuation will be required for areas upstream of WEX draining to the main stream.	Through resource consenting.
Greenfield flood depressions	Construction of new waterway crossings will need to consider existing upstream development levels so as to avoid creation of new culvert blockage risks – i.e. culvert block flood levels shall not exceed relevant freeboard levels for existing upstream development.	Through resource consenting.
	New building freeboard levels should consider flood depression levels in-line with RITS requirements and District Plan provisions – i.e. new development to provide freeboard above depression or culvert block levels.	Through resource consenting.

7.6 Overland Flow Paths

7.6.1 Overland Flow Paths Technical Assessment

Overland flow paths are formed or unformed channels or locations where stormwater tends to accumulate and flow. Overland flow paths have been assessed using the OLFP data for Hamilton City generated using an automatic GIS process by WSP Ltd and results of the flood modelling. OLFPs have been spatially intersected with other relevant GIS datasets such as critical infrastructure and building footprints. Results of this are discussed below.

7.6.2 Overland Flow Path Issues and Opportunities

A single key overland flowpath was identified at the northern end of The Boulevard. In this location, the main flowpath is piped and a concrete pipe lay-down facility (97 The Boulevard) blocks the path of any overland flow. This overland flowpath would only operate in a pipe-blocked scenario.

No conceptual mitigation project options were developed for the identified overland flowpath. This will need to be addressed at the time of re-development in accordance with District Plan and RITS requirements.

7.6.3 Overland Flow Path Actions

The solutions and actions in Table 27 have been adopted by the ICMP:

Table 27: Overland Flow Path Actions

Issue	Mitigation	Implementation
97 The Boulevard (concrete plant)	The OLFP through this property should be added to the HCC OLFP GIS layer so that it can be addressed in future consent assessments. The OLFP should be re-established on re-development of the site.	At resource consent.
Development design needs to consider existing overland flow paths and provide for future developed overland flow paths that safeguard people and property, and do not create, or exacerbate, erosion risk.	Compliance with RITS.	At resource consent.

The design of, and securing of, overland flow paths in new development areas in compliance with the RITS will ensure no more than minor impacts of overland flowpath on receiving environments, people and property as a result of development. Investigation, and where appropriate physical improvements to, overland flow paths in brownfields areas will to the extent reasonably practical, protect people, property and environment from the effects of existing overland flow paths.

7.7 Stormwater Network Capacity

7.7.1 Stormwater Network Technical Assessment

Stormwater network capacity has been assessed using pipe capacity maps generated from the Te Rapa flood model for the 2-year and 10-year ARI storm events within the existing industrial area. The 2-year and 10-year ED pipe capacity maps are shown in Figure 39.

The design standard for stormwater reticulation in industrial areas was previously the 5-year ARI event. This was increased to the 10-year ARI event when the RITS was adopted in 2018.

The pipe capacity maps show some surcharging of pipes in both the 2y and 10y ARI events. Given that The Boulevard has been designed as a series of road sags (intended to fill), and conservative assumptions have been made around the functionality of site-scale stormwater management devices (soakage/attenuation) and the fact that the commercial /industrial properties along The Boulevard are not impacted in any of the events modelled, no issues with network capacity have been identified.

Figure 39: Pipe Capacity – 2-year & 10-year ARI (ED with climate change).

7.7.2 Stormwater Network Issues and Mitigations

No issues were identified relating to stormwater network capacity as part of the ICMP. While capacity deficiencies were identified (compared to current RITS new design LoS), these do not cause impacts to private properties so stormwater network upgrades within the existing areas of the Te Rapa catchment are not considered priorities.

7.7.3 Stormwater Network Actions

No specific actions have been proposed around the existing stormwater network.

Appropriate design of the stormwater network (in accordance with RITS) and consideration of existing network capacity issues in renewals planning will reasonably protect people, property and the receiving environment from storm events of 10-year ARI or less.

7.8 Hydrogeology

This section summarises assessments Appendix B (Geotechncial and Hydrogeological Assessment).

7.8.1 Hydrogeology Technical Assessment

A desktop hydrogeological assessment was carried out using available existing investigations. A summary of identified hydrogeological issues within the Te Rapa catchment is as follows:

- Depth to groundwater
- Drawdown of the groundwater table
- Lining of excavations
- Groundwater seepage/infiltration leading to mounding
- Potential for changes in contaminant flow paths

The identified hydrogeological issues are detailed in Table 28.

Table 28: Hydrogeology issues

Issue	Description
Depth to groundwater	Based on the limited groundwater data available (generally recorded on borehole logs for specific investigations), the water table is likely to be encountered at or close to ground surface in some locations, which may locally: • Constrain the maximum achievable unlined basin depth (or any other related stormwater device); • Require allowance for part of the storage to be permanently or seasonally taken up by groundwater if an unlined basin or channel extends below the groundwater table in places, or require allowance for discharge of groundwater, or require lining to account for uplift pressure; • Require dewatering of excavations during construction or long-term operation; and/or, • Limit (or in some cases prohibit) soakage of stormwater to the ground.
Drawdown of the groundwater table	Where excavations are required below the groundwater table, drawdown could occur with the potential for: • Groundwater drawdown induced consolidation settlement. This is a risk even where excavations encounter only sandy materials that are located below the groundwater level as the excavation could still cause

Table 28: Hydrogeology issues

Issue	Description
	groundwater drawdown further away, causing settlement of overlying compressible soils (if present). The risk of settlement would need to be assessed on a site-specific basis to inform the need to limit drawdown and any constraints on maximum depth of excavation. • Groundwater drawdown effects on surface water bodies such as Te Rapa Stream which likely receives a component of baseflow from groundwater. Hence any changes in groundwater level could have an impact on stream level and/or flow. It may be necessary to limit the depth of excavation in proximity to Te Rapa Stream in order to avoid drawdown effects. • Groundwater drawdown effects on shallow groundwater users. Drawdown in private wells could result in users not being able to access their legal entitlement. Some drawdown of the groundwater table can also be expected as a result of increased impervious cover, and thus reduced direct rainfall recharge at the surface.
Lining of excavations	If a basin or channel excavations extend below the groundwater table groundwater is expected to discharge from the ground into the excavation. It may be necessary to line excavations (possibly in sections) where groundwater infiltration is sufficiently high that it reduces storage capacity or impacts on channel or basin slope stability.
Groundwater seepage/infiltration	Soakage / infiltration could be used as a means of maintaining groundwater levels and stream baseflows, however it would be prudent to restrict or prohibit groundwater infiltration in close proximity to slopes as this could lead to lowered factors of safety for slope stability.
Potential for changes in contaminant flow paths	In the upper catchment there are multiple HAIL sites located in the industrial area hence there is a higher risk that contaminant migration may occur if flow paths are significantly altered. It may be necessary for consideration of water treatment prior to soakage or discharge (e.g. raingardens and vegetation planting within basins) by developers to promote water of the same or improved quality compared to that which infiltrates the ground or runs off currently. Outside of the concentrated sites in industrial areas, contaminated land is more dispersed and typically comprises pesticide bulk storage or use. Contaminants in groundwater and surface water in these areas are currently more likely to comprise high pesticide or nitrate levels rather than industrial contaminants therefore it will be imperative to maintain water of the same or improved quality and prevent the discharge of industrial contaminants as industrial development occurs. Accordingly, appropriate water treatment devices shall to be considered by developers as and when necessary.

7.8.2 Summary of Issues and Mitigations

Issues relating to hydrogeology were identified, assessed and prioritised using the technical work above, and as described in Section 7.1. Issues have been prioritised against ICMP objectives and by applying engineering judgement. The key issues and proposed mitigations for hydrogeology are shown in Table 29.

Table 29: Hydrogeology Issues & Actions

Issue	Mitigation	Implementation
Depth to groundwater Drawdown of the groundwater table	Groundwater monitoring requirements for all new development & appropriate mitigations such as lining of excavations where required.	Groundwater monitoring requirement added to ICMP means of compliance – to be implemented at resource consent. Suitable mitigations should be identified by a qualified geotechnical/hydrogeology professional.
Groundwater seepage/infiltration	No soakage to be implemented within identified setback zones.	Through resource consent.
Potential for changes in contaminant flow paths	HAIL sites to be identified during the resource consent process & site-specific appropriate measures to be recommended.	At time of resource consent.

7.9 Geotechnical

This section summarises assessments Appendix B (Geotechnical and Hydrogeological Assessment).

7.9.1 Geotechnical Technical Assessment

A desktop assessment of geohazards within the Te Rapa catchment has been undertaken. Key identified issues/risks were as follows:

- Liquefaction and associated lateral spreading risks; and
- Waikato River bank stability

Liquefaction occurs when loose, saturated cohesionless soils lose strength under earthquake loading. The loose soil will tend to compact or densify under this loading. When the soils are saturated, the relatively incompressible pore water around the soil particles does not allow this densification to occur in the short-term. This causes the pore water pressure to increase significantly and the effective stress within the affected soil to correspondingly decrease. Where these effective stresses approach or equal zero, the soil loses most of its shear strength and behaves as a liquid, hence the term “liquefaction”. This condition will persist until excess pore water pressures dissipate and the soil strength increases. Excess pore water pressures within liquefied soils can continue to exist after the earthquake shaking has stopped.

The effects of liquefaction can include:

- Lateral spreading comprising lateral and vertical movements of the ground near slopes.
- Settlement due to densification, compaction and soil loss due to ejection, termed ‘sand boils’.
- Bearing capacity failure of shallow foundations and short pile foundations, where founded in or near to liquefied soil layers.
- Increased loading on deep pile foundations, where supported in soils below liquefied soils.
- Buried pipes, tanks and chambers can float where supported in liquefied soils, damaging affected infrastructure and the overlying ground surface.

Common liquefaction effects within residential urban areas are illustrated in Figure *40*.

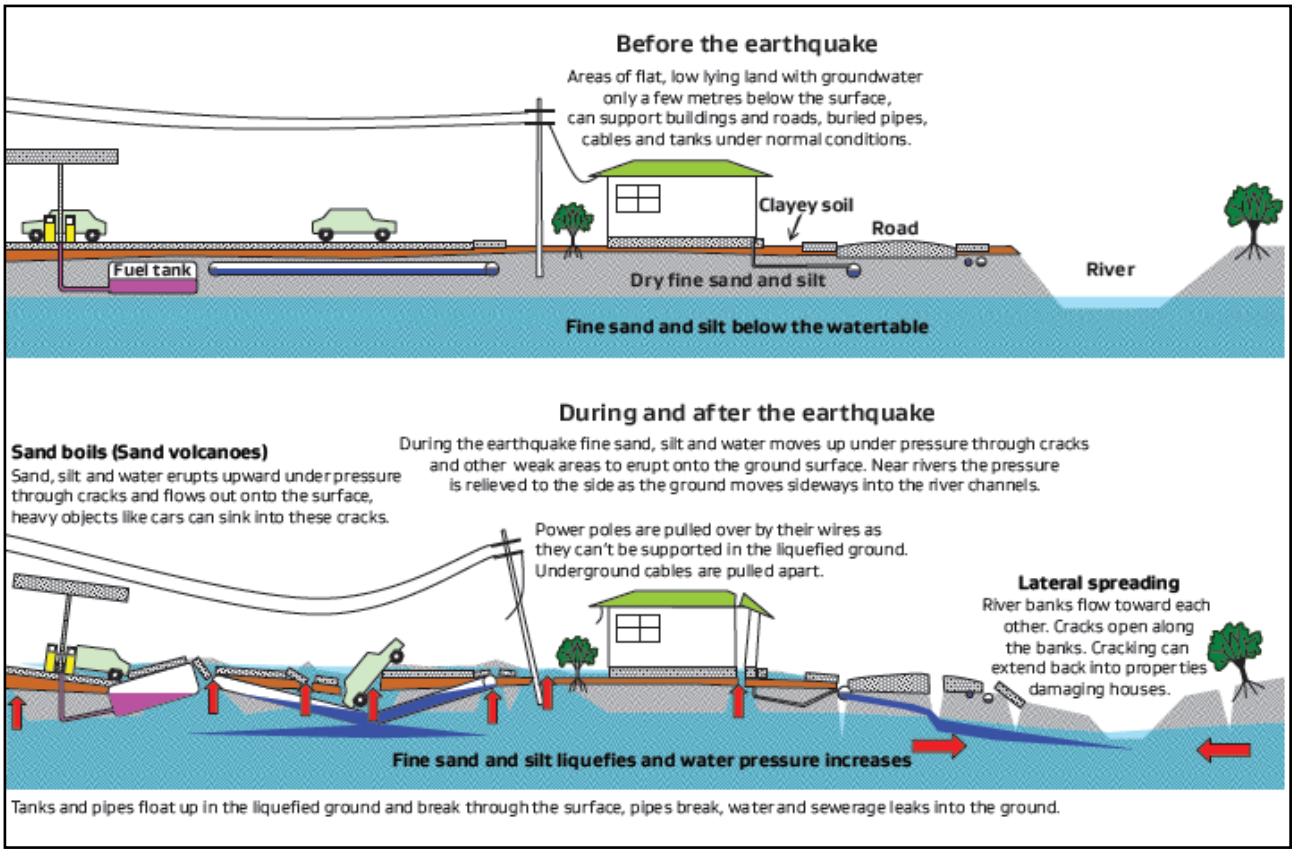


Figure 40: Common liquefaction effects within residential urban areas

Studies of the river bed level of the Waikato River indicate the river is aggrading at an average rate of approximately 30mm / year in the vicinity of Hamilton City. The primary cause of this is the entrapment of sediment from hydro dams upstream (Smart, 2005). Therefore, there is a predicted lowering of the river bed by about 1.5m at Hamilton over the next 50 years (Central Waikato River Stability Management Strategy 2008 – 2058).

Based on the identified geohazards, it is recommended that to obtain resource consent developers are required to engage the services of a qualified geotechnical professional to assess the site specific slope instability and liquefaction risks and identify a suitable development setback zone. The setback zone may be able to designate both a 'development not permitted' zone, and a zone where development is permitted but will require specific geotechnical design to satisfy the requirements of the NZ Building Code. These requirements are summarised in Table 30.

Table 30: Requirements for geotechnical assessment

Area	Requirement for Geotechnical Assessment
Waikato River bank	Proposed development within a zone extending back from the toe of the slope (or from the top of weathered ignimbrite where present) at a gradient of 1 vertical : 3 horizontal, and at least 30 m back from the slope crest of Waikato River Bank (refer HCC Operating District Plan for Te Rapa North Industrial Zone).
Gullies slopes	Proposed development within a zone extending back from the crest of the slope at a 1 vertical : 3 horizontal gradient from the toe of the gully slope and at least 6 m back from the slope crest (refer to HCC District Plan).

7.9.2 Geotechnical Issues and Actions

The solutions and actions in Table 31 have been adopted by the ICMP.

Table 31: Geotechnical Actions

Issue	Mitigation	Implementation
Liquefaction and associated lateral spreading risks and Waikato River bank stability.	Application of geotechnical assessment requirements specified above in **Table 30**.	Through means of compliance at resource consent time.

The controls proposed in this section are considered to appropriately manage geotechnical risk to people, property and the environment posed by development or naturally occurring features in the catchment.

7.10 Brownfield Stormwater Devices

This section summarises assessments in Appendix H (Stormwater Management Devices Report).

7.10.1 Existing Stormwater Devices Technical Assessment

Sub-Catchment Scale Devices

Review of HCC's GIS asset database shows that there are no HCC owned sub-catchment scale stormwater management devices (i.e. wetlands, soakage basins, attenuation areas etc) within the ICMP extents.

Waka Kotahi has a series of planted/wetland swales along the SH1 corridor, and an attenuation basin located adjacent to the Te Rapa Road interchange which Waka Kotahi manage in accordance with their resource consents. These act to treat and attenuate stormwater runoff from the highway. Waka Kotahi also has a small soakage basin on the south side of the Te Rapa Road / SH1 grade separated interchange. This is operated and maintained by Waka Kotahi in accordance with the SH1 resource consents.

HCC has several small soak pit/trench devices along The Boulevard, part of Ruffell Road and Kahu Crescent that serve these roads. Feedback from the Infrastructure Alliance, who maintain these on behalf of HCC noted they are functioning adequately and they have not received any drainage complaints about them and regular maintenance is undertaken (i.e. road catchpits are cleaned annually and kerbs are swept regularly). Council are currently in the process of developing a risk-based tool (based on measured sediment loads) to inform an updated catchpit cleaning programme.

Private On-Lot Devices

Records of subdivision and land use consents as well as Building Consent files were reviewed to identify privately owned on lot devices present within ICMP extents. The records search found that the design criteria for these devices is generally not available but HCC advise that it is likely that these devices would have been sized for a 10 year ARI 1 hour storm derived from the Building Act (or Verification Method 1, VM1) soakage designs. Prior to 1977 approximately one third of the existing development area sat outside of the then city limits; for this area there are no details at all other than HCC noting that soakage was the usual method for disposal of stormwater at that time (considering the lack of primary drainage networks in the area).

In summary there are:

- 10 properties with stormwater tanks or cells with associated soakage disposal
- 3 properties with rainwater reuse tanks
- 47 properties with soakage disposal (trenches or pits) and,
- 3 properties with swales

The majority of these are located in the existing development area upstream of Ruffell Road. Figure *41* shows the lots (and some sections of road) served by soakage related devices, shaded blue. It also shows

the currently vacant lots where future development would include a new on lot treatment/water efficiency device, shaded green. The roads and other lots not served by a soakage or treatment device are shown shaded purple and grey respectively. The largest area is at the upstream end of the catchment at The Base shopping centre (discussed in the following section). A breakdown of these by area is provided in Figure *41* below. HCC's records also show one property having detention tanks connected to the reticulation alone i.e. no associated infiltration. The majority have infiltration elements as well as connections to reticulation.

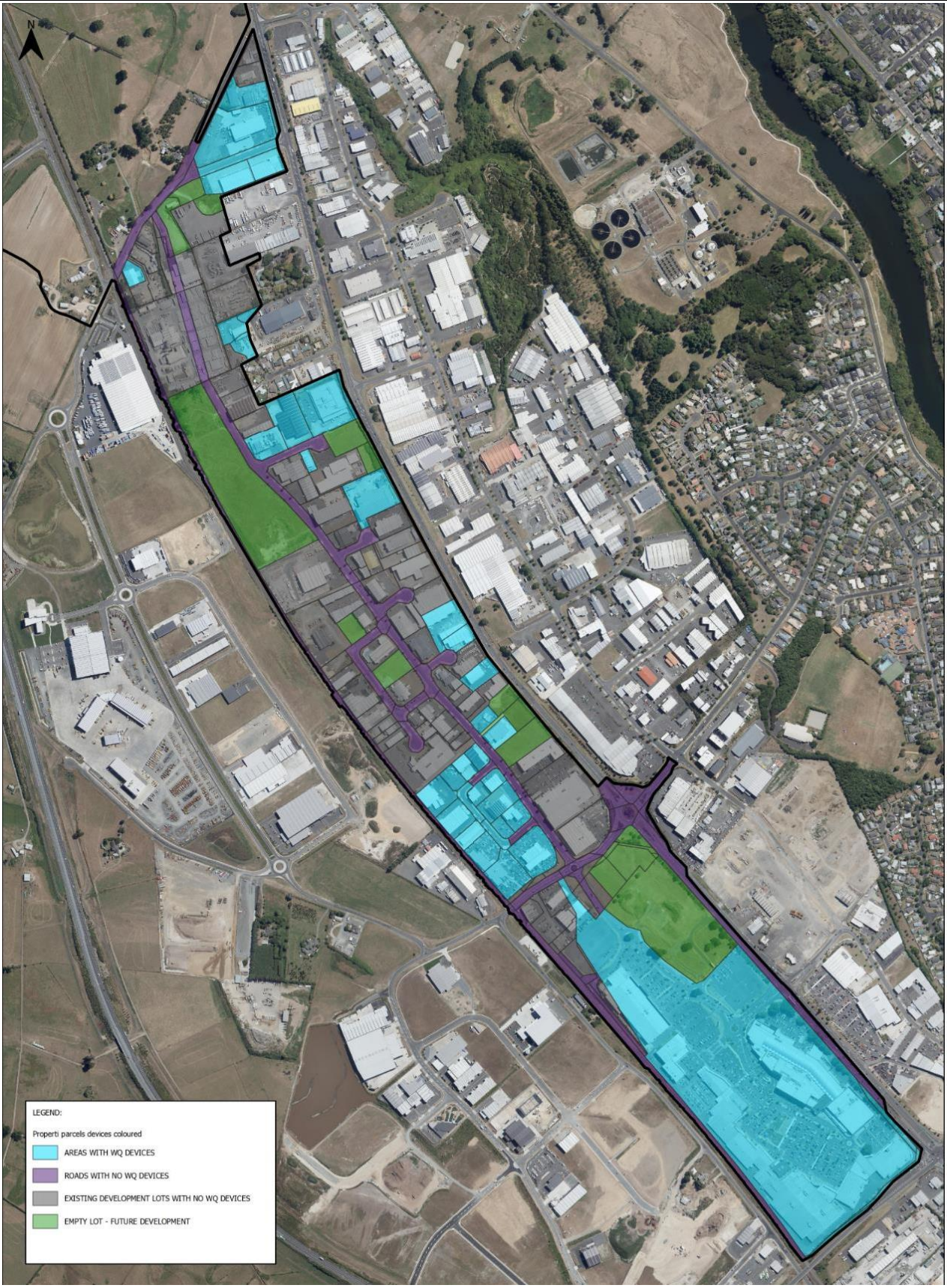


Figure 41: On-lot treatment in existing developed areas

Table 32: Summary of on-lot treated areas.		
Item	**Area (ha)**	**Percentage of Area**
Areas with existing devices	40.1	40%
Vacant Lots (that will have future on lot devices)	14.0	14%
Areas with no devices	45.6	46%
• Private land with no devices	31.8	32%
• Roads with no devices	13.8	14%

The soakage device associated with the Te Awa Base development services approximately 20% of the existing developed area. FB Hall Ltd provide drainage maintenance services to The Base and were contacted as part of the technical assessment. Based on observation and anecdotal evidence it was reported that The Base soakage device operated as designed and no issues had been reported during the operational life. While this is the case it was recommended that The Base was audited under HCC's high risk site audit programme as it represents a potential large source of contaminant generation, and impacts catchment-scale hydrology. An initial inspection occurred during September 2024, showing that the soakage device needs further investigation to ensure it is soaking.

A high-risk site audit was undertaken by HCC & Beca in September 2024, with the outcome being compiled.

Through the period 2021-23 HCC have developed an on-lot stormwater infrastructure auditing and compliance process. This has been developed in response to the recognition of the need to incorporate at-source private infrastructure into overall catchment treatment/management trains. To-date sites selected for auditing have focused on residential land use, however moving forward site selection will include all land uses.

7.10.2 Brownfields Stormwater Devices Technical Assessment

The existing Te Rapa commercial/industrial precinct along The Boulevard forms the only untreated or partially untreated brownfield catchment within the Te Rapa North area. As summarised in Section 7.10.1 on-lot treatment measures have been identified for 40% of the catchment. As part of the overall stormwater devices assessment (Appendix H) several treatment options were assessed for the residual un-treated areas. A summary of short-listed options is outlined in Table 33. For the purpose of estimating future CAPEX requirements for treating stormwater in the Te Rapa North area, option 2 has been allowed for in the ICMP recommendations as this does not require acquisition of private land (which is challenging & difficult to rely upon) and end-of-pipe solutions have specific design constraints (such as stream diversion). New design level of service (based on the RITS) would typically require a pre-treatment step for industrial roads, however this cannot be implemented with raingardens or tree pits within the roading corridor. The funding basis of this option aligns with the current citywide strategy for treatment in residual brownfield areas – i.e. full funding of treatment for public roading corridors, and a combination of compliance and cost sharing to treat private development. The intent of cost sharing in existing brownfield areas is to target treatment of specific high-risk sites that may be difficult to resolve through compliance activities.

Treatment of existing roading corridors within the Te Rapa North area could include an initial treatment option if an interim solution is needed prior to 'full' treatment – e.g. this may be required if it is determined that some level of intervention is needed to achieve shorter term water quality targets & full funding cannot be prioritised to the catchment. Currently catch-pit inserts are generally the preferred approach to pre-treatment for roading corridors. Catch-pit filters that incorporate filter bag inserts (typically 200 micron) have been shown to be able to capture some fractions of very fine sediments (sub 63 microns) which would typically attract the highest concentrations of metals and TPH.

Table 33: Brownfield Treatment Options				
Option		**CAPEX Cost ($million)**	**OPEX Cost ($/yr)**	**Comments**
1	End-of-pipe wetland located downstream of Ruffell Road.	20	40,000	While CAPEX estimates are higher for this option, OPEX costs will be lower. This option will potentially pose issues as construction cannot be staged.
2	Raingardens sized to treat untreated roads, with partial co-funding for private lots.	22	35,000	This option assumes a cost sharing arrangement between HCC and private landholders to treat un-treated lots. (Preferred option).
3	Raingardens sized to treat untreated roads only.	11	35,000	This option relies on existing landowners meeting treatment requirements at their own expense.

7.10.3 Existing Stormwater Issues, Opportunities and Actions

The solutions and actions in Table **34** have been adopted by the ICMP through either integration into the Means of Compliance (MoC) or as a recommendation for future funding.

Table 34: Existing Stormwater Devices Issues & Actions		
Issue	**Mitigation**	**Implementation**
Untreated brownfield areas (Zone 1).	Retrofit of stormwater treatment into existing brownfield area along The Boulevard.	Through existing brownfield stormwater management capital programme, in-line with overall citywide prioritisation.
Stormwater management for infill lots.	Application of ICMP design parameters to redevelopment.	At resource or building consent stage.
Ensuring landholders understand requirements of operation and maintenance of on-lot stormwater devices.	Education & auditing/compliance.	Through HCC's ongoing on-lot and high-risk site auditing and compliance process.
Te Awa Base stormwater device.	Undertake a high-risk site audit of The Base.	Through HCC compliance unit.

7.11 Greenfields Stormwater Management

7.11.1 Greenfields Stormwater Devices Technical Assessment

Greenfields stormwater devices are required to manage the effects of new urbanisation on stormwater. Greenfields stormwater devices are those new devices proposed within the defined stormwater management zones shown in

Figure *42*.

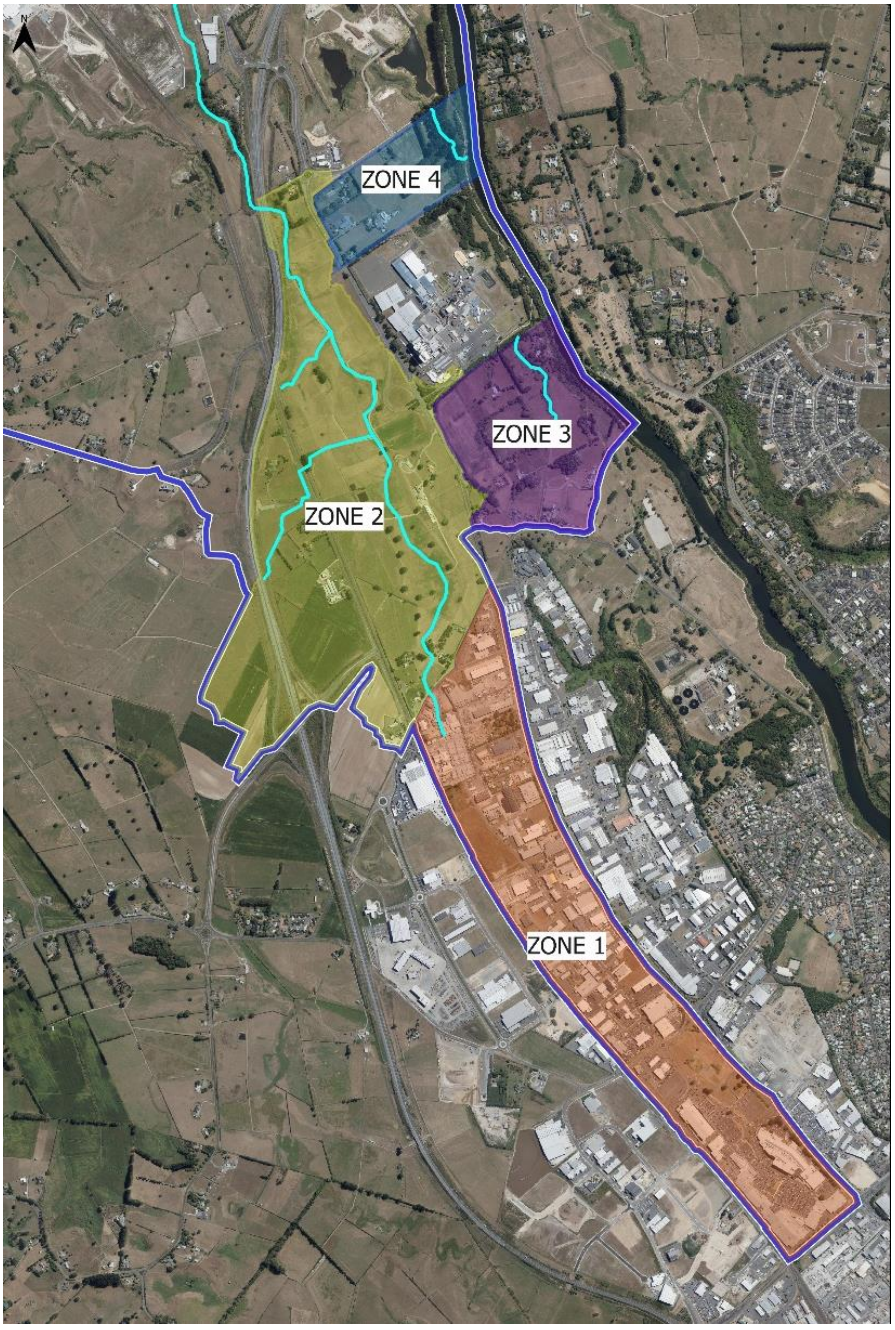


Figure 42: Stormwater management zones, Te Rapa North.

Design Parameters

Table 35 summarises the proposed design parameters for each of the stormwater management zones shown in

Figure *42*.

Table 35: Design Discharge Parameters								
Zone	Criteria							
	On Lot Water Efficiency Measure (1)	**On Lot Activity Specific Device (2)**	**Retention of First 10mm Runoff Volume (3)**	**Water Quality Measures (4)**	**Extended Detention (7)**	**Attenuation to Pre Development Peak Flow (ARI) (5)**		
						100yr (6)	**10yr**	**2yr**
1	Y	Y	Y	Y	Y	N	Y	Y
2	Y	Y	Y	Y	Y	Y	Y	Y
3	Y	Y	Y	Y	N	N	N	N
4	Y	Y	Y	Y	N	N	N	N

1) *Water efficiency measures in accordance with the District Plan and HCC's Practice Notes, refer Section 7. On Lot only, designed to retain the first 10mm of runoff either reused or soaked.*
2) *Relates to treating specific industry activities (than general stormwater treatment) such as oil/water separators, containment/bunding, filters, settling basins, washdown facilities etc) as per the requirements of the RITS. Designed in accordance with associated industry guidance or WRC's Stormwater Management Guide (WRC, 2020). As per RITS, if a downstream device does not exist on-lot treatment is required to meet full water quality requirements.*

3) *In accordance with the RITS and one device could meet the requirements for both an On Lot water efficiency measure and for Ia soakage. Ia is taken as 10mm. May not required where drainage discharges direct to the Waikato River but is recommended in line with citywide practices.*
4) *Note: at source treatment of industrial roads (or roads with >10,000 vpd) is required by the RITS. This is additional to subcatchment scale devices. RITS requires managing high sediment and contaminant loads specific to the land use.*
5) *The On Lot requirements are for only developments larger than 1,000m2 or involving 4 lots. These need to attenuate to 2 and 10 year pre development as well as retaining 10mm. Under 1,000m2 only need to retain 10mm with no 2 and 10 year attenuation required. The attenuation is required as the main pipe down the Boulevard only has a 2 year ARI pipe full capacity. It also surcharges in the 10 year ARI event (i.e. it has less than the current 10 year ARI level of service specified by the RITS for industrial areas). 2-year and 10-year ARI attenuation will be required if discharging to a watercourse prior to the River.*
6) *Not required within the treatment devices (wetlands/swales etc) or where a new outlet to the river is to be provided. Attenuation of the 100 year event for Zones 1 & 2 will be provided for either within the downstream floodplain or avoided by a new outlet to the river. Zone 1 flooding is relatively insensitive to new, infill development increases (based on modelling to District Plan impermeability limits).*
7) *Extended Detention required in Zones 3 and 4 if discharging to a watercourse prior to the River.*

7.11.2 At-Source Measures

On-lot stormwater management measures are required under the following statutory or guideline documents:

- Section 25.13.4.5 of the Operative District Plan requires new lots to install a *water efficiency measure* in line with the HCC three waters practice notes.
- It is anticipated that Plan Change 14 (PC14) will propose that all new commercial or industrial development shall provide for 10mm of retention as a minimum stormwater management measure. This is supported as a preferred approach for this ICMP. The preferred means of compliance to achieve this will be through a combination of reuse and soakage.
- The current WRC stormwater management guidelines (TR20/07) require that retention of a minimum of the pre-development Initial Abstraction (Ia) is provided for at-source.
- The RITS requires high contaminant load profile land uses (which includes all industrial land use) to have an initial primary treatment barrier to manage high sediment loads and any site-specific contaminants.

Initial Abstraction values in the HCC jurisdictional area of the Te Rapa North catchment generally vary between 8mm and 10mm, which aligns reasonably closely with the 10mm at-source retention proposed as part of PC14 as a citywide measure.

Preferred methods of at-source retention are through rainwater reuse and infiltration (i.e. soakage). In some instances opportunities for reuse may be limited due to low site demands.

Water quality treatment is required prior to infiltration or soakage for all on-lot impervious surfaces within the Te Rapa North area.

Roading Corridors

To achieve WRC requirements for at-source retention, retention within roading corridors will not be required within the Te Rapa North area. Average Initial Abstraction values for new greenfield areas are less than 10mm (8mm), which indicates on-lot retention will be sufficient to provide catchment or site-averaged retention requirements (assuming roading corridors are approximately 15% - 20% of new development areas).

In addition to the increased on-lot retention, existing soakage devices within the upper catchment provide additional soakage capacity redundancy to further support retention downstream. Assessment in the Stormwater Management Devices Report[102] showed that upper-catchment soakage devices can provide for

[102] Stormwater Management Devices Te Rapa North ICMP, Beca Ltd 2024.

approximately 20% - 30% of downstream Initial Abstraction retention requirements. Roading corridors are expected to cover 15% - 20% of future development areas.

Roading corridors within the Te Rapa North existing or deferred industrial zones will require initial pre-treatment to reduce sediment loads reporting to downstream treatment infrastructure (in accordance with RITS requirements). The current preferred means of achieving this is through catchpit filter inserts. Assuming new roading surface area of 160,000m^2 and a catch-pit catchment of 450m^2, this would mean approximately 350 catch-pit filters would be required to service new greenfield industrial roads.

7.11.3 Sub-catchment Scale Quality Management Options

Various options for sub-catchment scale water quality treatment were assessed using an MCA approach. The full MCA assessment is documented in Appendix H, however a summary of the criteria used is as follows:

- **Health and Safety**: Health and safety risks for public, construction workers and operations staff
- **Performance**: Robustness and risks of a stormwater management technical design nature. Effect on drainage, flood hazard, stream scour and water quality.
- **Cost**: Cost to construct and operate/maintain.
- **Multi-amenity**: Potential to integrate other amenity features such as habitat, landscaping, cycleway/pedestrian features and values.
- **Flexibility**: Ability to implement in stages over time or respond to changes in growth demand or unforeseen issues.
- **Yield**: Amount of land required for the management device.

Table 36 summarises the preferred treatment options for new development within each stormwater management zone.

Table 36: Preferred sub-catchment treatment options.

Zone	Preferred Treatment Option
Zone 1	Stormwater quality design criteria are required to be met on-lot for all new development within Zone 1.
Zone 2	Sub-catchment scale treatment wetlands are preferred for this zone.
Zone 3	Wetland swales are preferred for this zone.
Zone 4	Wetland swales are preferred for this zone.

The ICMP developed a concept stormwater system design and device sub-catchment layout for the Te Rapa growth cell to meet the design parameters, using the impervious surface growth assumptions in Section 4.2 (see Appendix I). Device sub-catchments and layouts also took note of topography (existing), and the objective of consolidating sub-catchment devices where possible. Sub-catchments and preferred sub-catchment device options are shown in Figure *43*. Sub-catchment devices are developed to a concept stage. Information on how devices have been sized is provided in Appendix I. Costs from Appendix I have been updated for the ICMP using the process outlined in the draft Council Stormwater Device and Cost Memo[103]. These costs are summarised in Table **37**.

Devices within the Te Rapa growth cell will be developer-led with upsize contributions to be made by HCC where roading assets will drain to wetlands.

[103] *Stormwater Device and Cost Memo*, Hamilton City Council, 2020

Detailed device sizing must be carried out at the resource consenting stage. The Waikato Regional Council's Waikato Stormwater Management Guideline, Waikato Stormwater Runoff Modelling Guideline and RITS must be used for that design stage, including any changes to those guides that occur after the approval of this ICMP.

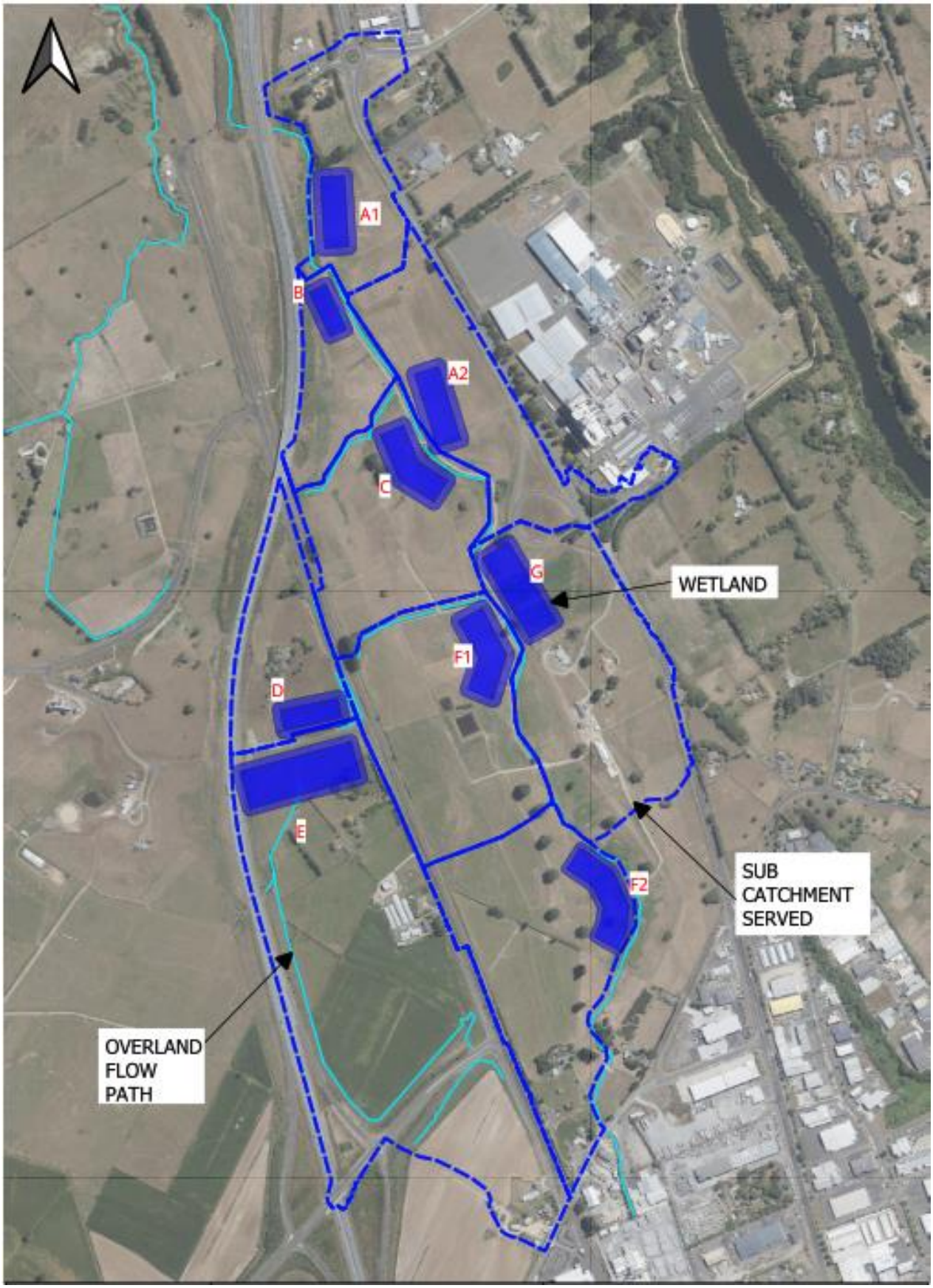


Figure 43: Greenfield stormwater devices

Table 37: Summary of sub-catchment scale greenfield devices.

Zone	Device Ref	Type	4% of Catchment Area (m2)	Footprint Area (m2)	Cost Estimate
2	A1	Wetland	3,500	6,300	$0.94M
	A2	Wetland	4,600	8,200	$1.24M
	B	Wetland	2,300	4,100	$1.13M
	C	Wetland	5,000	8,900	$1.34M
	D	Wetland	3,000	5,400	$0.81M
	E	Wetland	14,300	25,800	-[1]
	F1	Wetland	5,900	10,600	$1.6M
	F2	Wetland	6,600	11,900	$1.79M
	G	Wetland	7,300	13,100	$1.95M
3		Wetland Swales	-	9,000	$4.41M
4	-	Wetland Swales	-	6,000	$2.52M

1. *This wetland has been constructed serving a slightly smaller catchment than indicated in Figure 43. Additional treatment will be needed upstream.*

7.11.4 Sub-catchment Scale Quantity Management Options

As per Table 35, it is considered appropriate to apply 2y, 10y and 100y ARI event attenuation criteria to all zones which drain directly to the Te Rapa Stream (Zones 1 and 2).

Management of increased stormwater volumes generated through development for the purpose of managing stream erosion is a key issue for the Te Rapa catchment. The WRC Waikato Stormwater Management Guideline[104] provides for two methods of meeting erosion control objectives:

- Volume control: which requires that all volume differences between the pre and post-development scenarios are retained (through re-use, soakage etc) for events up to the 2-year ARI event; and
- Detention time control: which requires the retention and slow release (over 24h) of either 1 or 1.2 times the water quality volume – referred to as extended detention. Detention time control requires that a minimum of the pre-development initial abstraction is retained in combination with the extended detention.

Where detention time control is applied as the preferred means of stream erosion protection, the RITS requires additional mitigation (stream resilience works) in the receiving environment.

Three options for management of sub-catchment scale stormwater quantity design parameters were considered. These are as follows:

[104] TR2020/07

- **Option 1 (Flood Relief Pipeline – volume control)**: This option involves construction of a pipeline between the upper Te Rapa Stream and the Waikato River, following the route of the future northern crossing roading corridor (linking Te Rapa to Resolution Drive). This would require a new river outlet to be constructed, which would also serve the future road extension. The intent of the pipeline would be to engage once streamflow increases beyond 'normal' or environmental flow conditions. Modelling assessments show that the pipeline could achieve 2yr ARI volume reduction and 10yr and 100yr ARI attenuation requirements for the areas of the catchment reporting to the main stream (Zones 1 & 2). This option also provides some opportunity to extend the pipeline to the Mangaheka catchment if it was determined there was benefit in providing another outlet here.
- **Option 2 (Wetland and Central Corridor Attenuation – detention time control):** Option 2 corresponds to management of extended detention, 2yr and 10yr ARI attenuation within the centralised treatment wetlands proposed above (Section 7.11.3). Volume reduction would need to be achieved at-source based on site-specific assessment (with a minimum of retention of the initial abstraction volume required). 100yr attenuation would be managed within the existing floodplain through a combination of future sub-division earthworks and road crossing culverts.
- **Option 3 (Full Attenuation within Wetlands – detention time control):** Option 3 involves managing 2yr, 10yr and 100yr attenuation requirements within the treatment wetlands. This option creates a more complex flood attenuation requirement as multiple wetland outlets would need to achieve the overall cumulative attenuation target at the catchment outlet.

Quantity management Option 1 and 2 are represented schematically in Figure *44*. Option 3 was not considered in further detail as part of the technical assessments. It could potentially lead to larger wetlands overall and more complex flood routing arrangements, but would remain functionally similar to Option 2. There is also a potential disadvantage if overall attenuation outcomes are required to be coordinated across multiple consents.

The stream walkover and RGEA undertaken (Figure 32) showed that downstream reaches of the stream are subject to significant geomorphic degradation based on existing flow regimes. Based on this, it is considered that a residual risk remains with the detention time control options (Options 2 & 3) as this still results in some level of overall volume increase and watercourse resilience works in downstream reaches will need to be undertaken in combination with these options (in accordance with Table 4-3 of the RITS[105]). All development within the catchment, including that consented in the WDC area will be contributing to this residual risk.

[105] Regional Infrastructure Technical Specification, CoLab 2018.

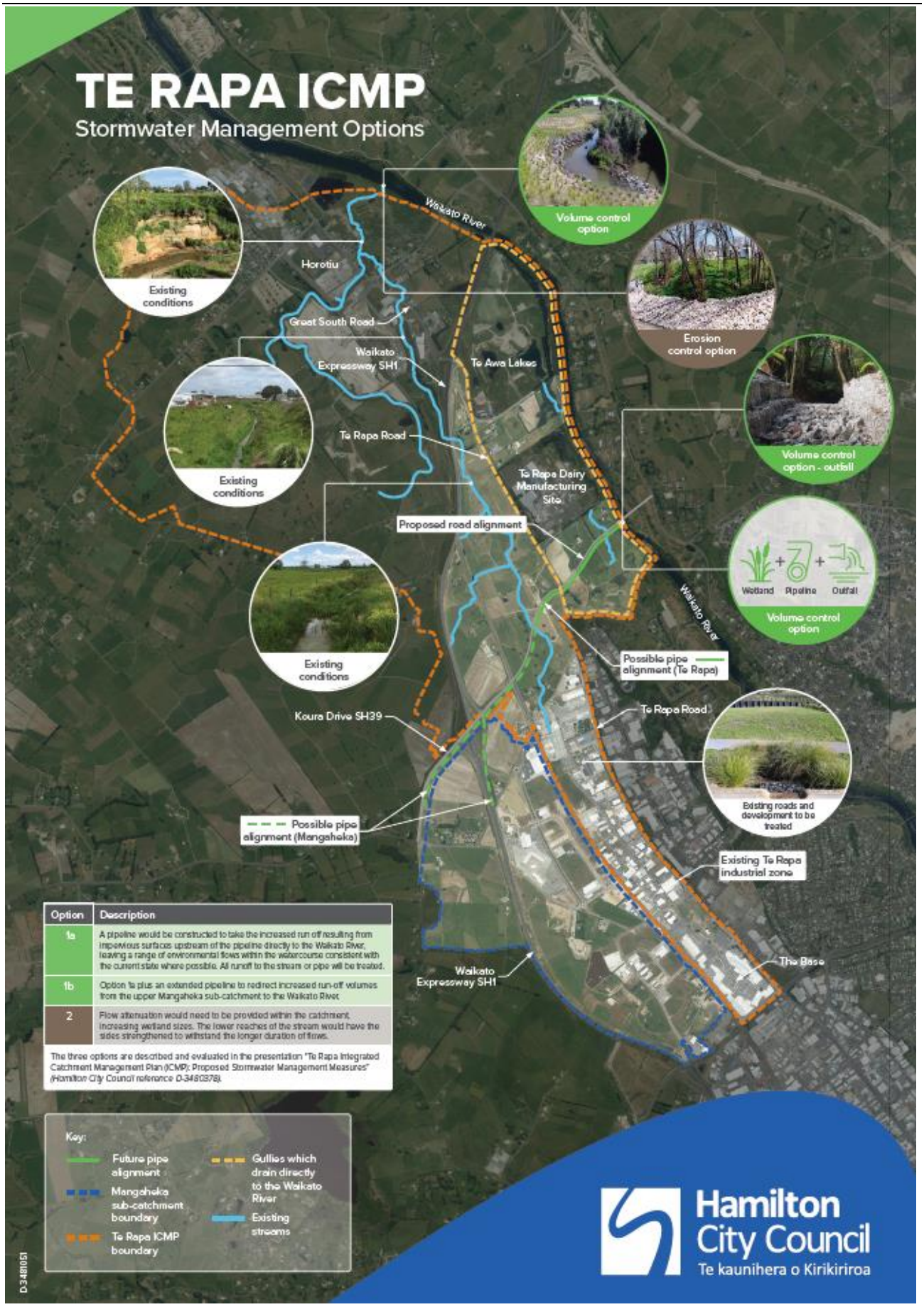


Figure 44: Sub-catchment scale quantity mangement options

Of the three stormwater quantity options considered, only Option 1 will ensure that post-development runoff volume increases can be fully mitigated (i.e. no increases in discharge volumes up to the 2y ARI event). Options 2 and 3 rely on at-source volume mitigation which will be unlikely to be able to achieve the same level of volume reduction as Option 1, particularly in a high imperviousness catchment.

Implementation of Option 1 (flood relief pipeline) will centre around timing of the future Northern River Crossing as the most practicable pipe alignment would follow this corridor. Ideally any construction activities associated with Option 1 would coincide with construction of the Northern River Crossing to achieve most efficient construction costs outcomes. At a minimum, construction of option 1 would ideally occur after a corridor designation was achieved to ensure that the pipe alignment would align with the future roading corridor. As per the 2024-34 LTP, designation works for the Northern River Crossing is scheduled to commence in the 2029/30 financial year. This is currently ahead of forecast growth within the catchment, based on HCC growth modelling undertaken to support to 2024-34 LTP process which did not plan for significant development of the Te Rapa North area within the 30-year infrastructure planning window. Where growth occurs out of sequence with HCC forecasts, a structure planning process is required which should identify a preferred route for the Northern River Crossing corridor (and therefore the diversion pipeline). Any future structure planning process would inform revised growth timing estimates.

In an interim scenario for option 1 (if development occurs prior to the pipeline), water quantity design parameters could potentially be met at an individual development scale. Any existing attenuation and volume reduction would then need to be factored into the pipe design when this is developed. Once the pipeline is constructed, the design parameters summarised in Table **43** could be reviewed and updated accounting for volume reduction performance achieved by the pipe.

Because of the likely lower levels of volume reduction achieved in Option 2 (as full 2-year volume reduction is unlikely to be met on most sites), this option is reliant on implementation of the identified downstream channel erosion works (refer Appendix E) to mitigate the residual effects of future development. Given that these areas exist outside of the current HCC jurisdictional area, uncertainty exists around the appropriate implementation (and funding) method to deliver the downstream works. Currently, the HCC watercourse resilience capital works programme delivers projects within HCC boundaries. The Project Watershed programme administered by WRC already includes mechanisms for co-funding of stream erosions control measures and may be the more appropriate vehicle for implementation of watercourse resilience measures in the Te Rapa Stream. Ownership, ability to maintain and access to any constructed assets will be another challenge that needs to be resolved as part of the implementation of any works. Currently much of the Te Rapa Stream footprint is located within privately-owned land. As part of this option, it is recommended that a Memorandum of Understanding (MoU) be developed between HCC, WRC, WDC and potentially downstream landholders to implement the required works. This needs to be driven by all stakeholders as all are contributing to the residual risk. While effects driven by urbanisation are a matter to be addressed by the district TAs (HCC, WDC), legacy issues are driven by both urban and rural land uses (e.g. native vegetation clearing and construction and operation of farm drainage systems).

Timing of Option 2 will be dependent on funding being made available by all stakeholders identified above. It is recommended that HCC allow for funding (subject to the LTP process) in line with funding for Option 1 (i.e. in line with the Northern River Crossing).

Option 2 would require the volume reduction and attenuation design parameters summarised in Table **43** be implemented both prior to and after construction of downstream channel resilience works.

Comparative costs between Options 1 & 2 have been assessed as being broadly similar (refer Appendix H, Appendix K), with total overall costs of approximately $30 Million (across all contributing entities) for either option to mitigate residual effects of development. Within HCC jurisdiction this gives an estimated rough order cost of $15 - $20 Million to mitigate effects of development within this jurisdiction. This represents either full construction costs of the volume bypass pipe or approximately 50% of the estimated cost of channel resilience works. The 50% contribution is a conservative estimate based on existing and forecast future impervious surfaces based on current district plans. If Option 2 proceeds, a more detailed approach

to the funding model should be adopted. This should be agreed upon as part of any MOU. Option 3 would have the same cost as Option 2 as it relies on the same downstream channel works.

It is noted that there are potential funding efficiencies that could be achieved in the delivery of Option 1. If construction of the pipeline could be timed with construction of the Northern Crossing transport corridor, then savings may be able to be made on preliminaries, mobilisation, earthworks etc.

To understand the alignment of the proposed options with the objectives of Te Ture Whaimana, HCC internal staff developed a MCA criteria assessment based on the Te Ture Whaimana objectives. This assessment is provided in Appendix I. The results of the assessment indicated that Option 1 was slightly preferred over Option 2, having scored 2.14 versus 1.95 (from a maximum of 3.00). However, these scores are very close and should not be interpreted as a clear indication of preference based on this assessment. The key difference identified between the options was that the piped option was more robust in mitigating cumulative volume effects (as volume is completely removed from the stream). Initial feedback from engagement undertaken with Mana Whenua as part of technical assessments and ICMP drafting reflect both options being identified as preferred – i.e. some stakeholders have identified the diversion pipe as being preferred, while others have indicated a clear preference for stream resilience works.

For the purposes of providing an implementable MoC for the ICMP that provides a robust solution for volume mitigation, Option 1 (pipeline) has been supported by the ICMP and put forward as the preferred MoC (Table 44). A summary of the rationale for this is provided below:

- The diversion pipeline achieves the actual volume reduction criteria, the in-stream works option does not reduce volumes but provides a mitigation for the increased runoff volumes.
- The diversion pipeline can be designed to achieve other design parameters (i.e. attenuation parameters). This then can reduce the size and cost of other stormwater management infrastructure, e.g. wetlands.
- This option does not rely on agreement (and funding) with 3rd parties (both public and private) and is fully located within the HCC jurisdictional area, so is considered to potentially have less implementation risk at time of development.
- It also has potential construction synergies with the future transport corridor. However, this is sensitive to development timing and timing of designation of the northern crossing corridor. De-coupling of these projects could lead to increases in cost for the pipe project if land is not being secured for transport purposes.

While the diversion pipeline option has been identified as the preferred MoC, it is recognised that it also involves significant construction and consenting risks (though this is true for both options). It is likely that both options will still need to be considered at time of future consenting. Design parameters (Table **43**) have been developed that are consistent with both options.

7.11.5 Sub-Catchment Quantity Management Options (Zones 3 & 4)

Zone 3 primary (reticulation) and secondary flows currently discharge into the Fonterra industrial facility. An existing inlet to the Fonterra private reticulation is located in the existing gully to the east of the Meadowview Lane entrance on the southern boundary of the industrial facility. Secondary overland flow enters the Fonterra site at a similar location. To develop Zone 3, a new outlet for both primary and secondary flows will need to be constructed directly to the Waikato River. Draining public reticulation into private assets is broadly not an acceptable form of stormwater management, as such a new publicly-vested stormwater outlet to the River will be required to develop this area. The volume diversion pipeline option for Zones 1/2 described above would function as the outlet for this zone if constructed. Where new drainage infrastructure is reticulated directly to the new outlet to the River no attenuation requirements (including extended detention) would be required. Where existing gullies/watercourses are used as primary discharge locations, design parameters as per Table **35** will be required.

Small areas (roading corridors) of Zone 4 are reticulated to the Te Awa Lakes development area or an NZTA treatment device located adjacent to the Te Rapa interchange. Secondary flowpaths currently have three (3) outlets from this zone; into the Te Awa Lakes development area, into the Fonterra industrial facility and into the Waikato River (the Waikato River outlet drains approximately 60% of Zone 4 secondary flow). It was identified that the BPO for this zone involves construction of a new primary outlet to the Waikato River (refer Appendix H). This could also involve utilisation of the existing outlet with appropriate upgrades. This allows for development of smaller-footprint, lower-cost treatment infrastructure (wetland swales) as extended detention and other attenuation requirements would not necessarily be required. If this cannot be achieved (either though construction or consenting issues), the existing gully would need to be utilised for both primary and secondary discharge. In this case, extended detention, stormwater attenuation and suitable stream erosion interventions will be required as per Table **35**.

7.11.6 Greenfields Stormwater Treatment Train Assessment

A concept stormwater treatment train has been designed for the greenfield development zones. All elements of the treatment train are to comply with the RITS and WRC Guidelines, including in areas outside of Hamilton's jurisdiction. Figure *45* and Figure *46* provide a schematic representation of the preferred treatment trains for the zones shown in

Figure *42*. Figure *45* shows the treatment train for both Option 1 and 2. At-source and sub-catchment measures are the same for both Options, with the divergence occurring downstream of this.

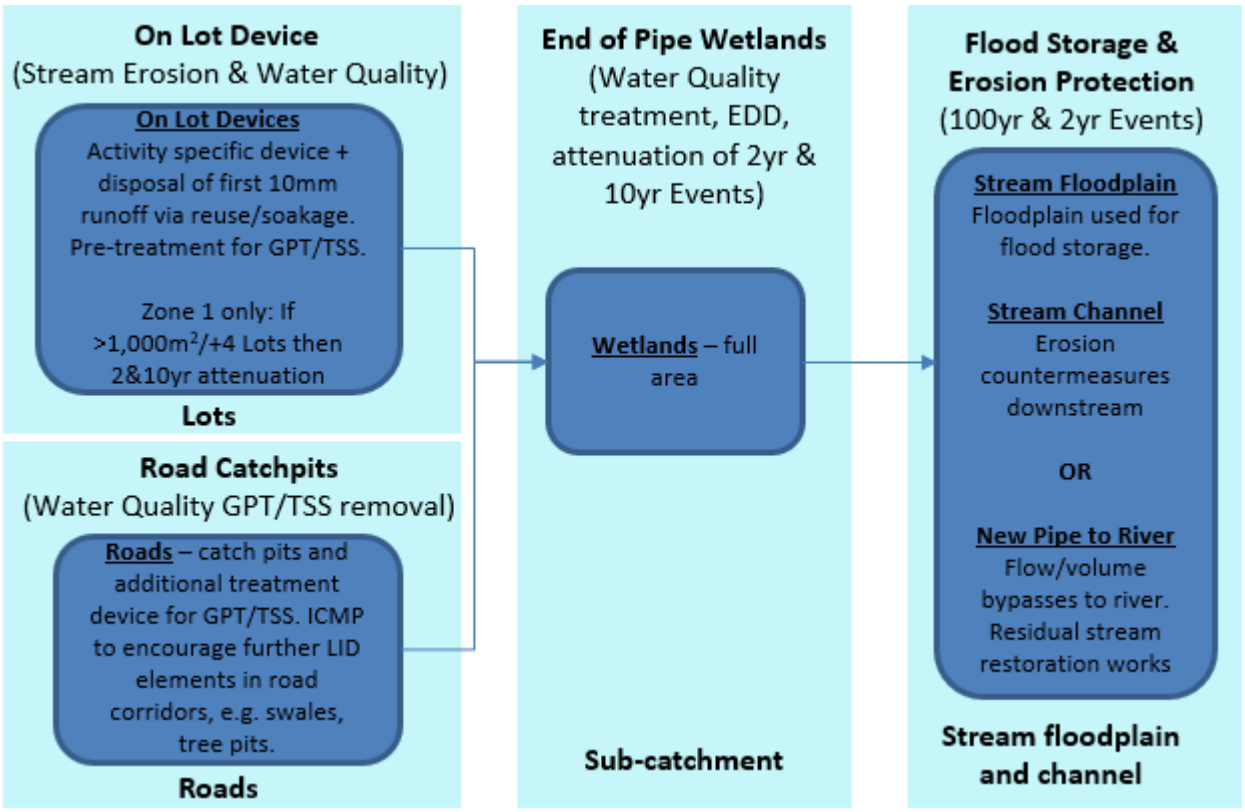


Figure 45: Zone 1 and 2 treatment train. Generally only infill development expected in Zone 1, so most likely only on-lot infrastructure to be constructed.

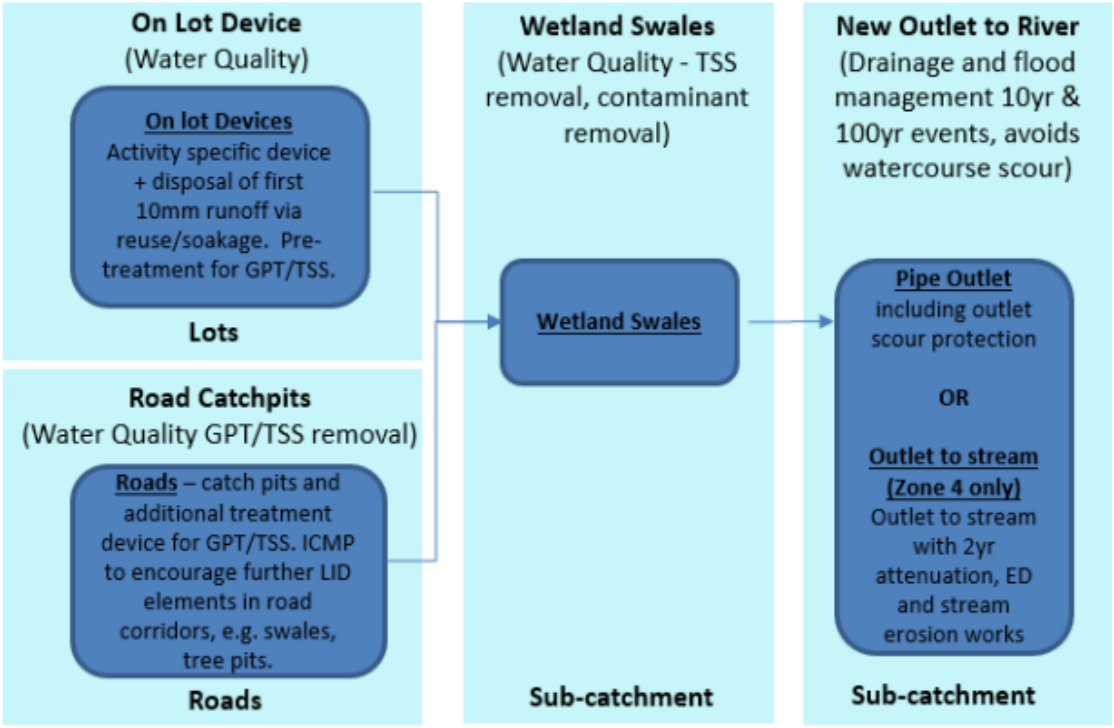


Figure 46: Zone 3 and 4 treatment train.

A summary of these proposed treatment trains is presented in Table 38.

Table 38: Greenfields Stormwater Treatment Train				
Measure	**Zone 1**	**Zone 2**	**Zone 3**	**Zone 4**
On-lot Requirements	Where soakage rates meet the rates in the RITS, and where there are no adverse effects on bank stability, soakage shall be the preferred method of stormwater disposal up to the 10 year ARI event. This may reduce stormwater device sizes from those indicated this ICMP where part of a sub catchment may discharge to soakage. Retention of a minimum of 10mm (or initial abstraction depth if greater) through reuse and soakage. Also refer to 'water quality' section below.	Where soakage rates meet the rates in the RITS, and where there are no adverse effects on bank stability, soakage shall be the preferred method of stormwater disposal up to the 10 year ARI event. This may reduce stormwater device sizes from those indicated this ICMP where part of a sub catchment may discharge to soakage. Retention of a minimum of 10mm (or initial abstraction depth if greater) through reuse and soakage. Also refer to 'water quality' section below.	Retention of a minimum of 10mm (or initial abstraction depth if greater) through reuse and soakage. Also refer to 'water quality' section below.	Retention of a minimum of 10mm (or initial abstraction depth if greater) through reuse and soakage. Also refer to 'water quality' section below.
Roading Corridors	Pre-treatment to reduce sediment loads in accordance with RITS requirements for high contaminant load surfaces.	Pre-treatment to reduce sediment loads in accordance with RITS requirements for high contaminant load surfaces.	Pre-treatment to reduce sediment loads in accordance with RITS requirements for high contaminant load surfaces.	Pre-treatment to reduce sediment loads in accordance with RITS requirements for high contaminant load surfaces.
Stormwater Sub-catchment Devices – Sub-catchments and Layout	Sub-catchment scale devices are not proposed for this zone.	Stormwater sub-catchment devices and associated sub catchments have been identified and sized (refer Section 7.11.5). Minor shifting and reconfiguring of wetlands or sub-catchments during consenting may be acceptable to better integrate with environmental and development outcomes. Larger, consolidated sub-catchment devices provide a better outcome that minimises land area required, construction, and operation and maintenance costs. Splitting of sub-catchments or sub-catchment devices is unlikely to be accepted. Soakage of stormwater up to the 10 year event has not been accounted for in concept design of sub catchment stormwater devices. If soakage rates allow, this may reduce the size of sub-catchment stormwater devices through diversion of part of a device sub-catchment to soakage.	Stormwater sub-catchment devices and associated sub catchments have been identified and sized (refer Section 7.11.5). Minor shifting and reconfiguring of wetlands or sub-catchments during consenting may be acceptable to better integrate with environmental and development outcomes. Larger, consolidated sub-catchment devices provide a better outcome that minimises land area required, construction, and operation and maintenance costs. Splitting of sub-catchments or sub-catchment devices is unlikely to be accepted. Soakage of stormwater up to the 10 year event has not been accounted for in concept design of sub catchment stormwater devices. If soakage rates allow, this may reduce the size of sub-catchment stormwater devices through diversion of part of a device sub-catchment to soakage.	Stormwater sub-catchment devices and associated sub catchments have been identified and sized (refer Section 7.11.5). Minor shifting and reconfiguring of wetlands or sub-catchments during consenting may be acceptable to better integrate with environmental and development outcomes. Larger, consolidated sub-catchment devices provide a better outcome that minimises land area required, construction, and operation and maintenance costs. Splitting of sub-catchments or sub-catchment devices is unlikely to be accepted. Soakage of stormwater up to the 10 year event has not been accounted for in concept design of sub catchment stormwater devices. If soakage rates allow, this may reduce the size of sub-catchment stormwater devices through diversion of part of a device sub-catchment to soakage.
Water Quality	Water quality design parameters are required to be met on-lot within Zone 1.	RITS compliant water quality treatment will be carried out in stormwater sub-catchment devices where possible, and otherwise through decentralised water quality devices. High contaminant load generating surfaces (defined in RITS section 4.2.3.5) require pre-treatment before discharge to a sub-catchment stormwater device	RITS compliant water quality treatment will be carried out in stormwater sub-catchment devices where possible, and otherwise through decentralised water quality devices. High contaminant load generating surfaces (defined in RITS section 4.2.3.5) require pre-treatment before discharge to a sub-catchment stormwater device where	RITS compliant water quality treatment will be carried out in stormwater sub-catchment devices where possible, and otherwise through decentralised water quality devices. High contaminant load generating surfaces (defined in RITS section 4.2.3.5) require pre-treatment before discharge to a sub-catchment

Table 38: Greenfields Stormwater Treatment Train

Measure	Zone 1	Zone 2	Zone 3	Zone 4
		where practicable. Pre-treatment must be appropriate to the contaminant profile of the surface.	practicable. Pre-treatment must be appropriate to the contaminant profile of the surface.	stormwater device where practicable. Pre-treatment must be appropriate to the contaminant profile of the surface.
Quantity Control	Extended detention and attenuation of the 2 year and 10 year ARI events is required on-lot.	Extended detention, and attenuation, of the 2 year and 10 year ARI events is required. 100 year ARI attenuation requirements will be provided for within the central floodplain area or volume control pipe.	Stormwater quantity control is not required unless discharging to a stream or gully.	Stormwater quantity control is not required unless discharging to a stream or gully.
Conveyance	Conveyance will be via pipes sized for a minimum of the 10 year event, with defined overland flow paths to convey stormwater up to the 100 year event safely to outfalls.	Conveyance will be via pipes sized for a minimum of the 10 year event, with defined overland flow paths to convey stormwater up to the 100 year event safely to outfalls.	Conveyance will be via pipes sized for a minimum of the 10 year event, with defined overland flow paths to convey stormwater up to the 100 year event safely to outfalls.	Conveyance will be via pipes sized for a minimum of the 10 year event, with defined overland flow paths to stormwater up to the 100 year event safely to outfalls.

7.11.7 Greenfields Stormwater Devices Actions

The solutions and actions in Table 39 have been adopted by the ICMP.

Table 39: Greenfields Stormwater Devices Actions

Solution	Action
Construction of new stormwater devices by Council and Developers	The ICMP has identified that up to eleven (11) new sub-catchment stormwater devices are required. These should be put forward (likely as upsize contributions) through the stormwater master plan to inform LTP planning where they service residual public domain areas such as roading corridors. Means of compliance have been developed.
Mitigation works for increase in runoff volumes due to development.	It is recommended that HCC allow for $15M - $20M within the Te Rapa growth cell capital programme to allow for mitigation of full effects of volume increases due to development. This would allow for construction of a volume reduction pipeline within HCC jurisdiction to mitigate increase in runoff volumes from development in HCC area. It is noted that this proposed capital investment would also allow for implementation of Option 2 (watercourse resilience works) if this was pursued prior to construction of the pipeline.
MOU for downstream works	It is recommended that HCC advocate for the development of an MOU between relevant stakeholders (WRC, WDC, HCC, landholders etc) to establish an agreed implementation framework for stream resilience works in the lower reaches of the Te Rapa Stream. This would be needed to implement resilience works to address legacy issues & would form a key component of implementation if the option of constructing additional stream resilience works was pursed to mitigate development effects.

7.12 Wastewater

7.12.1 Wastewater Technical Assessment

The wastewater technical assessment for the Te Rapa North area has been based on the 2023 Wastewater Master Plan[106]. The ICMP has used outputs from these documents to summarise infrastructure planned for zoned growth and options for hypothetical growth. The strategy presented in the ICMP is subject to confirmation through future iteration of the wastewater masterplan.

No key issues around LoS were identified within the existing network in the Te Rapa area based on the 'current-day' scenario. However, there is currently no capacity within the existing network to discharge wastewater from the Te Rapa North area.

High level conceptual network servicing has been adopted for the purpose of strategic hydraulic modelling but will require further investigation when the area is developed.

Key risks/actions are:

- No funding has been allocated to this area for specific wastewater network upgrades within the 10-year LTP period.
- Any development of the Te Rapa North area would need to be coordinated and programmed with HCC to ensure development, water allocation requirements and available capacity are matched.

7.12.2 Wastewater Issues and Actions

The solutions and actions in Table 40 have been adopted by the ICMP.

Table 40: Wastewater Issues & Actions

Issue	Mitigation	Implementation
Currently, conceptual planning of wastewater trunk infrastructure in the Te Rapa North area has only been undertaken to a high-level to inform strategic considerations.	Prior to development occurring, develop a conceptual design (including cost estimates) for a strategic wastewater supply trunk infrastructure network (distribution) for the Te Rapa North area.	Either through the HCC Wastewater Network Master Plan or Plan Change process (dependent on timing).

7.12.3 Wastewater Programme of Works

No specific programme of works (10-year or 30-year horizons) for strategic wastewater infrastructure servicing the Te Rapa North has been developed as part of the most recent master plan. Current modelling of Te Rapa North is high-level only and will require refinement.

7.13 Water Supply

7.13.1 Water Supply Technical Assessment

Water supply technical assessment for Te Rapa has been collated from the outputs of the 2023 Water Supply (WS) Masterplan[107]. The ICMP has used outputs from these documents to summarise infrastructure planned for zoned growth and options for hypothetical growth. The strategy presented in the ICMP is subject to confirmation through future iteration of the water supply masterplan.

[106] Wastewater Master Plan Version 4 Technical Report, WSP Dec 24.
[107] Hamilton Water Supply Network Master Plan, Mott MacDonald Oct 2023.

No key issues around LoS were identified within the existing network in the Te Rapa area based on the 'current-day' scenario. While this is the case, the Te Rapa North area has no water allocation based upon its current zoning status, thus no water treatment plant capacity has then been set aside to supply the area.

As part of the forward master planning two zone boundaries are proposed around northern Hamilton, west of the Waikato River. These zones are the 'Pukete Zone' and 'Rotokauri Zone', the Te Rapa North area spans these zones. Figure 47 shows the extent of these pressure zone. Based on the 2023 masterplan, the Pukete Zone will established in 2023 in the near term through an upgrade of the existing Pukete Pump Station (implemented) and installation of valves and road crossings. The Rotokauri Zone is forecast to be implemented in 2041.

Trunk main WS infrastructure was modelled for the Te Rapa North growth area as part of the most recent WS Masterplan (refer Figure 47). However, this infrastructure is currently not funded under the current LTP (2024-34) or 30-year infrastructure Plan (2034-54).

Changes to assumptions around growth timing such as bringing-forward development of the Te Rapa North growth cell (or increased growth within Rotokauri) will change timing of strategic WS infrastructure requirements.

Key risks/actions are:

- No funding has been allocated to this area for specific water network upgrades within the 10-year LTP period.
- Any development of the Te Rapa North area would need to be coordinated and programmed with HCC to ensure development, water allocation requirements and available capacity are matched.

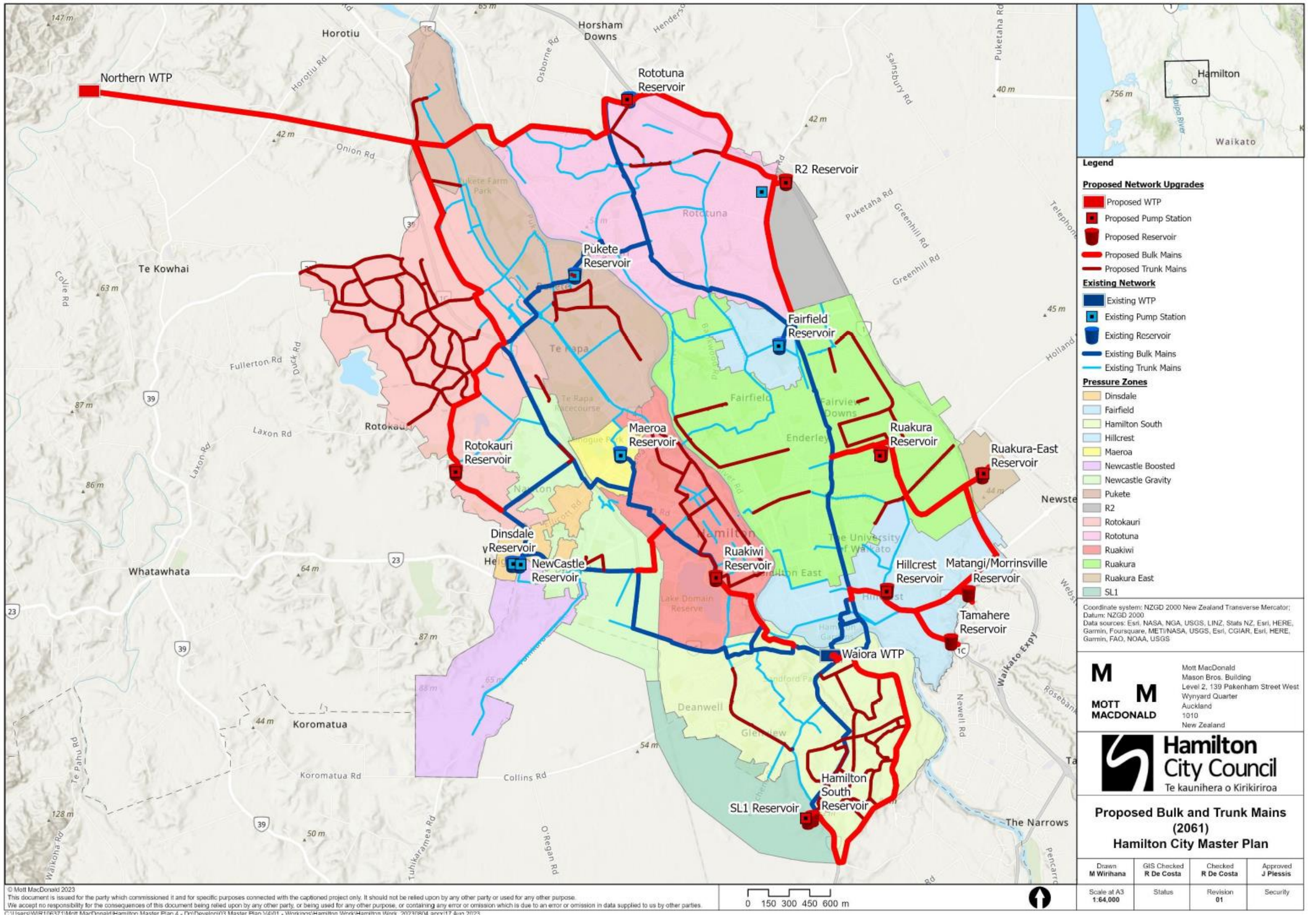


Figure 47: Proposed strategic WS infrastructure – 2061 planning horizon. Trunk main alignment in Te Rapa North is below bulk main alignment.

7.13.2 Water Supply Issues Actions

The solutions and actions in Table 41 have been adopted by the ICMP.

Table 41: Water Actions

Issue	Mitigation	Implementation
Currently, no conceptual planning for water supply trunk infrastructure in the Te Rapa North area has been undertaken.	Develop a conceptual design (including cost estimates) for a strategic water supply trunk infrastructure network for the Te Rapa North area.	Either through the HCC Wastewater Network Master Plan or Plan Change process (dependent on timing).

7.13.3 Water Supply Programme of Works

As current and proposed water supply zones typically extend across ICMP areas, strategic water supply projects are not necessarily associated with individual ICMP areas. Table 42 summarises the key strategic water supply projects required to establish the Pukete and Rotokauri water supply zones. These zones cover areas significantly greater than the Te Rapa North area.

Table 42: Key Water Supply Projects

Project	Proposed Year	Cost
Pukete Service Mains	ongoing	$54.8 Million
Rotokauri Service Mains	ongoing	$211.9 Million
Rotokauri Zone Implementation (requires 20ML reservoir)	2041	$107.9 Million

8. ICMP IMPLEMENTATION

8.1 Implementation methods

Measures set out in this ICMP will be implemented at different stages including ahead of development (generally by Council), during subdivision consenting and works, and/or during individual lot development.

Funding decisions of Council are made via the Long Term Plan process in accordance with the LGA which is further informed by Councils 30 Year Infrastructure Plan and a range of other factors including financial strategy and strategic planning documents (e.g. District Plan, Hamilton Urban Growth Strategy).

Developer led provision of key infrastructure is carried out in accordance with resource and/or building consents, the RITS, and private developer agreements.

As required by the CSDC, key infrastructure is provided for in concept form with implementation generally driven through development timing.

Where works are required outside of the HCC jurisdictional area, this will need to be undertaken in partnership with other territorial authorities and local landholders.

In order for implementation to be carried out effectively, it is recommended that a technical expert familiar with the ICMP is available to provide technical support for resource consent applications, and general advice on the ICMP.

8.2 Catchment Specific Requirements

The CSDC[108] requires an integrated catchment management approach for stormwater based upon the Best Practicable Option (BPO). Means of compliance are proposed under the ICMP which are the methods of implementing the BPO in the Te Rapa Catchment. Means of compliance must be appropriate for site conditions such as contours, ecology and geotechnical characteristics. If a developer proposes an option not listed in the ICMP, then the developer must prove the option is the most appropriate and will meet the ICMP objectives and Design Parameters without compromising the overall ICMP solution and its implementation. This may form the basis of a Water Impact Assessment as required under the District Plan.

- The BPO and means of compliance to be implemented must ensure management of stormwater quality and quantity, and the associated adverse effects in the receiving environment.
- Unless specifically superseded by the requirements of this ICMP, all development design is to be in accordance with the RITS.
- Development design must specifically consider cumulative and residual environmental effects; and
- Development design must provide for long-term management of effects related to three waters over the entire area in which potential effects may occur.

The BPO and means of compliance provide an approach (informed through technical assessments) for achieving the required design parameters, which determine the minimum requirements that must be met in the Catchment (Table 43).

For the purposes of setting design parameters and means of compliance, the ICMP is split into the Sub-catchments shown in Figure 48. Water Impact Assessments and/or site-specific stormwater management plans in the Catchment must include a section that demonstrates how the associated development has complied with all relevant Design Parameters and means of compliance.

[108] Condition 30(j)

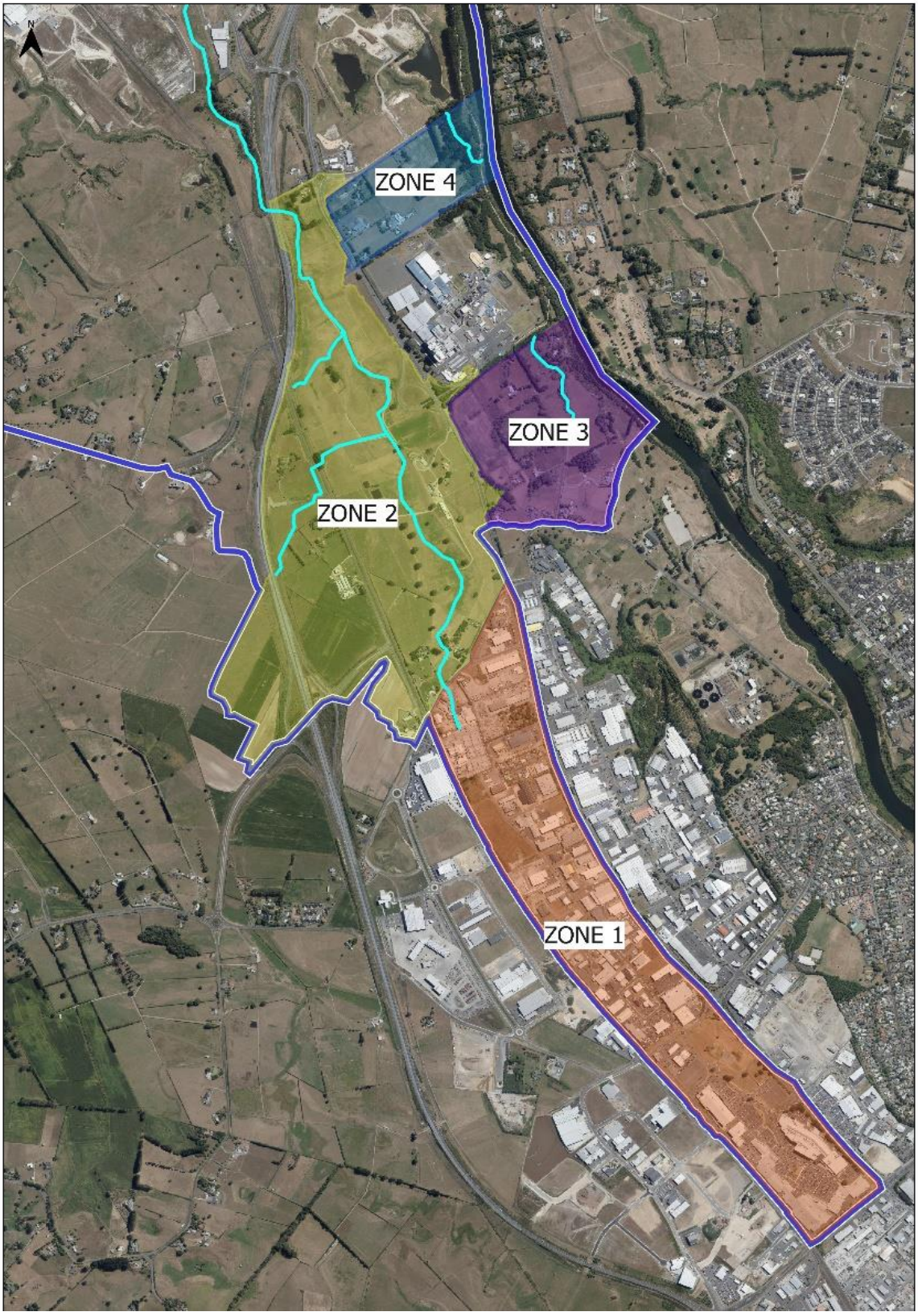


Figure 48: Sub-catchment (SW management zones) extents

8.3 Design Parameters

Table 43 outlines the design parameters to be achieved for all discharges within the Te Rapa catchment. These parameters have been selected to address catchment risks and sensitivities set out in the technical assessments, and to meet ICMP objectives. The parameters shall be used in the design of stormwater treatment and flow attenuation devices within catchment where applicable. For further information in regard to the design of specific solutions, refer to the RITS and Waikato Stormwater Management Guideline.

Note that the design parameters summarised below are minimum requirements. At time of development, site specific constraints are still required to be considered as part of site-specific stormwater management plans which may require higher levels of management/mitigation than that specified by the design parameters table.

Table 43: Design Parameters

REF	Design Parameter	Sub-catchment			
		Zone 1	Zone 2	Zone 3	Zone 4
Water Quality - Devices					
1	Gross Pollutant removal	√	√	√	√
2	Water Quality - contaminant removal that complies with RITS, HCC CSDC and relevant WRC guidance.	√	√	√	√
3	Water Quality – New high contaminant load surfaces (as defined by the RITS) to provide pre-treatment.	√	√	√	√
4	<25°C at the point of discharge to a waterway and water temperature change of no more than 3°C. Achieved via wetland planting over 80% of the device area or vegetated swale as per the RITS.	√	√	√	√
5	Lots with High-Risk activities require a Pollution Control Plan as per the Hamilton Stormwater Bylaw 2015, and on-lot source control and treatment.	√	√	√	√
Stream Erosion Control					
6	Retain a minimum of either 10mm or the initial abstraction volume (whichever is greater) on average across the site. This is to be achieved through a combination of reuse and soakage.	√	√	√	√
7	Match pre-development runoff volume up to the 2-year ARI event within the sub-catchment – i.e. volume control required. Preference is for this to be achieved through a centralised diversion pipeline.	√	√		

Table 43: Design Parameters

REF	Design Parameter	Sub-catchment			
		Zone 1	Zone 2	Zone 3	Zone 4
8	Where this is not achieved (such as Zones 3 & 4), mitigation within the receiving environment will be required.				
9	Extended Detention (where discharging to a stream or gully). *Note: Where volume control is being provided up to the 2y ARI event, extended detention is not required.*	√	√	√	√
Stormwater Flows (unless discharging directly to the Waikato River)					
10	Soakage of the 10 year event to be provided where soakage rates meet RITS thresholds. Soakage devices should be as far back from waterways as is practical. If 10 year soakage devices are within 20 m of the primary gully setback line, consideration shall be given to the effects on bank stability and risk of piping.	√	√	√	√
11	2 Year Attenuation.	√	√	√	√
12	10 Year Attenuation.	√	√	√	√
13	100 Year Event Attenuation. (Required to be achieved at outlet of the catchment, i.e. SH1 culverts)	√	√		
Water Quality - Receiving Watercourse (achieved after reasonable mixing)					
14	Turbidity no greater than 25 NTU for stormwater discharge in a water quality storm (1/3rd of a 2year 24 hour storm).	√	√	√	√
15	No conspicuous changes in colour downstream of the discharge point	√	√	√	√
16	Dissolved oxygen greater than 80% of saturation concentration. If the concentration of dissolved oxygen in the receiving environment is below 80 percent saturation concentration, any discharge into the water shall not lower it further. (WRC Regional Plan).	√	√	√	√
17	Existing natural watercourses shall be retained and enhanced. Existing farm drains where indicated on Figure 48 shall also be maintained as open channel	√	√	√	√

Table 43: Design Parameters

REF	Design Parameter	Sub-catchment			
		Zone 1	Zone 2	Zone 3	Zone 4
	conveyance corridors. Re-alignment of existing drains may be appropriate where approval has been sought from HCC and WRC.				
18	Riparian corridors shall be established at time of development. A minimum width of 10m from top of bank (either side of the watercourse) is required along the main Te Rapa Stream, 5m in other locations. Riparian margin widths are exclusive of any other requirements within the stream corridor (e.g. maintenance access).	√	√	√	√
Site Design					
19	Freeboard shall be based on the 100-year MPD flooding scenario (including provision for climate change).	√	√	√	√
20	Floor levels shall be constructed 150mm above the 100-year flood depressions level.	√	√	√	√
21	Operation and maintenance access to stormwater assets and systems (including drains and watercourses) shall be provided in accordance with the relevant asset owners requirements – to be confirmed at time of resource consent.	√	√	√	√
22	At time of sub-division and where the relevant RMA triggers apply, esplanade reserves shall be vested to HCC. Where this conflicts with achieving practicable development layouts this can (in agreement with HCC) be reduced to the minimum riparian and operation and maintenance access requirements as specified in this table. It is expected that development layouts (and associated infrastructure) will broadly align with the central stream corridor concept shown in Figure 50.		√	√	√

8.4 Best Practicable Option and Means of Compliance

Table 44 outlines means to achieve compliance with the discharge requirements and other related mitigations identified in this ICMP. Where there is an approved Water Impact Assessment (WIA)[109] that recommends specific on-lot water efficiency measures, the methods prescribed in the WIA shall be used as the relevant methods to be implemented to achieve compliance with the ODP and CSDC. It is noted that the ODP is currently under review as part of Plan Changes 12 and 14, which will likely alter the terminology used for development-specific stormwater assessment documents.

Where the methods listed below are not practical for a given site, reference should be made to the relevant authority, including the Regional Infrastructure Technical Specifications for alternative solutions which are acceptable to Hamilton City Council. It will be important for developers to have joint pre-application meetings with Hamilton City Council and Waikato Regional Council in such circumstances.

Table 44: Means of Compliance

REF	Means of Compliance	Assessment Timing	Sub-catchment			
			Zone 1	Zone 2	Zone 3	Zone 4
1	**Accidental Discovery Protocol** During development works; in the event of discovery of artefacts that may have potential cultural or historical significance, the appropriate iwi representatives and authorities shall be notified.	During physical works or investigation	√	√	√	√
2	**Standard requirements** for all Lots include • No exposed zinc or copper building products. • High Contaminant Load areas to drain to stormwater pre-treatment device prior to leaving site. • Catchpits designed for capture of gross pollutants (as per RITS). • Retain a minimum of 10mm (or initial abstraction volume if greater) on average across the site for new impervious areas. Pervious areas are to be remediated. • Match pre-development runoff volume through reduced runoff practices & sub-catchment management including soakage,	At time of resource consent and building consent	√	√	√	√

[109] prepared in accordance with District Plan 25.13.4.6

Table 44: Means of Compliance

REF	Means of Compliance	Assessment Timing	Sub-catchment			
			Zone 1	Zone 2	Zone 3	Zone 4
	reuse and/or reduced impervious areas. Where this cannot be fully achieved, mitigation within the receiving environment will be required such as channel stabilisation and/or a financial contribution for a third party to undertake downstream erosion prevention (such as via Hamilton City Council's erosion programme).					
3	Lots with **High Risk activities** require a **Pollution Control Plan** and site-specific on-lot source control and treatment design.	At the time of building consent and/or Hamilton City Council resource consent and/or as required by the Hamilton City Council Stormwater Bylaw.	√	√	√	√
4	**Centralised devices** (e.g. Wetlands) • To be located and sized to ensure design flows are captured and managed and operation and maintenance costs are kept to a practical minimum. Devices are to be consolidated where reasonably possible. • Devices to be off-line from watercourses. • Devices to have high flow bypasses, or to demonstrate through modelling that peak velocities do not exceed 0.25m/s in the device or forebay in any event up to the 100 year ARI.	At time of building consent and/or Hamilton City Council resource consent	√	√	√	√

Table 44: Means of Compliance

REF	Means of Compliance	Assessment Timing	Sub-catchment			
			Zone 1	Zone 2	Zone 3	Zone 4
	• New greenfield centralised devices and device sub-catchments located within the Hamilton City boundary to be in accordance with this document. These may be shifted slightly or have layouts revised from the locations shown in the ICMP but will generally not be split or have substantial changes to catchment delineation unless it can be demonstrated that these are necessary. • **Water Quality** - Water quality treatment is required as per the design parameters table. • **Submerged Outlets** must comply with the RITS. • **Groundwater (depth) monitoring** is required as per the design parameters. • **Vesting -** Devices must be compliant with design parameters prior to vesting to Hamilton City Council and for the duration of the defects liability period and planting maintenance period. If the entire contributing catchment has not been developed at the time of vesting, alternative methods for demonstrating compliance will be required. Detailed operations and maintenance plans shall be provided to Hamilton City Council prior to vesting. • **Biodiversity.** Devices must be designed to provide non-aquatic biodiversity function and be sized and located at consent and detailed design stages with consideration of provision of ecological buffering to green					

Table 44: Means of Compliance

REF	Means of Compliance	Assessment Timing	Sub-catchment			
			Zone 1	Zone 2	Zone 3	Zone 4
	corridors. Guidance on biodiversity enhancement for wetlands is provided in Appendix A. Resource consent applications must demonstrate how this guidance has been followed. • **Amenity and Access.** Stormwater wetlands shall have walkways around at least 50% of the extent for safe public access in addition to standard maintenance requirements and shall be designed to maximise their amenity value. Resource consent applications must demonstrate how this will be achieved.					
5	**Residual Water Quality Effects** Developers are required to identify stormwater discharges that may have a residual post-treatment negative impact on water quality. Where it is identified that stormwater discharges post treatment will have an adverse effect on aquatic habitat and water quality values, then additional enhancement shall be included as a mitigation measure via works such as riparian planting and/or stream enhancement as appropriate (in addition to 'standard' ICMP requirements).	At time of resource consent	√	√	√	√
6	**Developers and Key Stakeholders** shall work together and collaborate with Hamilton City Council to effectively implement the Te Rapa ICMP to implement the solutions and meet the requirements of the ICMP.	At time of resource consent	√	√	√	√
7	**Overland Flow Paths (OLFP's):** Developments must allow for, and protect via an easement, existing	At time of building consent	√	√	√	√

Table 44: Means of Compliance

REF	Means of Compliance	Assessment Timing	Sub-catchment			
			Zone 1	Zone 2	Zone 3	Zone 4
	overland flow paths discharging onto any lot. Detailed design is required to accommodate up to the 100 year post-developed flows from neighbouring catchments.	and/or resource consent				
8	**Culvert Block (Flood Depression) Hazards:** Where new waterway crossing are being proposed, secondary overflow must be allowed for such that new culvert block hazards are not created that affect existing (or future) properties.	At time of building consent and/or resource consent	√	√	√	√
9	**Stabilised outlet to the Stream/River** All discharges points from development to the stream or river should where practical be via a vegetated surface outlet in preference to piped outfalls. Outfall design must adhere to the following principles: • All outlets must be designed to convey the 100 year maximum probable development flows to the stream or river without causing erosion; • Outfalls should not restrict terrestrial habitat and should be blended into the ecological landscape. • Consider of potential impacts on cultural and historical sites; • Minimise the habitat impact on river/stream banks, floodplains, gullies, riparian margins and aquatic habitat; • Avoid, as much as practical, placing outfalls in locations that provide unique spawning opportunities;	At time of resource consent	√	√	√	√

Table 44: Means of Compliance

REF	Means of Compliance	Assessment Timing	Sub-catchment			
			Zone 1	Zone 2	Zone 3	Zone 4
	• Avoid damaging point bars in the Waikato River; • Avoid placing outfalls in locations that are already exhibiting failures or poor stability, unless the stability issue can be stabilised by the new outfall; • In small streams, avoid placing the outfall in a manner that will result in scour on the opposite bank. When the outfall cross-sectional area is more than 30% of the bank full stream cross-sectional area, a confluence angle of 12° should be maintained; • To the extent that is practical, the distance from the final treatment device to the receiving environment should be minimised; and • The number of outfalls should be minimised. This may require that outfalls be located to serve more than one sub-catchment.					
10	**All infrastructure sizing**, locations and alignments are concept or preliminary and shall be confirmed by detailed design and integrated with other infrastructure (e.g. roads, wastewater pump stations) to implement the solutions and meet the requirements of the ICMP.	At time of resource consent	√	√	√	√
11	**Networks and infrastructure shall be designed and constructed to RITS standards** (unless specified otherwise within this ICMP) and sized to service the fully developed catchment to meet the design parameters and	At time of resource consent and building consent	√	√	√	√

Table 44: Means of Compliance

REF	Means of Compliance	Assessment Timing	Sub-catchment			
			Zone 1	Zone 2	Zone 3	Zone 4
	requirements to achieve minimum levels of service. Open channel drainage is preferred to piped systems where possible to support waterway health & quality outcomes.					
12	**Water Impact Assessments (or equivalent)** shall include a table showing all relevant ICMP means of compliance and design parameters and demonstrate that they have been met.	Submission of Water Impact Assessment	√	√	√	√
13	**Development proposals** which are lodged with Hamilton City Council and/or WRC shall demonstrate how the solutions and requirements of the Te Rapa ICMP will be met. This includes showing that development proposals: • Are consistent with the solutions and requirements of the ICMP; • Will not compromise future development or implementation of major infrastructure; • Can establish stormwater management solutions in the catchment which meet the design parameters in Table **43** of this ICMP; and • Have carried out any required site/activity specific technical investigations, and that assessments have been undertaken as part of development planning which have the potential to determine site layout, yield and developability (in particular hydrological, hydrogeological, geotechnical and	At time of resource consent	√	√	√	√

Table 44: Means of Compliance

REF	Means of Compliance	Assessment Timing	Sub-catchment			
			Zone 1	Zone 2	Zone 3	Zone 4
	ecological investigations/ assessments)					
14	**Erosion and Sediment Control:** Erosion and sediment controls shall be in accordance with Hamilton City Council and WRC requirements, and shall be established on site and approved by Hamilton City Council and WRC (as required) prior to any soil disturbance activities taking place. Note 1: This applies to all catchment development and physical works activities where soil disturbance activities are undertaken, e.g. bulk earthworks and development of major infrastructure/services where best practice guidelines, standards and relevant City bylaws shall be applied Note 2: Flocculation treatment systems shall be established on all development sites to treat sediment laden runoff prior to discharge from the site (e.g. to the stormwater network or directly to the receiving environment). In this regard flocculent bench testing to determine the reactivity of soils to treatment shall be undertaken, and the most efficient flocculent type applied via conditions of resource consent or associated management plans.	At time of resource consent and during construction	√	√	√	√
15	**Acid Sulphate Soils** Acid sulphate soils (ASS) and potential acid sulphate soils (PASS) may be present within the ICMP area – in particular along the western boundary of Zone 2. Identification of the presence of ASS or PASS is required as part of	At time of resource consent and during construction	√	√	√	√

Table 44: Means of Compliance

REF	Means of Compliance	Assessment Timing	Sub-catchment			
			Zone 1	Zone 2	Zone 3	Zone 4
	geotechnical investigations and if identified, appropriate management measures (both construction & post-construction phases) will need to be developed in consultation with WRC as part of earthworks consenting.					
16	**Resource consent applications for development activities** should be lodged with Hamilton City Council and WRC contemporaneously, and both Councils shall work together to ensure that decision outcomes are consistent with the solutions and requirements of the Te Rapa ICMP. Note 1: WRC has jurisdiction over earthworks sites and HCC has jurisdiction over building sites. Small scale development sites may not trigger WRC requirements for soil disturbance activities. In these instances, Hamilton City Council will ensure that site specific erosion and sediment controls (including flocculation treatment systems) are required via Hamilton City Council land use and/or building consents. Hamilton City Council may also seek advice and specific input from WRC as required. Note 2: Developers must include a monitoring plan as part of the discharge consent applications. The developer will be responsible for carrying out the conditions of that consent until the time of vesting of stormwater infrastructure.	At time of resource consent	√	√	√	√
17	**Any trafficked surface which does not service a single residential lot only** requires treatment prior to discharge	At time of resource consent, or during assessment	√	√	√	√

Table 44: Means of Compliance

REF	Means of Compliance	Assessment Timing	Sub-catchment			
			Zone 1	Zone 2	Zone 3	Zone 4
	to ground, reticulation or a watercourse.	of permitted activity rules if a resource consent is not triggered.				
18	**Suitable energy dissipation and erosion protection measures** shall be provided at all points of discharge to streams, in order to minimise erosion of stream beds and banks. Solutions shall enhance the amenity, biodiversity, and ecological function of their environments.	At time of resource consent	√	√	√	√
19	**Modified and natural stream channels** shall be avoided as locations for stormwater treatment devices, and appropriate offsets will be provided where a stormwater treatment device footprint impacts upon a watercourse or reduces existing ecological value. Stormwater devices shall not be located online to stream courses.	At time of resource consent	√	√	√	√
20	**Ecological Requirements:** • Ecological assessments are required for all watercourses in the catchment (including farm drains). • All waterways and areas of aquatic or terrestrial ecological value are subject to a hierarchy of avoid, remedy, mitigate, offset. Any development shall result in a net increase to biodiversity value. • Riparian vegetation, where present, should be retained and any new riparian planting carried out using indigenous eco-sourced vegetation selected from the Plant	At time of resource consent	√	√	√	√

Table 44: Means of Compliance

REF	Means of Compliance	Assessment Timing	Sub-catchment			
			Zone 1	Zone 2	Zone 3	Zone 4
	Selection Tool for Waikato Waterways, Waikato River Authority, the Local Indigenous Biodiversity Strategy and/or the Hamilton City Gully Restoration Guide. In particular, opportunities to introduce mahinga kai species such as harakeke (flax) into the natural environment in areas where they can be accessed for harvest and cultural use should be included. Consideration must be given to species with robust root structure directly on unstable banks. • In the event of any discovery of threatened native aquatic species, the authorities shall be notified, and an appropriate translocation programme shall be developed in line with a WRC consent.					
22	**Watercourse Access:** Access for cultural purposes, maintenance, and low impact recreation (such as walking) should be provided to the watercourse where practicable and appropriate. Mana whenua and Waikato-Tainui should be consulted on proposed access.					
23	**Peat in the development area:** It is encouraged that where peat is outside of the development footprint, it should be maintained. When in the development footprint the developer is required to: • Identify if peat is to be removed (and over what extent and depth);	At time of resource consent	√	√	√	√

Table 44: Means of Compliance

REF	Means of Compliance	Assessment Timing	Sub-catchment			
			Zone 1	Zone 2	Zone 3	Zone 4
	• Advise if being replaced (and if so, with what); and • Provide an assessment that this does not change shallow groundwater flows sufficient to cause any adverse effects (including but not limited to consolidation settlement, drawdown of surface water bodies etc.) Inconsistent approaches to peat in adjacent areas (removing or retaining) can reduce the effectiveness of either. Approaches to peat management should be co-ordinated with adjoining developments and managed strategically for local areas of peat.					
28	**Geotechnical Assessment** New land-use and development which is vulnerable to the adverse effects of land instability shall avoid the gully and riverbank zones specified in Table **30** of this document, where the adverse effects and risks have not been minimised to an acceptable or tolerable level. New land-use and development which is resilient to the adverse effects of land instability shall otherwise be provided for in the Primary setback area.	At time of resource consent	√	√	√	√
31	**Archaeological Sites** An authority may be required under the Heritage New Zealand Pouhere Taonga Act 2014 for any works near an archaeological site. Subdivision, development and use, including the construction and operation of stormwater devices, shall be managed to avoid damage to archaeological sites. Wherever practicable,		√	√	√	√

Table 44: Means of Compliance

REF	Means of Compliance	Assessment Timing	Sub-catchment			
			Zone 1	Zone 2	Zone 3	Zone 4
	archaeological sites shall be incorporated into reserves to protect and manage the sites. The significance of archaeological and cultural sites shall inform the sites' protection and management. Where appropriate, the relationship of mana whenua with sites of spiritual, cultural or historical significance shall be recognised and provided for, including through on-site marking.					
32	**Within Hamilton City Council Boundary all sub-catchments shall be served for wastewater** by the existing and proposed wastewater network. Strategic planning of wastewater infrastructure has not been allowed for within the 2024-34 LTP period. Developers are required consult with Hamilton City Council as early as practicable to agree on infrastructure servicing requirements. Levels of service are to be achieved in accordance with Hamilton City Council's requirements. Best practice design, construction and inspection are required to ensure that inflow and infiltration is minimised.	At time of resource consent	√	√	√	√
33	**Planning of Strategic water mains** has not been allowed for within the 2024-34 LTP period. Developers are required consult with Hamilton City Council as early as practicable to agree on infrastructure servicing requirements. **Trunk mains** shall be extended along road corridors as the sub-catchments develop.	At time of resource consent	√	√	√	√

Table 44: Means of Compliance

REF	Means of Compliance	Assessment Timing	Sub-catchment			
			Zone 1	Zone 2	Zone 3	Zone 4
	Levels of service to be achieved in accordance with Hamilton City Council's requirements. Minimum pressure and flows to be achieved, including consideration of adverse effects on the existing built and consented environment.					
34	**Low impact design principles** shall be adhered to including, to the extent possible: • Minimising changes to the land that alter natural drainage patterns • Minimising earthworks • Minimising impervious surfaces. Permissible maximum imperviousness under the ODP should not be viewed as a target.	At time of resource consent	√	√	√	√
35	**Groundwater Level:** Depth to groundwater at the location of each lined stormwater device to be determined through groundwater level monitoring for a minimum of 3 readings over a period of 3 to 4 months sufficient to assess the winter groundwater level, at a minimum of 1 groundwater monitoring well(s) / piezometer(s)location. Monitoring wells should be of suitable depth and construction to monitor the near - surface groundwater table only (e.g. screened response zone 2 – 5 m below ground level). Depth to groundwater at the location of each unlined stormwater device to be determined through groundwater level monitoring for a minimum of	At time of resource consent	√	√	√	√

Table 44: Means of Compliance

REF	Means of Compliance	Assessment Timing	Sub-catchment			
			Zone 1	Zone 2	Zone 3	Zone 4
	monthly readings over 9 months at a minimum of 1 groundwater monitoring well(s) / piezometer(s) location. Monitoring wells should be of suitable depth and construction to monitor the near - surface groundwater table only (e.g. screened response zone 2 – 5 m below ground level).					
36	**Volume Diversion Pipeline:** The ICMP supports construction of a pipeline within Zone 2 to achieve volume mitigation design parameter.	LTP Programme of works/resource consent		√		
37	**Zone 3 Outlet:** Primary & secondary drainage from Zone 3 currently discharges to a private reticulation/roading system. Development of Zone 3 will require consenting & construction of a new outlet to the Waikato River. The new outlet is required to serve all landuse in Zone 3 and landholders are required to co-ordinate together and consult with HCC, WRC and relevant Iwi groups to deliver this infrastructure. The ICMP also supports diversion of secondary flows from Zone 3 to the River prior to discharging into the Fonterra industrial site. Depending on development timing, the proposed Zone 2 diversion pipeline may serve as the required outlet for Zone 3.	At time of resource consent			√	
38	**Zone 4 Outlet:** The ICMP supports discharge of primary flows to an upgraded current outlet to the Waikato River or new					√

Table 44: Means of Compliance

REF	Means of Compliance	Assessment Timing	Sub-catchment			
			Zone 1	Zone 2	Zone 3	Zone 4
	outlet to the River. Consenting & construction is expected to be developer-led at time of consent. The outlet is required to serve all landuse in Zone 4 (that is not currently reticulated) and landholders are required to co-ordinate together and consult with HCC, WRC and relevant Iwi groups to deliver this infrastructure.					

8.5 Programme of Works

A programme of works has been developed for the ICMP, shown in Table **45**, which summarises programmes and costs from the Technical Assessments section of the ICMP. The programme will need to be considered in alignment with other Council funding commitments and remains subject to change through the LTP process. The programme includes costs that will be funded by Council, developers and others.

Table 45: Capital works recommended by ICMP

Programme	Description	CAPEX	OPEX	Implementation
Watercourse Erosion	Erosion remediation works required based on construction of volume reduction infrastructure (diversion pipeline) within HCC jurisdictional area. Six (6) reach-based projects identified downstream of WEX (within WDC), two (2) projects identified within HCC jurisdictional area.	$5.3M	$0.05M/y	In-line with development where required as mitigation. In-line with overall city-wide prioritisation where part of city-wide erosion control programme (projects within HCC jurisdiction).
Watercourse Enhancement	Implementation of identified watercourse enhancement/restoration opportunities. Allows for 10m/5m riparian corridors within HCC jurisdictional area and planting to top of bank downstream within WDC area. Estimates are based on Te Rapa Stream only, no estimates made for western tributary within WDC area.	$8.0M $5.5M (within HCC jurisdiction)	$0.035M/y to $0.045M/y	NiTC to consider in-line with city-wide prioritisation. HCC to look at opportunities to implement as part of upgrades to urban LoS at time of development.
Growth Cell Capital Programme	Eleven (11) centralised devices identified as preferred means to provide stormwater management for future development. Devices will be developer-led with upsize required	$25.4M	$0.1M/y	Delivered by developers with upsize contribution where required.

Table 45: Capital works recommended by ICMP

Programme	Description	CAPEX	OPEX	Implementation
(or developer-led investment)	where treatment of existing public-domain areas required.			
	Installation of catch-pit filters in new industrial roading corridors. Allows for approximately 350 filter inserts.	$0.3M	$0.1M/y	Delivered by HCC or developer at time of development.
	Construction of a diversion pipeline along future northern crossing transportation corridor route. Primary purpose of the pipeline is to route sufficient flow volumes directly to the river to offset increases in volume from development.	$20M	$0.05M/y	Delivered by HCC or developer, depending on timing. Recommended to be funded through development contributions if delivered by HCC.
	Construction of a new primary and secondary flow outlet to the Waikato River serving all new landuse in Zone 3. This may be implemented/constructed as part of the diversion pipeline project above.	$3M	-	Delivered by developer(s) at time of consent. Where serving multiple developments, landholders to work together through Private developer Agreements.
	Retro-fit of existing outlet to the Waikato River, or construction of a new primary flow outlet to the River serving all new landuse in Zone 4. (May not be required depending on preference for upstream stormwater management infrastructure.)	$3M	-	Delivered by developer(s) at time of consent. Where serving multiple developments, landholders to work together through Private developer Agreements.
Brownfield stormwater management	Retro-fit of raingardens (or similar) into existing Te Rapa Boulevade corridor. Allowance for treatment of 13.8 Ha of roading corridor and 30% co-funding of private impervious surfaces.	$22.0M	$0.035M/y	In-line with overall city-wide prioritisation as part of brownfields stormwater management programme.
	Total:	**$87.0M**		

8.6 Education

Education initiatives support the implementation of ICMPs. Education initiatives relating to the Te Rapa ICMP are listed in Table 46.

Table 46: Education Initiatives

Initiative	Description	Action
GIS means of compliance viewer	Viewer to communicate simplified means of compliance for internal staff use.	Te Rapa ICMP means of compliance to be added to the viewer on ICMP certification.
Update Councils Flood Viewer (external and internal)	Council has flood viewers for external and internal use that display flood hazard	Flood data has been provided for update into the flood viewer.

Table 46: Education Initiatives

Initiative	Description	Action
High-Risk site auditing	Communication with asset owners as part of auditing of high-risk stormwater facilities for compliance with consenting requirements and by-law.	Ongoing
On-lot stormwater management auditing	Communication with asset owners as part of auditing of on-lot stormwater management devices, in-line with current practices for residential on-lot devices.	Ongoing
Operation & maintenance of on-lot stormwater management devices.	Education material has been developed as part of residential on-lot monitoring and compliance process around operation and maintenance of on-lot stormwater infrastructure.	Ongoing
On-lot consent notices	Consent notices are placed on consents to ensure that on-lot infrastructure is constructed and maintained.	Current standard practice.
ICMP document available online	Final ICMP document to be made available online through HCC website on ICMP certification.	On technical certification.

8.7 Actions

Table 47 lists actions required to implement the ICMP. Where these actions are not the responsibility of the Te Rapa ICMP Project Manager, the responsible party is to be informed by the project manager.

Table 47:Actions

Action	Responsibility
Provisions of this ICMP are recommended to be incorporate into any future council-led plan structure planning process.	City Planning
Planning Guidance Unit and Development Engineers to incorporate the provisions of this ICMP into future resource consents within the Te Rapa area.	Planning Guidance Unit, Development Engineers
At time of resource consent, HCC to seek securing of an esplanade corridor along the Te Rapa Stream for the purpose of establishment of a natural riparian corridor. Note: It is expected that future floodplain areas (required to manage 100y ARI flood volumes) will exceed the esplanade corridor width along much of the Te Rapa Stream within the HCC jurisdictional area. The esplanade corridor would effectively serve to set a minimum width.	Planning Guidance Unit
HCC to incorporate Maaori ceremonies into council-led construction projects within the Te Rapa catchment.	All business units

Table 47:Actions

Action	Responsibility
Update internal & external GIS databases with the following datasets: • Stream walkover data • Erosion hotspots • Fish barrier data • Flood hazard data	Strategic Waters Infrastructure Unit
Add the Boulevard OLFP issue/project to internal viewer & ensure that OFLP is formalised when redevelopment occurs.	Strategic Waters Infrastructure Unit & Development Engineers
Update internal means of compliance mapping to reflect the provisions within this ICMP document.	Strategic Waters Infrastructure Unit
HCC to advocate for the development of a memorandum of understanding between watercourse stakeholders for the purpose of establishing a framework for watercourse resilience works in the Te Rapa Stream outside of HCC jurisdiction. If achieved, this may allow for a review of the ICMP design parameters and MoC.	Strategic Waters Infrastructure Unit
HCC to engage with WRC drainage manager to resolve strategy around future management of the Te Rapa watercourse as land use changes. This needs to map out the process of changing the boundary of the land scheme and to understand what interim agreements (if required) may need to be put into place to hand O&M roles to HCC if boundary changes are not achieved by the time land use is urbanised.	Three Waters Infrastructure.
Undertake concept design of proposed diversion pipeline to progress understanding of cost, construction and consenting feasibility.	Strategic Waters Infrastructure Unit, Design & Deliver
HCC to incorporate the funding recommendations of this document into the next round of LTP submissions to elected members (2027 -37).	Strategic Waters Infrastructure Unit
Undertake a high-risk site audit at the Te Awa Base shopping centre.	Compliance Team.
Continue to undertake on-lot and high-risk site inspections as part of overall citywide programmes.	Compliance Team.

8.8 Mechanisms for Implementation

Mechanisms for implementing measures include, but are not limited to, the following:

ICMP Implementation - Once the ICMP is finalised and approved by the HCC Project Governance Group:

- Place the ICMP (and appendices) on the HCC website;
- Inform key stakeholders (internal and external);

- Pass to the HCC Compliance team for educational purposes in accordance with HCC CSDC requirements;
- Include in the agenda of the Developers Forum quarterly meeting and/or other similar meetings as appropriate; and
- Meet with HCC Development Engineers, City Planning, Planning Guidance Unit and Building Unit to ensure requirements within the ICMP (design parameters and means of compliance) are sufficiently understood and implemented through Resource Consents and Building Consents (as required).
- Provide ICMP programme of works to internal staff to inform Master Plans and long term plans.
- Provide list of actions to relevant staff for implementation.

Development applications – Developments will be assessed at the time of resource consent and/or building consent application. Resource consent conditions will be written and enforced accordingly. Developers will need to check with Hamilton City Council on the status of the plans in this ICMP, catchment performance. Where resource consent is required, developers should participate in pre-application meetings to understand requirements prior to development of proposals.

Enforcement – Proposed District Plan and Bylaws – Council has adopted a stormwater bylaw which sets out Councils powers under the Local Government Act to manage, regulate and protect, and to prevent the misuse of Council's land, structures or infrastructure associated with stormwater drainage. This will be supported by an Education Strategy.

Council's Long-Term Plan – The LTP is used as a funding mechanism for infrastructure required for the Te Rapa Catchment. ICMP's will contribute to funding decisions on infrastructure projects in the LTP.

Existing programmes such as:

- Planned maintenance[110] and operational improvements;
- Asset renewal programmes;
- Design and development in accordance with Infrastructure Technical Specifications; and
- Customer service level (satisfaction surveys, complaints, monitoring).

ICMP Communication Strategy – this requires effective internal and external communication

Incorporate ICMP communication into City Waters education strategy and assess appropriate communications plan within one month of ICMP approval. The strategy needs to ensure that affected Units understand and apply ICMP content and implement though mechanisms such as consent approval processes and conditions. The external communication strategy needs to ensure that the ICMP is understood, referenced in consent application documents and by key stakeholders, means of compliance are adopted and there are no buildings exposed to unacceptable levels of risk from flood hazards. Measures will include: Roadshow, Intranet, Website – ICMP, Website – FAQ, Territorial authority websites where appropriate.

Collaboration with other agencies

Collaboration with other agencies on ICMP's, District Plan changes and Resource consent approvals and bylaw reviews to ensure appropriate quality and quantity requirements are met.

Annual CSDC Reporting

Annual CSDC reporting provides a platform for reporting against implementation of the ICMP. In particular, reporting against implementation of strategic infrastructure and ICMP monitoring provisions.

[110] For example, road catch-pits and sumps are currently cleaned out on an annual cyclic basis. However, streets with known leaf fall problems which are swept up to three times a week to forestall blockages.

9. CONSULTATION

The Te Rapa ICMP Communications Plan was developed for the ICMP, and consultation has been carried out in line with that document, along with revisions to it during the project. Parties consulted included iwi, key stakeholders (internal and external), directly affected landowners, and the wider community as an integral part of developing the Te Rapa ICMP. This consultation has helped to generate a greater understanding of the Te Rapa Catchment. Outcomes of consultation will be integrated into the ICMP document where appropriate, or otherwise addressed.

9.1 Key Stakeholders

A list of the parties consulted is provided below:

Internal

- Elected members;
- City Planning;
- City Waters;
- Development;
- City Transportation;
- Asset Owners;
- Operations and Maintenance;
- Regulators;

External

- Waikato Regional Council: (Regional authority, and technical assessor for compliance with the Comprehensive Stormwater Discharge Consent);
- Waikato District Council: Territorial authority for part of the catchment;
- Mana Whenua (Te Ha o te Whenua o Kirikiriroa);
- Waikato-Tainui;
- Property owners and developers;
- Key stakeholders listed in the CSDC; and
- Central government departments.

9.2 Consultation Timeline

Table **48** presents a summary and timeline of key consultation activities undertaken in support of preparation of the Te Rapa ICMP.

Table 48: Consultation Timeline

Date	Description	With Who?
July 2019	Internal communications circulated to internal stakeholders informing of commencement of ICMP study.	HCC internal stakeholders
July 2019	Project kick-off workshop with other catchment territorial authorities.	WRC & WDC

Table 48: Consultation Timeline

Date	Description	With Who?
July 2019	ICMP scope documents circulated to WRC and internal stakeholders for feedback	WRC & HCC internal stakeholders
Oct 2019	Letters circulated to landholders within the catchment (adjacent to watercourses) identifying commencement of ICMP activities and requesting access to properties to collect stream walk-over and water quality and ecological data.	Key landholders
April 2020	Internal stakeholder workshop	HCC internal stakeholders
June 2020	Issues & opportunities workshop based on draft	WRC
Aug 2020		THaWK and Waikato Tainui
Oct 2020	Stormwater management options workshop to collect feedback	THaWK and Waikato Tainui
Dec 2020	ICMP summary workshop	HCC internal stakeholders
Feb 2021	Stormwater Infrastructure MCA workshop	
Aug 2023	Summary presentation of technical appendices and key findings.	WRC, WDC
Aug 2023	Summary presentation of technical appendices and key findings.	HCC internal stakeholders
Aug 2023	Draft technical appendices circulated to external territorial authorities for review.	WRC, WDC.
Feb 2024	Summary presentation of technical appendices and key findings.	Ngaati Wairere, THaWK and Waikato Tainui
May 2024	Presentation of draft design parameters and means of compliance.	WRC, WDC
May 2024	Presentation of draft design parameters and means of compliance.	Fonterra (key landholder)
October 2024	Draft ICMP sent to key stakeholders for feedback.	WRC, WDC, Fonterra, Ngaati Wairere, THaWK and Waikato Tainui
March 2025	Revised draft ICMP sent to key stakeholders.	WRC, WDC, Fonterra, Ngaati Wairere, THaWK and Waikato Tainui

9.3 Consultation Feedback

Section to be updated at the completion of consultation.

Key stakeholder consultation to date has included Mana Whenua, Waikato Regional Council, Waikato District Council, Hamilton City Council and Fonterra. We received some differences of opinion on significant issues such as the proposed mitigation to volume control, cross-jurisdictional coordination, and the stream esplanade width. These views have been considered and mitigations/projects recommended while

factoring funding, growth, timing and jurisdictional responsibilities and statutory powers. All projects have been identified as a funding request and will go through a consent process prior to construction.

Below is a high-level summary of the key issues and proposed solutions of the draft ICMP:

Key issues	**Proposed solutions**
Increased development in the catchment will generate additional stormwater volume which will exacerbate the existing erosion issues in the downstream areas outside of Hamilton City Council jurisdiction.	Erosion of the Te Rapa watercourse is a key issue both now and in the future. The draft ICMP considered two options to protect the stream from erosion: stream armoring and erosion protection works, or a pipeline that would divert increased flows directly to the Waikato River, leaving environmental flows to remain. The draft ICMP assessed both options as being similar from both a technical perspective, and with their alignment to Te Ture Whaimana (our vision and strategy for the Waikato River). During initial workshops, stakeholders did not agree on a preferred option, so both remained as valid options in the ICMP. We then received feedback encouraging a preference to provide more clarity for the implementation of the ICMP. While both options are still recorded, currently the pipe is favoured alongside a more natural, restored stream. This option is seen as providing the clearest path for implementation. The below sets out key reasons for the pipeline being preferred: • The Te Rapa Stream would be restored and continue to carry environmental flows while a relief pipe would carry high flows from growth increase. • To armor the stream would require significant engineering works which would significantly change the appearance of the stream. • It is acknowledged that piping water is not in itself a preference, but it is considered the best practicable option in this situation to manage increased stormwater resulting from development. • Additional stormwater runoff volume generated by development that may cause erosion is not discharged to the stream. • Soakage and treatment to required levels would occur before the water entered the pipe and stream. • The whole pipe is in Hamilton City Council's jurisdictional area and therefore doesn't require co-funding from other councils who may never secure the funding. • Construction of a new outlet to the river would be required, but could be combined with a planned future transport corridor. Any pipe or stream project will require consent before works could occur.
Industrial zoning with higher contaminant loading requires increased treatment of stormwater before it reaches the watercourse to give effect to Te Ture Whaimana.	The draft ICMP proposes a multi-barrier stormwater treatment train for any development within the catchment. This will require stormwater management measures at-source, within the roading corridor, and at the end-of-pipe prior to discharging into the watercourse.
Establishment of a central stream corridor.	The draft ICMP supports the establishment of a corridor along the Te Rapa Stream with a minimum width of 20m on either side of the watercourse. The key objectives are watercourse restoration, flood control, access to the watercourse, and potential walking and cycling connectivity.

Key issues	Proposed solutions
	The principle of establishing a stream or esplanade corridor has generally been supported, but further consideration needs to be made on the ultimate purpose of this corridor and how it's maintained.
Restore and protect natural features in the catchment, particularly riparian plants and fish habitat.	The draft ICMP supports the restoration and naturalisation of the Te Rapa Stream. A number of potential natural wetlands and existing fish barriers have been identified which need to be considered for restoration.

9.4 Future Stakeholder Liaison

Ongoing liaison with key stakeholders and directly affected landowners will be critical to the effective implementation of the ICMP. This is recognised throughout the ICMP, in particular Section 8. Consultation may also be carried out as part of further investigations and assessment work, major infrastructure and development design, land designation and resource consent processes and general implementation where appropriate.

10. CONSENT COMPLIANCE OF THIS ICMP

Condition 30 of the Hamilton City Council CSDC (#105279) requires that, in accordance with Condition 3(c), Catchment Management Plans (CMPs) which are prepared to guide new stormwater diversion and discharge activities in developing catchments shall be to a standard acceptable to WRC and shall be submitted to WRC for written approval in a technical certification capacity. Condition 30 further requires that CMPs shall determine and recommend an 'integrated catchment management approach' which is based upon the BPO to avoid as far as practicable and otherwise minimise the cumulative adverse effects of all new stormwater activities in developing catchments.

In this regard a compliance assessment of the Te Rapa ICMP against Condition 30 of the Hamilton City Council CSDC is presented in Section 10.1 below. This is followed in Section 10.2 by a more detailed assessment against Condition 30(g) and (h) requirements which relate to the environmental impacts of new stormwater activities on the catchment.

In addition, Section 3.5.1 of the AEE in Appendix D provides an assessment of the Te Rapa ICMP against the Waikato Tainui Environmental Plan (including those provisions relating to Te Ture Whaimana).

Condition 3(a) of the Hamilton City Council CSDC requires all new stormwater activities to be consistent with all relevant conditions of the Hamilton City Council CSDC and prompts a broad-scale compliance assessment on a site/activity specific basis prior to technical certification by WRC[111]. This is a separate process and beyond the scope of this ICMP compliance assessment (Condition 30). However, it is noted that the proposed BPOs and stormwater management solutions presented in this ICMP are consistent with the wider conditions of the Hamilton City Council CSDC.

10.1 Compliance with Comprehensive Stormwater Discharge Consent

Table 49 sets out the minimum information requirements for CMPs under Condition 30 of the Hamilton City Council CSDC and how the Te Rapa ICMP meets these requirements.

Table 49: CSDC requirements and relevant ICMP sections

Condition	**Status and comments**
In accordance with Condition 3(c) of this consent, Catchment Management Plans which are prepared to guide new stormwater diversion and discharge activities in developing catchments shall be to a standard acceptable to the Waikato Regional Council and shall be submitted to the Waikato Regional Council for written approval in a technical certification capacity, prior to the establishment of these activities. Catchment Management Plans shall determine and recommend an integrated catchment management approach which is based upon the Best Practicable Option to avoid as far as practicable and otherwise minimise, the cumulative adverse effects of all new stormwater diversion and discharge activities in developing catchments	The Te Rapa ICMP has been prepared to guide new stormwater diversion and discharge activities in the Te Rapa Catchment. It follows an integrated catchment management approach which is based upon the BPO to avoid as far as practicable and otherwise minimise the cumulative adverse effects of all new stormwater activities in the catchment.
As a minimum, Catchment Management Plans shall include the following information:	

[111] For further background explanation refer to the Hamilton City Council CSDC / Appendix 2: Administrative Process for Incorporating New Municipal Diversion and Discharge Activities into the CSDC.

Table 49: CSDC requirements and relevant ICMP sections	
Condition	**Status and comments**
a) Catchment maps/drawings of the catchment delineating the catchment boundary, catchment topography, natural features, surface water bodies, existing drainage systems and infrastructure (if any) and current land-uses	A comprehensive set of catchment maps and drawings are included in Section 4 (Catchment Description).
b) Classification of the surface water bodies within the catchment as detailed in the Waikato Regional Plan	Surface water classification details and drawings are included in Section 4.4.3 (Surface Water Classification and Features).
c) A description of the social, economic, ecological, amenity and cultural objectives being sought for the catchment (likely to stem from a concurrent structure planning process)	A description of ICMP generic and catchment specific objectives is included in Section 6 (Objectives).
d) A description of proposed urban growth, development and land-use intensification within the catchment	A description of proposed urban land use intensification is included in Section 4.3 (Future Land-use Changes).
e) A list of the key stakeholders associated with the catchment, and details of their respective views on providing for new stormwater diversion and discharge activities within the catchment	A list of key stakeholders and details of their respective views are included in Section 9 (Consultation).
f) An assessment of the current status of the catchment and its environs, together with a description of the geological, hydrological, ecological and existing infrastructural characteristics of the catchment, including any existing resource use authorisations within the catchment	An assessment of the current status of the catchment and its environs is included in Section 4 (Catchment Description), along with existing resource use authorisations in Section 5 (Planning Framework).
g) An assessment of the environmental effects of all new stormwater diversion and discharge activities on the catchment, in such detail as corresponds with the scale and significance of the effects that these activities will have on the catchment, including but not limited to, effects on:	Refer to Section 10.2
i) Natural features, surface water bodies and aquifers	
ii) Sites of cultural and/or historical significance	
iii) Public health	
iv) Flooding hazards	
v) Receiving water hydrology, including base flows and peak flows in rivers and streams and long-term aquifer levels	

Table 49: CSDC requirements and relevant ICMP sections	
Condition	**Status and comments**
vi) Receiving water sediment and water quality	
vii) Receiving water habitat, ecology and ecosystem health	
viii) Receiving water riparian vegetation	
ix) The extent and quality of open stream channels	
x) Fish passage for indigenous and trout fisheries (refer to the Waikato Regional Plan Water Management Classes for applicability)	
xi) Natural and amenity values	
xii) Existing infrastructure	
xiii) Existing authorised resource use activities	
h) An assessment of the cumulative environmental effects of all new stormwater diversion and discharge activities on the catchment over time	Refer to Section 10.2
i) In response to the environmental effects assessment information, an assessment of the available management options (including Low Impact Urban Design measures and stormwater management devices), for all new stormwater diversion and discharge activities within the catchment; followed by	An assessment of the available management options for all new stormwater activities within the catchment is included in Section 7.11 (Greenfields Stormwater Devices).
j) Recommendations on an integrated catchment management approach which is based upon the Best Practicable Option to avoid as far as practicable and otherwise minimise actual and potential adverse effects of all new stormwater diversion and discharge activities on the catchment	An integrated catchment management approach which is based upon the BPO is presented in Section 8 (ICMP Implementation). The BPO meets the generic and catchment specific objectives presented in Section 6, where relevant.
k) A description of proposed education and promotion initiatives to be carried out by the Consent Holder to support the integrated catchment management approach recommended by the Catchment Management Plan	A description of proposed education and promotion initiatives is included in Section 8.6 (Education).

Table 49: CSDC requirements and relevant ICMP sections

Condition	**Status and comments**
I) A description of key infrastructure works to be carried out by the Consent Holder to support the integrated catchment management approach recommended by the Catchment Management Plan	A description of key infrastructure works is referred to in Sections 7.10 (Existing & Brownfield Stormwater Devices) 7.11 (Greenfields Stormwater Devices), 7.12 (Wastewater) and 7.13 (Water Supply).
m) A prioritised infrastructure works schedule for implementing the integrated catchment management approach recommended by the Catchment Management Plan	A prioritised infrastructure works schedule is provided in Section 8. Note: the prioritised infrastructure works schedule is presented at the catchment scale and must be integrated into the citywide programme of works. It is subject to revision through the Hamilton City Long Term Planning process.
n) A list of performance measures by which the implementation of the integrated catchment management approach recommended by the Catchment Management Plan will be gauged	Key performance measures are reflected in: • Section 8.3 (Design Parameters) • Section 8.4 (Means of Compliance). These are details pertaining to stormwater treatment and conveyance infrastructure, and the actions to be considered and undertaken as part of consenting. • Section 10 (Consent Compliance of this ICMP) and; • Section 12 (Monitoring). These should be gauged and reported on an annual basis via the Hamilton City Council CSDC Monitoring Programme (Condition 37) and Annual Report (Condition 39)

10.2 Assessment of Environmental Effects

An Assessment of Environmental Effects ("AEE") is provided within Appendix D of this ICMP and assesses the effects on the Te Rapa Stream Catchment ("the Catchment") of the planned stormwater diversion and discharge activities undertaken in accordance with the ICMP. The AEE is intended to satisfy the requirements of the following conditions of the Hamilton City Council's CSWDC:

- Condition 30(g) requires an assessment of the environmental effects of all new stormwater diversion and discharge activities on the catchment in such detail as corresponds with the scale and significance of the effects that these activities will have on the catchment. The headings used below in Section 2 are based on the requirements set out in condition 30(g) of the CSWDC on which the effects of the activities are to be assessed.
- Condition 30(h) requires an assessment of the cumulative environmental effects of all new stormwater diversion and discharge activities on the catchment over time.

The AEE is based on technical assessments undertaken by environmental specialists in support of the development of the ICMP. A summary of the AEE in Appendix D is provided below.

The AEE identifies seven of the thirteen objectives of Te Ture Whaimana, the Waikato River Vision and Strategy which are specifically relevant and influence this ICMP. On-going planned development of the lower and mid catchment will replace rural land with light industrial and commercial land uses over the coming years. The key impacts arising from this change in land use is flood management and increased stormwater volume flowing into the Te Rapa Stream as a result of an increase of impermeable surfaces in the catchment and a reduction in soakage potential. The ICMP includes a number of provisions to manage stormwater generated within the catchment and to mitigate these and other potential effects. While there are a number of water efficiency measures prescribed in the District Plan and Regional Infrastructure Technical Specifications (RITS) which can be defined as 'business as usual', key provisions of the ICMP include:

- Requirement at-source stormwater retention to mitigate potential erosion effects from increases in runoff volumes in small or frequent storm events.
- Use of sub-catchment wetland devices with greater than 80% vegetation cover to remove contaminants and attenuate stormwater flows.
- Watercourse enhancement via riparian planting at the time of development/redevelopment,
- Erosion protection works in the stream to maintain integrity of the Te Rapa Stream bank and the outlet to the Waikato River
- Monitoring of groundwater to inform wetland design
- Regular water quality monitoring as part of the city-wide monitoring plan
- Maintaining existing modified watercourses and requirement for new watercourses to mimic natural environment.

It is generally concluded that there are varying degrees of actual and potential environmental effects associated with new stormwater diversion and discharge activities in the Te Rapa Catchment. In consideration of the ICMP technical assessment findings, and subject to all issue avoidance and mitigation measures being fully implemented as documented in this ICMP, this assessment has determined that the environmental effects of stormwater discharge effects undertaken in the Te Rapa catchment will overall have various level of effects ranging from less than minor to no more than minor with some positive effects across various aspects including aquifer recharge, cultural

considerations, public health, flooding managements, geohazards, water quality, aquatic habitat, fish passage, mudfish, riparian vegetation, natural and amenity values, and infrastructure.

The urbanisation of this area adjacent to existing watercourses also presents geotechnical and lateral spread risks in relation to proximity of buildings and devices to slopes, and seismic risks in relation to potential liquefaction in the event of earthquake events. These have the potential to impact on site layout, yield and developability of land in the catchment. The ICMP includes recommendations for further site specific assessment of geotechnical and liquefaction risk at the time of subdivision and land use consent applications.

The ICMP further concludes that these effects can be managed through implementation of the proposed design discharge parameters and the means of compliance. The ICMP identifies two potential solutions to mitigating the residential effects of increase in stormwater discharge volumes – one involving construction of a diversion pipe to the Waikato River, the other through providing enhanced stabilisation and armouring of downstream reaches of the Te Rapa Stream. Both options have been assessed as requiring similar financial commitments from HCC and are considered equivalent practicable options. Potential challenges to implementation have been identified with both options which include cross boundary / jurisdictional management of development, funding sources and complicated consenting processes. Both options have been recorded in the ICMP to ensure that a solution can be achieved. To provide clarity to developers and territorial authorities and other stakeholder, the diversion pipeline has been supported as the preferred option. At the time of development, this option will need to be reassessed in line with prevailing strategic and statutory environment to determine that it remains best practical option.

The ICMP is consistent with regulatory documents such as the Waikato Regional Policy Statement (WRPS), Waikato Regional Plan (WRP) and relevant iwi management plans. Most importantly, it aligns with the Vision and Strategy / Te Ture Whaimana o Te Awa o Waikato as it anticipated over time the change in land use and the targeted reduction in nutrients and sediment coupled with measures to remove heavy metal contaminants at source in the Te Rapa Stream catchment will contribute to the restoration of the Waikato River.

11. ICMP REVIEW

Updates to the ICMP can be initiated if the need arises, subject to available budget and resourcing. Approval of any changes would require robust consultation and review or certification by WRC. The following could trigger an ICMP review:

- Substantial changes in major infrastructure development that are likely to result in different ICMP outcomes;
- Changes in the legal framework (Waikato Regional Policy Statement, Waikato Regional Plan, District Plan, central government legislation e.g. National Policy Statement for Freshwater Management);
- New information (e.g. LIDAR, further catchment investigations and assessments undertaken by HCC and/or other agencies); or
- Review, renewal or replacement of the HCC CSDC and subsequent requirements.

Updates to the RITS and Waikato Stormwater Guideline are allowed for in the ICMP and will not generally require updates to the ICMP document for them to have effect. This ICMP will provide guidance to any future changes in land-use when implementing a Structure Plan (for example through consent processes), and when preparing and processing formal plan changes.

The ICMP will be reviewed periodically to ensure that it remains relevant to current policy settings and considers the results of any ongoing monitoring and changes within the catchment which will occur through development.

12. MONITORING

Monitoring under the ICMP is largely based on existing monitoring programmes described below.

12.1 Hamilton City Council monitoring responsibility

Hamilton City Council holds Waikato Regional Council resource consents for stormwater discharges, water take, and wastewater discharges. Hamilton City Council's Comprehensive Stormwater Discharge Consent (CSDC) covers existing urban areas and the associated stormwater network. Hamilton City Council prepared a monitoring plan to assess the adverse effects of municipal stormwater diversion and discharge activities on the environment in accordance with the requirements of Condition 37 of the CSDC. The original monitoring plan was approved by Waikato Regional Council in 2013 (Tonkin + Taylor 2012). It has recently been updated and incorporated into a comprehensive citywide Stormwater and Receiving Environment Monitoring Plan (SREMP, T+T, 2019). The SREMP has the following purposes:

- To assist Council in monitoring and enable all relevant agencies to understand the effects of stormwater discharges and compliance with the CSDC;
- To assist Council in determining if a response is required to an event;
- To assist Council in prioritising stormwater quality improvements; and
- To assist Council in determining if catchment management initiatives are needed or successful.

The SREMP is an adaptive monitoring programme that includes regular review to capture any new monitoring requirements as they arise and monitoring site priorities and frequencies that change in response to observed data and catchment development.

The SREMP includes a comprehensive network of monitoring sites throughout the Te Rapa Stream network. The effects of existing and proposed stormwater discharges and stormwater improvement and management initiatives on freshwater receiving environments in the Te Rapa Catchment will be monitored primarily through the SREMP. Monitoring of the effects of development will also occur under any specific subdivision discharge consent monitoring requirements prior to those consents being transferred to Hamilton City Council and captured under the CSDC and SREMP.

12.2 Development Community Responsibility

Developers require stormwater consents to allow discharge to the receiving environment in accordance with the requirements of the Waikato Regional Plan. The ICMP will help developers in the preparation of these consent applications and assist the Waikato Regional Council in determining what monitoring of discharge quality and quantity is required. In particular the ICMP will help ensure consents are issued that consider cumulative effects. In general, discharge consent conditions need to be consistent with the Council CSDC to provide certainty that the consents can be transferred to Hamilton City Council.

Any stormwater discharge consent held by a developer must have its specific consent monitoring requirements carried out by the developer until the consent is transferred to Hamilton City Council. Performance assessment of stormwater treatment systems that are in private ownership are to be carried out by the owner/operator before treatment systems are vested with HCC.

12.3 Proposal for Te Rapa Catchment Monitoring

A catchment-specific monitoring plan has been developed by T&T and is included as Appendix J. Figure *49* shows monitoring locations within the catchment. Monitoring locations are generally consistent with those adopted for sampling as part of the ICMP, with the exception of shifting

location SL_4 to the tributary draining underneath Onion Road, and no monitoring to be undertaken at location SL_6.

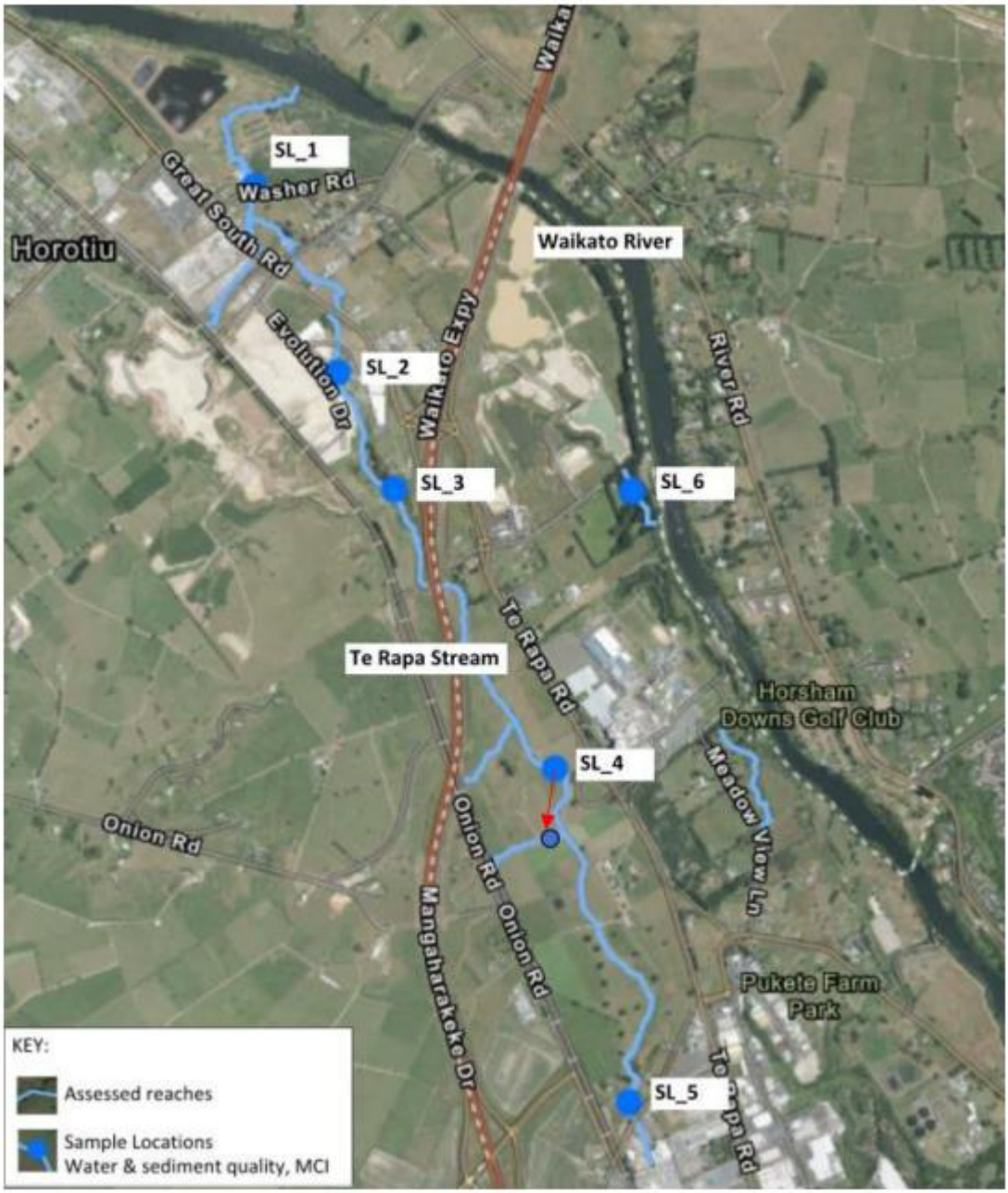


Figure 49: Monitoring Location

12.4 Reporting

Monitoring reporting for the Te Rapa catchment will be undertaken as part of the Municipal Stormwater Network Operation Annual Report which is to be submitted to WRC annually by 1 July.

The report will contain recommendations on any changes that may be needed to the monitoring plan for the following year in line with the adaptive approach set out in this SREMP.

All raw data and monitoring assessments/reporting relevant to CSDC requirements or collected in conjunction with a WRC monitoring programme will be made available to WRC on request.

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Statutes

Waikato Raupatu Claims Settlement Act 1995

Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010

GLOSSARY OF ABBREVIATIONS AND TERMS

AMP: Activity Management Plan

Average Recurrence Interval (ARI): A statistical estimate of the average period in years between the occurrences of an event of a given size or larger.

Base Flow: The flow in a stream between storm events, supplied by groundwater.

Bioretention: Systems such as raingardens that use soil filtration and plant uptake to remove contaminants from stormwater.

Best Practicable Option: The best method for preventing or minimising adverse effects on the environment, having regarded to:

- The nature of the discharge or emission and the sensitivity of the receiving environment to adverse effects;
- The financial implications, and the effects on the environment, of that option when compared with other options; and
- The current state of technical knowledge and the likelihood that the option can be successfully applied.

Catchment: The area of land drained by a stream or river system, or the boundary of an area where all surface water drains to a common point.

CSDC: Comprehensive Stormwater Discharge Consent

et al: and others

Flood Hazard Mapping: Defines flood hazard areas using flood levels established as part of flood hazard studies.

Flow Attenuation: The process of reducing the peak flow rate by redistributing the same volume of flow over a longer period of time, i.e. by using detention structures.

Groundwater Recharge: Increasing the amount of groundwater in storage via percolating rainwater into the ground.

HUGS: Hamilton Urban Growth Strategy

Hydraulic Model: A computer model of a watercourse used to evaluate the hydraulic conditions of water flow through natural rivers and other channels.

Impervious surface: Those surfaces in the landscape that cannot infiltrate rainfall, such as rooftops, road pavements, footpaths, driveways and compacted earth.

Infiltration: The downward movement of water from the surface of the land to subsoil.

Integrated Catchment Management Plan (ICMP): A management plan devised to manage natural resources on catchment basis to achieve sustainable use which provides for social and economic benefit.

inter alia: among other things

M: Million

Perennial stream: A stream that has water flow all year.

Rain garden: A planted depression or raised enclosed bed that is designed to absorb contaminants in stormwater runoff which are generated from impervious areas such as roofs, roads, paving, and

lawn areas. The water will percolate through the rain garden prior to discharge, which is either through natural soakage, to low velocity overland flow or a piped network.

Riparian Corridor: The vegetated land adjacent to a watercourse.

SICMP: Sub-catchment Integrated Catchment Management Plan

SOP: Standard Operating Procedure

Stormwater Receiving Environment Monitoring Plan (SREMP): Council's stormwater monitoring plan as required under the Comprehensive Stormwater Discharge Consent.

Swale: A drainage depression along which stormwater flows. It is usually vegetated. It collects and treats water by slowing the flow and allowing solids to drop out of the water prior to discharging via a cesspit to a piped network.

Te Ture Whaimana: Vision and Strategy for the Waikato River (Te Ture Whaimana). This is set out in Schedule 2 of the Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010.

The Council: Hamilton City Council

Treatment Train: A "Treatment Train" approach to stormwater management consists of sequential components that contribute to the treatment of stormwater before it discharges to natural watercourses.

APPENDICES

Appendix A: Cultural Values Assessment

Appendix B: Geotechnical and Hydrogeological Assessment

Appendix C: Receiving Environment Report

Appendix D: Assessment of Environmental Effects

Appendix E: Stream Erosion Protection Measures Memo

Appendix F: Watercourse and Wetland Classification

Appendix G: Model Build Report

Appendix H: Stormwater Management Devices

Appendix I: Te Ture Whaimana Memo

Appendix J: Monitoring Plan

Appendix K: Pipeline 2025 Estimate