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PATTLE DELAMORE PARTNERS LTD

Assessment of Environmental Effects: Stormwater discharges within the Geraldine Stormwater Management Area

Timaru District Council

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Prepared for

Timaru District Council

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Limitations:

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Executive Summary

The Geraldine Stormwater Management Area (SMA) is managed by Timaru District Council (TDC), providing a drainage network for the township of Geraldine, South Canterbury. The SMA covers an area of 315 ha and has three main receiving waters including the Waihi River, Serpentine Creek and to ground via soak pit infiltration. The scheme consists of a network of pipes, open channels, manholes, soak pits and detention dams.

TDC are seeking resource consent to discharge stormwater to surface waterways and to ground within the proposed management area so that the network can be effectively managed under one consent, and environmental outcomes can be effectively managed.

This Assessment of Environmental Effects has been prepared to support the discharge consent for the stormwater management area resource consent application. The associated Stormwater Management Plan is the key management document for the consent application.

This assessment covers the following items:

- Activity Description – a description of the stormwater discharges and network, including the current performance and condition of the scheme, expected future growth and consenting requirements.
- Description of the potentially affected environment – History of the stormwater discharges in Geraldine, current land use and geological setting of the area. This section also provides a detailed description of groundwater and surface water quality and quantity, flooding history and ecological assessments of the Waihi River and Serpentine Creek.
- Nature of the discharges – This section details both the expected volumes and quality of the stormwater discharges from the SMA.
- Activity status and planning matters – This section contains an assessment against the relevant objectives and policies for the relevant planning documents.
- Assessment of Environmental Effects – A detailed assessment of the proposal against any potential adverse effects on the environment. Effects on surface waterways, local ecology, groundwater, neighbouring water users, archaeological sites and Ngai Tahu values have all been considered in this section. Benefits to the community from having an area wide stormwater discharge consent are also outlined in this section.
- Mitigation measures – This section outlines the proposed mitigation measures intended to improve the Geraldine stormwater management scheme. A consideration of alternatives has also been provided.

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Abbreviations

ECan – Environment Canterbury

TDC – Timaru District Council

NIWA – National Institute of Water and Atmospheric Research

SMA – Stormwater management Area

SWMP – Stormwater Management Plan

ESCP - Erosion and Sediment Control Plan

SEMP – Site Environmental Plan

CLMP –Contaminated Land Management Plan

LWRP – Canterbury Land and Water Regional Plan

ORRP – Opihi River Regional Plan

CRPS – Canterbury Regional Policy Statement

ANZECC – Australia and New Zealand Environment and Conservation Council

NPS-FM – National Policy Statement for Freshwater Management

DWSNZ – Drinking Water Standards for New Zealand

CHI – Cultural Health Index

NZFFD – New Zealand Freshwater Fish Database

PAH – Polycyclic Aromatic Hydrocarbon

TSS – Total Suspended Solids

EPT Index – Ephemeroptera, Plecoptera and Trichoptera Index

MCI - Macroinvertebrate Community Index

QMCI – Quantitative Macroinvertebrate Community Index

1.0 Introduction

Pattle Delamore Partners (PDP) have been engaged by Timaru District Council (TDC) to prepare the resource consent application and associated Assessment of Environmental Effects (AEE) required by Environment Canterbury (ECan) for a resource consent to discharge stormwater within the Geraldine area.

This application relates to both existing and future stormwater discharges from the Geraldine Stormwater Management Area (SMA). TDC are applying for consent to discharge stormwater, pursuant to s15 of the Resource Management Act 1991 (RMA). Stormwater discharge consent is required to discharge stormwater to the Waihi River, Serpentine Creek, Raukapuka Stream, Downs Creek and to ground.

2.0 Activity Description

2.1 Geraldine Township Stormwater Management Area

The Geraldine Stormwater Management Area includes the existing developed area of Geraldine that is serviced by a stormwater network to prevent flooding being caused by local runoff from the developed areas.

Geraldine Township is located near the base of the foothills in South Canterbury. The town is separated by the Waihi River which differentiates the main township on the western side of the river with the Raukapuka community on the east side of the river.

A map of the scheme is presented in Appendix A, Figure 1, which shows the SMA covered by the scheme.

The land uses within the township include:

- Residential dwellings;
- Facilities such as service stations, accommodation, food and beverage outlets, retail and commercial businesses;
- Schools;
- Tourism facilities;
- Various transport / machinery depots and servicing workshops; and
- Public pools and parks.

The town is relatively slow growing, although demand for retirement facilities has been increasing with the recent construction of a new retirement village off Connolly Street.

2.2 Physical Description of the Stormwater Network

The Geraldine SMA covers an area of 315 ha and has five receiving water bodies:

- The Waihi River;
- Serpentine Creek;
- Raukapuku Creek;
- Downs Creek; and
- To groundwater in Raukapuka and the western side of Geraldine.

Downs Creek and Raukapuka Stream only provided limited input discharges from the Geraldine Stormwater management area.

The Geraldine Stormwater Scheme consists of collection sumps, inlets, pipes, open channels, manholes, soak pits and detention dams in Geraldine Township. The network includes the following components:

- 5.2 km of piped network;
- 3.8 km of open channels;
- 60 manholes;
- 60 soak pits; and
- 2 detention dams.

A number of properties discharge directly to the adjacent receiving waters without passing through the public stormwater network. Private discharges to ground also exist in the form of roof drainage and privately constructed soak pits in driveways. As the effects of these discharges are very difficult to separate from the effects of the network discharges and have been previously authorised by Timaru District Council or its predecessor's, it is proposed that these discharges will also be included in this consent.

The majority of the pipes network (65%) consists of cast concrete pipes while 20% of the pipes network is of unknown material.

The network is divided by the Waihi River which flows from north to south through the town. On the west side of the river, stormwater discharges run through a series of open channels or pipes before discharging to an outfall and subsequently into the Waihi River or Serpentine Creek (which subsequently flows into the Waihi River). Serpentine Creek has at least 28 public stormwater discharge points along its length while the Waihi River has at least 21 direct discharge points within the scheme area with the majority of these on the western side of the river. There are also at least six inland discharge points (soak pits) in the western side of town.

Two retention dams are located at the base of the Geraldine Downs, one in the headwaters of Serpentine Creek and one in Slaughterhouse Creek. These provide a buffer for higher flows from the downstream urban catchment during rainfall events.

The portion of the scheme on the eastern side of the Waihi River predominantly consists of inland discharge points that discharge to ground via road sumps (at least 45 of them) due to the soils in this area being of higher permeability. However, there is also a limited piping network along parts of Mckenzie Street, Tancred Street, Cascade Place and Orari Station Road.

Appendix A, Figure 2 shows the location of the above features.

2.3 Current Consents

There are currently three existing consents for the Geraldine Stormwater Management Area which covers the construction and use of the two detention dams in the headwaters of Serpentine Creek. There are no existing consents for the current stormwater discharges to the Waihi River, Serpentine Creek and to ground.

2.4 Consents Required

TDC are seeking consent to discharge stormwater from the Geraldine urban area into the Waihi River, Serpentine Creek and to groundwater. Downs Creek and Raukapuka Stream will also receive limited discharges. The proposed consent conditions are included in Appendix C.

2.5 Stormwater Network Drainage Performance

2.5.1 Hydraulic Performance of the Scheme

A Stormwater Services Activity Management Plan (AMP) has been prepared by TDC for the 2015 to 2025 period to provide for the management of TDC operated stormwater services within the district including Timaru, Temuka, Geraldine, Pleasant Point, Winchester, Cave and Milford-Opihi. This outlines how TDC will deliver stormwater services in the 10 year period according to agreed levels of service.

2.5.2 Asset Condition

The Geraldine Stormwater network is generally considered to be in good condition, with minimal pipe maintenance being necessary over the last 10 years. The cast concrete pipes are estimated to have a remaining useful life of between 120 and 150 years. However, 24% of the pipes in the network are predicted to be expiring within the 10 year period of the associated Asset Management Plan (AMP). Of these, 81% are of unknown material and 245 m consists of earthenware piping. Additionally, visual inspections have indicated that open channels, manholes and the two detention dams are generally in good condition. Soak pits are generally in good condition, although some blocking has occurred due to fine sediments and debris collecting in the bottom of the pits, impeding the flow of stormwater into the shallow subsurface.

The AMP includes an ongoing inspection programme of routine visits to inspect the overall condition of the scheme.

2.5.3 Levels of Service

The Geraldine Stormwater Network has been designed to accommodate rainfall events up to a one in 5 year return period or a 20% Annual Exceedance Probability (AEP) for residential properties and a 10% AEP level of service for commercial and industrial properties. Appendix 1 of the AMP (Timaru District Council, 2015) indicates that they aim to have zero flooding of residential buildings for up to a one in 50 year return period event over the period of the AMP.

The associated Preliminary Infrastructure Capacity Assessment (PDP, 2017) identified that approximately 45% of pipe infrastructure and 90% of soakage infrastructure has less capacity than the 20% AEP flow and the 10% AEP 1-hour flow, respectively. Notwithstanding, the based flooding complaints received and on the understanding of the network floodway capacity, flooding risks to properties in Geraldine do not appear to be a result of the stormwater network discharges. The Stormwater Management Plan provides procedures to complete capacity upgrades as required and afforded by the community to meet the targets in the Activity Management Plan.

2.5.4 Asset Capacity and Performance

Generally, in higher rainfall intensity events, surface flooding has occurred (Timaru District Council, 2015) with stormwater expected to drain through overland flow paths as identified in the PDP report '*Geraldine Stormwater Network – Preliminary Infrastructure Capacity Assessment*' (PDP, 2017). One point of concern is where Serpentine Creek flows under Majors Road, approximately 1 km upstream of the confluence with the Waihi River. A combination of a low gradient of the stream bed and the available freeboard of the road bridge caused flooding to occur in this area and hence, this section of Serpentine Creek is dependent on channel maintenance.

It is understood that the two detention dams are designed to buffer rainfall events up to 10% AEP, as detailed in the SWMP. Above these flows, water will overtop the embankments and cause stormwater to flow into Serpentine Creek.

The soak pits discharging stormwater to ground are the lowest performing component of the stormwater management asset within the Geraldine Stormwater Management Area. Based on TDC observations as discussed in the associated AMP (Timaru District Council, 2015), many of the soak pits are likely to be performing below standards particularly on the western side of the Waihi River Flooding often occurs around these soak pits during rainfall events. It is expected that this is due to the soils having a lower absorption capacity on the western side of the river but also from clogging of the pits from fine sediments over time, reducing the infiltration capacity of the structures. Ponding and flow

over secondary flow paths has been reported in low intensity rainfall events but, while being a nuisance to residents, this has not resulted in significant flooding of buildings.

2.6 Anticipated Future Growth Rates

The associated AMP (Timaru District Council, 2015) provides TDC estimates of both population and household growth. These are important factors when planning for future network upgrades as population has a direct correlation with demand for services. TDC has projected the District population to change by between -2.2% to 4.4% to 2026, and -3.5% to 5.1% to 2031. Additionally, household growth in the District is predicted to increase by approximately 9.3% to 14.8% to the year 2026.

The SWMP contains future development scenarios in the Serpentine Creek catchment for stormwater quantity runoff during rainfall events as modelled by Opus (2014b). This was based on a mid to high growth rate which predicts 300 new houses being built in Geraldine by 2070. This is estimated to result in an additional 75,000 m^2 of impervious area. However 45% of this growth is predicted to be on the Geraldine Downs and within McKenzie Lifestyle Village which are outside the Geraldine urban SMA.

2.7 Allowances for Climate Change

As outlined in the associated SWMP, stormwater quantity modelling in Serpentine Creek undertaken by Opus (Opus, 2014b) used a 16% increase in rainfall to account for climate change in the future scenario (2070). This estimate was based the Opus high intensity rainfall study of 1999 which predicted the increase in rainfall for the study area using the South Island Probable Maximum Precipitation (PMP) storms as studied by Tomlinson and Thompson (1992).

2.8 Management of Potential Adverse Environmental Effects

Operation of the stormwater network has the potential to cause adverse environmental effects with the discharge of additional runoff from hard stand surfaces causing flooding and environmental effects from the discharge of contaminants from upgradient land uses and activities.

2.8.1 Flooding

Additional runoff is caused by hardstanding. Adverse effects are controlled with provision of sufficient capacity in the stormwater network and land use planning to ensure that activities are not located where flooding may occur.

2.8.2 Water Quality and Ecology

Principal contaminant sources are anticipated to be from the following land uses and sources:

- Roads (sediment, hydrocarbons, heavy metals)
- Buildings (sediment, heavy metals)
- Industrial and Commercial Properties (sediment, heavy metals)
- Domestic animals (microbial)
- Domestic and Municipal green areas (nutrients from excess organic material and fertilisers)
- Construction activities (sediment)

These effects may be modified at source where the stormwater network owner is able to modify the upgradient activity or land use, or providing treatment to remove contaminants prior to discharge to the downstream environment.

2.9 Geraldine Stormwater Management Plan

The Geraldine SWMP has been prepared as an integral part of this application to provide for the management of controlled stormwater discharges within the Geraldine Stormwater Management Area.

The SWMP has been prepared in general accordance with the requirements outlined previously in the Natural Resources Regional Plan (NRRP) and the Land and Water Regional Plan (LWRP) and incorporates information contained in the Timaru District Plan and the TDC Stormwater Services Activity Management Plan (AMP). This provides a comprehensive description of the activity.

The purpose of the SWMP is to provide a framework for managing stormwater runoff from Geraldine township to meet the required environmental objectives. It also outlines strategies for future improvement of the network as well as how identified issues will be addressed.

The associated SWMP outlines the procedures that will take place to maintain or improve the overall stormwater network within Geraldine. This includes:

- Monitoring and Review to improve knowledge of the effects and performance of the stormwater network;
- Education to modify upgradient land uses discharging contaminants into the stormwater network. This is particularly important to modify existing land use activities that can potentially discharge contaminants to the stormwater network and/or when the contaminants that may be potentially discharged to the stormwater network may not be able to be fully treated or controlled;
- Capacity upgrade options for improved protection from flooding;
- Treatment requirements for new development and if adverse effects are observed from upgrades to the existing infrastructure;
- New development requirements to ensure additional adverse flooding effects and adverse water quality effects are not caused by future stormwater discharges;
- Maintenance Requirements to ensure the stormwater system continues to perform reliably;
- Site Management Requirements for sites with high risks of contaminant discharges;
- Site Spill Management Requirements to ensure minimise risks of accidental discharges of contaminants to the stormwater network in dry weather; and
- Construction Discharge Management to limit discharges of sediment to the stormwater network during construction activities.

Environmental monitoring will help to determine the actual effects of stormwater discharge on the receiving environment. This, with the addition of public involvement such as the previously completed customer satisfaction survey will allow for targeted upgrades to be completed. The SWMP also details the requirements for new developments that are expected to generate stormwater.

3.0 Description of the Potentially Affected Environment

3.1 History

Geraldine Township was formed more than 150 years ago and originally formed a hub for native forestry milling and sheep farming. Subsequently, much of the surrounding land has been converted to crop, orchard, deer and dairy farms while sheep farming still remains dominant upstream of Geraldine Township. The town now acts as a centre for retirees and the nearby rural community as well as a popular tourist stop-over spot. The current population estimate for Geraldine is approximately 2,250 residents including those residing in surrounding areas.

In 1857, an area was set aside for the formation of the township on the western side of the Waihi River. The Raukapuka area on the eastern side of the Waihi River was developed at a later stage during 1953 (McLintock, 1966). Aerial imagery from 7 February 1965 shows that a large amount of development occurred during the 12 years between 1953 and 1965. The majority of development had occurred adjacent to the main streets with paddock land in between which was infilled at a later date.

While the Waihi River has been kept relatively in its natural state as the town has grown, Serpentine Creek has been heavily urbanised as the residential footprint grew and the need for more space became apparent. Much of Serpentine Creek adjacent to industrial areas has limited riparian planting, whereas in the residential areas, riparian planting is typically abundant, where the waterway channels have not been culverted.

Traditionally, local iwi have used the Geraldine area for the collection of Mahinga Kai from local rivers. During the associated Cultural Health Index (CHI) Assessment of the Waihi River (Tipa & Associates Ltd, 2014), three sites were identified by local iwi as being of traditional significance, these being:

- Waihi River – Coach Road (downstream of Geraldine Township);
- Waihi River – McKenzie Street (within Geraldine Township); and
- Waihi River – Woodbury Road (upstream of Geraldine Township).

McLintock (1966) identified that local Maori once used local timber for canoe building in the vicinity of Geraldine.

3.2 Existing Land Use

Serpentine Creek has the largest catchment area within the Geraldine SMA. Serpentine Creek catchment covers approximately 59% of the SMA, while the remaining 41% is drained into the Waihi River, either from Raukapuka (25%) or from land adjacent to the west side of the Waihi River (16%).

Land use within the Geraldine SMA is comprised mainly of residential areas and green spaces. Overall, commercial and industrial sites account for 5.4% of the Geraldine SMA, residential accounts for 50.2% and rural/park/open spaces account for 44.4% of the SMA as shown in Figure 3.

Table 1 summarises the land use areas within each catchment.

Table 1: Summary of Land Use within the Geraldine SMA

Land Use	Serpentine Creek Catchment	Waihi Catchment on West Side of Waihi	Raukapuka Catchment
Commercial/Industrial	4 %	1.4 %	0 %
Residential	22 %	6.2 %	22 %
Rural/Park/Open Space	33.1 %	8.4 %	2.9 %

3.2.1 Contaminated Land

A report provided by Opus (2014a) on the groundwater and contaminated sites in the Geraldine area provides details on previous and existing land use that may have involved the use of hazardous material.

The report identifies 27 sites within the Geraldine area that are listed on ECan's Listed Land Use Register (LLUR) for current or historical land use activities that are on the Hazardous Activity or Industry List (HAIL).

The report identifies that the majority of the HAIL sites are related to fuel storage and engineering activities. Additionally, the former Geraldine gas works and market garden has been identified along Talbot Street. There is also a site in the main commercial area of town identified as having been used for seed cleaning and agrichemical use for filling, storing or washing out tanks. There are no known soak pits within any of these potentially contaminated sites.

Six of the potentially contaminated sites are located within the Serpentine Creek catchment, with the remainder being in the Waihi River catchment. In addition to the potentially contaminated sites, it is expected that there will be localised sources of illicit discharges of contaminants to stormwater such as paint, hydrocarbons and other contaminants from residential areas. The locations of the sites identified on the HAIL register are provided in the SWMP in Figure 5.

The land surrounding Geraldine is mainly used for agriculture and as a result, it is expected that pesticide, agrichemicals, fuel storage, nutrients and animal faeces are all potentially present in these areas with the potential to affect the shallow

groundwater quality in the area. However, these areas are not within the scope of the Geraldine Stormwater management Area.

3.3 Climate and Rainfall

Geraldine is located near the base of the Southern Canterbury foothills and is dominated mainly by westerly and southerly airflow. As stated in the associated Stormwater Management Plan, rainfall has been estimated at 500 to 700 mm per year and highlights the position of Geraldine being in the westerly wind, rain shadow zone. The mean annual temperature for Geraldine is between the 11 and 12 degrees centigrade band based on NIWAs Climate NZ Temperature Graph for 1981 to 2010 (NIWA, 2012).

The Waihi River and Serpentine Creek typically flood during the intersection of cool southerly airflows with warmer westerly winds which results in the rapid cooling of warm humid air causing a large amount of precipitation to occur.

Rainfall statistics have been provided in the Opus (2014b) report on stormwater quantity modelling in Serpentine Creek and the Waihi River. Rainfall depth data was taken from a previous Opus report from 1999 (High Intensity Rainfalls in Geraldine and Temuka). A summary of the rainfall statistics for various rainfall events are provided in Table 2 below.

Table 2: One and 24 Hour Rainfall Statistics from the Opus (2014b) Report

ARI	30 min (mm)	1 hour (mm)	2 hours (mm)	6 hours (mm)	12 hours (mm)	24 hours (mm)
5 year	12	19	28	45	57	80
10 year	17	27	36	58	75	99
50 year	43	49	56	85	116	140
100 year	62	63	64	97	134	158

Notes:

1. *Information obtained from the Opus (2014b) report on stormwater quantity modelling in Serpentine Creek and Waihi River.*

3.4 Geology

Cox and Barrell (2007) geographically presented the geology of the Aoraki Region, they indicate that the Geraldine flats are underlain by quaternary alluvial deposits bounded to the west by the extrusive igneous Geraldine Basalt which forms the Geraldine Downs (Appendix A, Figure 4). The Raukapuka area is underlain by quaternary gravels from the last glacial period, there gravels also underlie the western side of the Waihi River on the Geraldine flats with younger quaternary deposits closer to the Waihi River. The slopes of Talbot Forest are

underlain by the Geraldine Basalt. There is a loess cap on top of the Basalt which is assumed to grade into river deposits over the lower slopes of the Geraldine Downs.

Bore logs from the Geraldine flats indicate typical alluvial deposits with silty and sandy gravels with lenses of clay, which matches the lithology described in the geological map of the area.

The driller's log for bore J38/0657 is available within the Geraldine Downs basalt. This indicates that the basalt is overlain by a quaternary clay cap approximately 8 m thick. The basalt then extends from 8 to 47 m bgl with clayey gravels below this to the end of the driller's log at 54 m bgl.

3.5 Soils

The ECan online GIS database was used to source soil information regarding the soil types that are present over the Geraldine Stormwater network. The soils underlying the town are rather contrasting due to the presence of alluvial waterways passing through the town and the basaltic intrusion to the north-west of the town.

The majority of the flat area of town on both the eastern and western side of the Waihi River (main Geraldine township and Raukapuka) is covered by silty loams of the Barrhill, Pahau, Mayfield, Waimakariri and Eyre Formations, Eyre Formation stony silty loam and Ashburton Formation very stony sandy loam. The Geraldine Basalt is overlain by the Claremont Formation which consists of moderately deep silty loam over clay (loess).

Typically, soils on the eastern side of the Waihi River are much more freely draining than on the west side of the river as a result of the lithology. As a result, soak pits are the main feature of stormwater management in the eastern area.

3.6 Surface Water

The Waihi River is the main water body located in the vicinity of the Geraldine Township. The Waihi River is a hill fed tributary of the Opihi River, with a catchment area of approximately 16,585 ha. The adjacent land use is dominated by sheep, beef, dairy and deer farming, although dairy support has increased in the lower foothills in recent years. The Waihi River is typical of many small to medium hill – fed rivers in Canterbury in that the river can be divided into two distinct areas: the steeper, permanently flowing headwaters and the lower gradient, intermittent reaches below the Geraldine Township. The Waihi River is fed by small hill fed tributaries (e.g., Barkers Creek and Downs Creek), small spring fed streams (e.g., Dobies Stream and Raukapuka Creek) and by shallow groundwater.

Serpentine Creek is a small hill fed tributary of the Waihi River that meanders through the Geraldine township before entering the Waihi River on its southern

bank downstream of Geraldine. Serpenritne Creek is heavily influenced by the urbanisation that has occurred in and around Geraldine. Riparian planting through residential areas is generally abundant, with few riparian plants in the more southern industrial area of town due to less amenity values in this area.

Both Serpentine Creek and the Waihi River receive direct and indirect stormwater discharges. As Serpentine Creek flows into the Waihi River, and shallow groundwater is expected to drain into the Waihi River, the Waihi River ultimately receives almost all stormwater runoff from the Geraldine SMA.

3.6.1 Serpentine Creek

Serpentine Creek originates on the slopes of the Geraldine Downs and it is expected that base flows in the creek are derived from soil drainage and groundwater seepage from the basaltic aquifer of the Geraldine Downs. There are no gauging sites located on Serpentine Creek. However, the PDP (2016) survey identified that Serpentine Creek was largely dominated by slow runs and pools, with flows being more variable in the upper catchment and consistent in the creeks lower catchment through to the confluence with the Waihi River.

Previous PDP site visits and the Opus (2013) surveys were undertaken during base flow conditions, i.e., no rainfall in the days preceding observations. During previous PDP site visits conducted in July and August 2016 the flows in Serpentine Creek were consistent with ephemeral flows, with the creek being dry in the vacinity of Kennedy Street (E:5114919; N:1459278) and Majors Road (E:5114799; N:1459270). Downstream of Majors Road flow did increase which could indicate an increase of overland flow from adjacent paddocks and/ or from increased flows from groundwater.

3.6.2 Serpentine Creek Surface Water Quality

Serpentine Creek is primarily fed by rainfall runoff/drainage from the Geraldine Downs. Seepage from the basalt of the Geraldine Downs also contributes to Serpentine Creek in its headwaters. As with the Waihi River, Serpentine Creek can have sections of no flow during dry periods, and is generally charcterised by an ephemeral flow regime, with sections of the creek going dry in the vicinity of Kennedy Street and Majors Road with only seepages emerging further downstream. Additionally, the outfall to the Waihi River does not always have surface water flow.

There is relatively little water quality data available for Serpentine Creek in the vicinity of Geraldine Township. At present the water quality data is limited to two studies; an October 2016 PDP investigation that represents spring conditions and an Opus, 2013, study which represents winter conditions. Water quality results from the PDP 2016, and Opus (2013) study are available in Tables 3 and 4 below.

Table 3: Summary of water quality parameters from sites on Serpentine Creek

		Nitrate-N	Nitrite-N	NH_4N	NH_4N [a]	DIN	TKN	TN	TP	DRP	TSS	E.coli
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100 mL
PDP (2016) water quality sampling												
Serpentine Creek	at Domain	0.35	0.013	0.12	0.074	0.483	0.41	**0.78**	**0.15**	0.072	12	40
	at Winchester Rd	1.51	0.006	0.095	0.034	1.611	0.44	**1.96**	**0.084**	0.031	13	**980**
	above confluence	1.25	0.006	0.11	0.045	1.366	0.22	**1.47**	**0.075**	0.031	1.5	**520**
Waihi River	upstream of Serpentine Creek confluence	0.5	0.003	0.065	0.040	0.568	0.42	0.93	0.025	0.016	1.5	74
	downstream of Serpentine Creek confluence	1.09	0.001	0.091	0.039	1.182	0.05	1.09	0.047	0.012	3	25
Opus (2013) water quality sampling												
Serpentine Creek	Upstream	0.182	0.003	-	-	-	0.33	0.51	**0.033**	-	<3	26
	Downstream	2.4	0.003	-	-	-	0.32	**2.7**	**0.022**	-	<3	**150**
Waihi River	Upstream of Geraldine	3.4	0.005	-	-	-	0.19	**3.6**	0.009	-	<3	**170**
	Cole St	3.1	<0.002	-	-	-	0.17	**3.2**	0.012	-	<3	2
	Upstream of Serpentine Creek confluence	3	<0.002	-	-	-	0.14	**3.1**	0.006	-	<3	9
Trigger values and guidelines												
NPSFM Attribute state B	Annual Median	>1.0 and ≤ 2.4			>0.03 and ≤ 0.24							130
	95th percentile	>1.5 and ≤ 3.5			>0.05 and ≤ 0.40							
NPSFM National Bottom Line	Annual Median	6.9			1.3							
	95th percentile	9.8			2.2							
LWRP (spring-fed plains urban)	Schedule 8	3.8										<550
ANZECC (2018) CDL[b]		0.265		0.01		0.44 and 2.00[c]		0.913	0.014	0.008	2.1	

Notes:

a) NH_4N has been scaled to a pH value of 8 to allow comparison to the NPSFM attribute state concentrations.

b) ANZECC (2018) default guideline values for physical and chemical stressors for Cool Dry Low-Elevation (CDL) sites (as per ANZECC, 2018)

c) Recreational/aesthetic guideline indicative of an enriched nutrient condition in Canterbury (40 day accrual) (MfE, 2000; Stevenson et al, 2010)

Bold values indicate that trigger values/ objectives were not met.

Table 4: Toxicant results for surface water sites located on the Waihi River and Serpentine Creek (data sourced from PDP (2016) and Opus (2013))

Parameter	Waihi River					Serpentine Creek					ANZECC trigger value[1]	
	PDP (2016)		Opus (2013)			PDP (2016)			Opus (2013)			
	Upstream of Serpentine Confluence	Downstream of Serpentine Confluence	Upstream	Cole St	Downstream	at Domain	at Winchester Rd	above confluence	Upstream	Downstream	90%	95%
Recoverable Trace Elements (all in mg/L)												
Arsenic[2]	<0.0005	<0.0005	<0.0011	<0.0011	<0.0011	0.0013	<0.0005	<0.0005	<0.0011	<0.0011	0.042	0.013
Boron	0.007	0.007	0.0097	0.009	0.0088	0.011	0.015	0.015	0.020	0.021	0.680	0.370
Beryllium	<0.00001	<0.00001				0.00002	0.00002	<0.00001				
Cadmium	<0.00001	<0.00001				<0.00001	0.00002	0.00001				
Copper	0.0005	0.0005	<0.0005	<0.0005	<0.0005	**0.0020**	0.0010	0.0008	**0.0034**	0.0012	0.0018	0.0014
Chromium	<0.0002	<0.0002				0.00048	0.0002	<0.0002			1	0.01
Mercury*	<0.0001	<0.0001				<0.0001	<0.0001	<0.0001			0.0019	0.0006
Nickel	<0.0002	<0.0002				0.0004	<0.0002	<0.0002			0.013	0.011
Lead	<0.00005	<0.00005				0.0011	0.0005	0.0001			0.0056	0.0034
Zinc	<0.001	<0.001	<0.0011	<0.0017	0.0011	**0.023**	0.007	0.012	**0.052**	**0.032**	0.015	0.008
Soluble Trace Elements (all in mg/L)												
Arsenic	<0.0005	<0.0005				0.0011	<0.0005	<0.0005			0.042	0.013
Boron	0.01	0.01				0.01	0.01	0.01			0.680	0.370
Beryllium	<0.00001	<0.00001				0.00001	0.00002	<0.00001				
Cadmium	0.00001	<0.00001				<0.00001	<0.00001	0.00001				
Copper	0.0005	0.0004				0.0017	0.0008	0.0009			0.0018	0.0014
Chromium	<0.0002	<0.0002				0.0002	<0.0002	<0.0002			1	0.01
Mercury	<0.0001	<0.0001				<0.0001	<0.0001	<0.0001			0.0019	0.0006
Nickel	<0.0002	<0.0002				0.0005	<0.0002	<0.0002			0.013	0.011
Lead	<0.00005	<0.00005				0.00041	<0.00005	<0.00005			0.0056	0.0034
Zinc	<0.001	<0.001				**0.024**	0.0051	0.014			0.015	0.008

Notes:

1) *ANZECC trigger values were converted from µg/L to mg/L*
2) *Arsenic (ASV) trigger value was used as it is more conservative*
3) *Laboratory non-detects have not been assessed against ANZECC species protection levels*

* *In organic mercury*

Bold *values indicate concentrations that do not meet the 90th species protection level, while underlined values indicate concentrations that do not meet the 95th species protection level*

Results from the Opus (2013) and PDP (2016) survey indicated that total and dissolved copper and zinc were elevated within Serpentine Creek within the SMA. The high dissolved metals fraction of zinc at the Geraldine Domain within Geraldine Township could present a toxicity risk to aquatic biota. However, it has yet to be determined if the elevated concentrations of metals are naturally sourced. There were no guideline exceedances in the Waihi River, with the majority of the total and dissolved metals less than the laboratory detection limit. At sites where concentrations were above the laboratory detection limit, no increase was observed downstream of the Serpentine Creek confluence.

Nutrients (particularly Nitrate-N) were elevated throughout Serpentine Creek and were observed to increase downstream. Sections of unfenced agricultural land, localised pathways of land run-off and stock access appeared to be common adjacent to Serpentine Creek downstream of the Geraldine Township. This could be contributing to the elevated nutrient concentrations that were observed in Serpentine Creek.

Serpentine Creek nutrient values indicated that enrichment was occurring downstream. Increases of Nitrate-N, Total Nitrogen and Total Phosphorus were observed in both the PDP and Opus surveys, and could be a result of agricultural inputs and/ or run-off from adjacent land.

Overall, Serpentine is currently in a poor ecological and water quality condition, however, the discharge of Serpentine Creek into the Waihi River does not appear to negatively impact the downstream environment.

3.6.3 Waihi River Flows

The Waihi River is typical of many small to medium hill – fed rivers in Canterbury in that the river can be divided into two distinct areas: the steeper, permanently flowing headwaters and the lower gradient, intermittent reaches below the Geraldine Township. A report conducted by Wilson, (2013) indicates that the section of the Waihi River through the Geraldine Township is a 3 to 4 km long losing reach of river where the river is gaining for approximately 2 km upstream of the township. The Waihi River is additionally fed by small spring fed streams such as Dobies Stream, Worners Creek and Raukapuka Creek. A site assessment undertaken by PDP (2016) indicated that the Waihi River in the vicinity of Geraldine Township has variable flow and can remain dry for periods of the year, typical flows in the river are generally less than 1 m^3/s.

There is only one flow measurement site located on the Waihi River, at Waimarie in the gorge approximately 12 km upstream of the Geraldine SMA. River flow gaugings from this site between 1 January 2014 and 1 November 2018 indicated an average daily flow of 0.83 m^3/second with a minimum average daily flow flow of 0.13 m^3/second on 5 February 2015 and a maximum average daily flow of 36.02 m^3/second on 18 April 2014. Periods of high flows occurred during the

warmer months (November, January and April) while smaller flood events occurred during the winter months. This highlights the Waihi River suseptability to flooding during warmer months where warm westerly airflow meets a cold southerly change causing a heavy rainfall over the catchment.

3.6.4 ECan Surface Water Quality

Surface water quality data has been summarised for four ECan sites (Figure 5, Appendix A) on the Waihi River; two sites are located in the lower catchment downstream of the Geraldine Township (ECan site SQ202326 and SQ20325), one site is located in the vicinity of the Geraldine Township (ECan site number SQ20328) and the fourth site is located in the upper catchment at Waimarie (ECan site number SQ20332). Additional to the Waihi River sites, ECan sample a spring-fed – plains site on the Raukapuka Creek (ECan site SQ20318). This site is located in a predominantly agricultural catchment located on the plains to the north of the Waihi River, and represents a catchment that is mainly free from 'urban contaminants'. ECan sampled all four of the above sites on the Waihi River until 2013, currently only Waihi River at Waimarie is sampled as part of the State of the Environment monitoring. Summary data analysis was restricted from 1998 onwards to better reflect current state.

Additional water quality data for the Waihi River is available from the PDP (2016) and the Opus (2013) investigations. However, the evaluation of water quality within the Waihi River catchment has been restricted to the water quality data collected by ECan. A summation of results observed by the PDP and Opus investigations is available in PDP (2016a) and Section 3.6 of this AEE.

A summary of key water quality parameters is provided in Table 5. Summary water quality statistics were compared against regional objectives (Table 1a, LWRP 2015) and, where applicable, national trigger values (ANZECC 2000, Hickey 2013, National Policy Statement for Freshwater Management 2014; in Table 5). Water quality analysis has been undertaken on monthly and quarterly sampling events for dissolved oxygen, nutrients (nitrogen and phosphorus), total suspended solids and *E. coli*.

Table 5. Summary surface water quality results from sites located on the Waihi River (ECan data).

		DO	DO Sat	Temp.	Cond.	NH4N	NH4N*	NNN	DIN	TN	DRP	TP	TSS	Turbidity	E. coli
		mg/L	%	° C	mS/m	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU	E.coli/100mL
Waihi River Sites – Hill-fed – upper															
SQ20332	min	6.0	**58.9**	0.3	3.8	0.003	0.001	0.021	0.030	0.040	0.001	0.002	0.2	0.1	1
	median	10.6	99.5	10.0	6.9	0.005	0.003	0.150	0.157	0.205	0.004	0.005	0.6	0.3	34
	max	15.0	111.2	20.0	11.0	0.310	0.173	**1.600**	1.603	**1.700**	**0.014**	**0.047**	**4.8**	**4.2**	727
	N	112	111	112	114	114	111	114	114	114	114	112	114	114	105
	average	10.8	97.1	9.6	6.8	0.012	0.009	0.194	0.206	0.255	0.004	0.007	0.8	0.5	92
SQ202328	min	6.2	**62.3**	5.3	7.0	0.003	0.002	**0.300**	0.316	**0.400**	0.001	0.004	0.2	0.1	1
	median	9.8	94.2	11.7	10.3	0.015	0.009	**1.300**	1.311	**1.500**	**0.009**	0.012	1.0	0.4	58
	max	13.6	113.8	18.7	15.0	0.110	0.075	**3.500**	3.509	**3.500**	**0.032**	**0.170**	**86.0**	108.0	820
	N	58	58	59	61	61	59	61	61	61	61	59	61	61	50
	average	9.9	93.9	12.1	10.5	0.021	0.012	1.359	1.380	**1.499**	0.010	**0.016**	3.3	**2.4**	159
SQ20326	min	5.5	**56.1**	6.5	9.0	0.003	0.001	**0.990**	1.002	**1.000**	0.002	0.004	0.3	0.1	16
	median	10.2	97.7	11.1	11.0	0.012	0.006	**1.700**	1.703	**1.700**	0.006	0.009	1.6	0.4	150
	max	97.5	108.2	15.5	21.0	0.079	0.034	**3.400**	3.419	**3.400**	**0.021**	**0.029**	**11.0**	**6.0**	2400
	N	52	49	53	53	53	51	53	53	53	53	51	53	53	47
	average	11.6	94.2	11.2	11.1	0.014	0.007	1.705	1.718	**1.833**	0.007	0.011	**2.2**	0.7	241
SQ20325	min	6.0	**60.2**	6.8	9.1	0.003	0.002	**0.740**	0.751	0.860	0.002	0.004	0.2	0.1	6
	median	10.1	97.9	11.2	11.0	0.013	0.008	**1.400**	1.406	**1.500**	0.005	0.010	1.8	0.5	120
	max	13.8	117.5	16.2	20.0	0.078	0.074	**3.200**	3.217	**3.200**	**0.018**	**0.029**	**12.0**	**2.4**	1300
	N	59	56	61	61	61	59	61	61	61	61	59	61	61	50
	average	10.1	95.9	11.6	10.9	0.018	0.011	**1.506**	1.524	**1.652**	0.006	0.012	**2.5**	0.7	221
Triger Values/ Objectives															
LWRP (2013) – Hill fed - upper			90	20											
NPSFM (2014) – Attribute B (median)		>5.0 and ≤7.5					>0.03 and ≤ 0.24	>1.0 and ≤ 2.4							
ANZECC (2018)[a]		6	81 - 101		11.6		<0.01	0.265 [b]		0.913	0.008	0.014	2.1	1.3	

Table 5. Summary surface water quality results from sites located on the Waihi River (ECan data).

		DO	DO Sat	Temp.	Cond.	NH4N	NH4N*	NNN	DIN	TN	DRP	TP	TSS	Turbidity	E. coli
		mg/L	%	° C	mS/m	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU	E.coli/100mL
Raukapuka Creek – Spring-fed – plains															
SQ20318	min	6.5	**11.6**	6.2	4.8	0.003	0.001	**0.820**	0.825	0.760	0.001	0.002	0.3	0.1	1
	median	10.2	95.8	11.4	11.0	0.005	0.002	**1.845**	1.855	**1.915**	0.006	0.012	**3.1**	1.0	387
	max	12.8	117.5	15.8	15.3	0.030	0.019	**4.900**	4.905	**5.000**	**0.076**	**0.120**	**14.0**	**22.0**	2420
	N	105	105	105	105	105	101	106	106	106	106	106	106	106	106
	average	10.2	94.4	11.4	11.5	0.007	0.003	**2.114**	2.121	**2.173**	0.005	0.010	**2.9**	**1.6**	506
Triger Values/ Objectives															
LWRP (2013) – Spring-fed - plains			70	20											
NPSFM (2014) – Attribute B (median)		>5.0 and ≤7.5					>0.03 and ≤ 0.24	>1.0 and ≤ 2.4							
ANZECC (2018)[a]		6	81 - 101		11.6		<0.01	0.265 [b]		0.913	0.008	0.014	2.1	1.3	

Notes:

a) ANZECC (2018) default guideline values for physical and chemical stressors for Cool Dry Low-Elevation (CDL) sites (as per ANZECC, 2018)

b) In Canterbury waterways, nitrate is generally dominant over nitrite within Nitrate Nitrite Nitrogen (Stevenson et al., 2010). Therefore, the observed NNN concentrations were assessed against the respective NPSFM and ANZECC nitrate attribute states and guideline values.

Bold values indicate that trigger values/ objectives were not met.

3.6.4.1 Dissolved oxygen

Adequate dissolved oxygen is essential for instream fauna while low dissolved oxygen levels can be a major stressor to aquatic life, including fish, invertebrates and micro-organisms. A summary of the daytime spot dissolved oxygen concentration (DO) and percent saturation dissolved oxygen (DO Sat) is available in Table 5.

The lowest concentration of daytime DO at sites located within the Waihi River was 5.5 mg/L measured at SQ20326, whilst the spring-fed plains site SQ20318 recorded minimum daytime DO values of 6.5 mg/L. These results show that minimum DO concentrations may present minor stress to sensitive aquatic organisms. However, all sites had median daytime DO concentrations greater than 7.5 mg/L indicating that on average sites experienced DO concentrations that do not present any stress to sensitive aquatic organisms.

DO Sat fluctuated between sampling occasions at all sites. Median DO SAT values were above the 70 % (spring-fed plains) and 90 % (hill-fed lower) freshwater outcomes outlined in Table 1(a) (Table 5) at all sites. Occasionally, recorded DO SAT values were low and at some sites were well below the Table 1 (a) objectives (LWRP, 2013) and the ANZECC (2018) CDL lowest 20th percentile.

3.6.4.2 Temperature

Suitable water temperatures are a fundamental ecological requirement for aquatic life and the maximum temperature is the critical factor in a diurnal and seasonally variable temperature regime. Daytime spot temperature values were less than their respective daily maximum temperature objective of 20 °C for hill-fed lower and spring-fed plains river types (Table 5).

Note: The above measurements are spot measurements (a single point in time) and as such are not representative of the full diurnal pattern. However, the data do allow comparison of the range of daytime temperatures and dissolved oxygen values measured. Continuous DO and temperature monitoring would be required to determine the extent of low DO concentrations and maximum temperatures and thus the potential effect on aquatic life.

3.6.4.3 Nutrients

Nutrient (nitrogen and phosphorus) concentrations in river waters mainly affect the growth of periphyton (benthic algae) and macrophytes (aquatic plants). While periphyton is essential for ecosystem functioning as a primary food source, under certain circumstances it can proliferate causing degradation of aesthetic, recreational and biodiversity values of the river. Soluble nutrients such as dissolved inorganic nitrogen (DIN) and dissolved reactive phosphorus (DRP) are the bioavailable forms used by plants and are important in controlling proliferation of periphyton and plant growth in waterways. Nutrient enrichment

is therefore often discussed in relation to concentrations of DIN and DRP. Toxicity to aquatic life is an issue with high concentrations of nitrate-nitrogen and ammonia-nitrogen and trigger values are identified that protect aquatic ecosystems from such effects (ANZECC 2000, Hickey 2013, NPS FM 2014). Trigger values only provide an indication of the concentrations that may be potentially toxic to aquatic species, site specific toxicity investigations should be undertaken for exceedances of the trigger values.

Nutrient levels were elevated at the lower Waihi River sites, and were indicative of a moderately enriched to an enriched nutrient condition (as per Stevenson *et al* 2011). Median dissolved inorganic nitrogen (DIN) concentrations were observed to be highest at SQ20326 at Winchester Bridge (median = 1.703 mg/L) followed by the Te Awa Bridge site and the SH72 Bridge site (SQ20325 median DIN = 1.406 mg/L and SQ20328 median DIN = 1.311 mg/L, respectively). The most upstream site at Waimarie (SQ20332) recorded the lowest median DIN concentration of 0.157 mg/L. There were minimal differences in median dissolved reactive phosphorus (DRP) concentrations; were median DRP ranged from 0.004 mg/L at SQ20332 to 0.009 mg/L at SQ20328. Maximum nutrient concentrations occasionally exceeded the recommended guideline trigger values for the protection of aquatic ecosystems (ANZECC, 2000)

Kelly (2015), documented that nutrients in the Waihi River were “significantly contributed to” by the Barkers Creek sub-catchment which is located approximately 2.2 km upstream of the Geraldine Township. Furthermore, the current results indicated that the increases in biologically available nutrients (e.g., DRP and DIN) may be contributing to the high levels of cyanobacterial matts in the Waihi River downstream of the Barkers Creek confluence (Kelly, 2015).

3.6.4.4 Suspended Solids and Turbidity

Total Suspended Solids (TSS) and turbidity are two different indicators of water clarity and sediment inputs to waterways. Poor clarity (affected by suspended organic and inorganic matter in the water column) affects a range of ecological, amenity and recreational values of waterways. Turbidity and TSS can be naturally elevated during high flow conditions.

Turbidity values were generally indicative of good water clarity (median NTU = < 5) (Table 5). Generally, high TSS and turbidity values within the Waihi River catchment are associated with high flood flows, which carry higher amounts of sediment within the water column.

As has been detailed in Section 3.6.4, the Waihi River is susceptible to being influenced by water quality issues within its sub-catchments. Likewise, it is susceptible to the influence of nutrient loads to the Waihi River from Barkers Creek, the high sediment load that was observed by Kelly (2015) is influencing the aquatic ecosystem within the Waihi River downstream of the confluence.

3.6.4.5 *E Coli*

E.coli are the bacteria commonly used in freshwater as an indicator of the likely presence of pathogenic (disease causing) faecal contamination. The presence of faecal contamination primarily affects the suitability of water for human uses (e.g. contact recreation). The National Policy Statement for Freshwater Management (NPSFM) has five *E.coli* attribute states (A, B, C, D and E), where each state has four criteria that need to be met for water quality to be within that state. All four criteria must be met to establish the attribute state. Data analysis is to be undertaken on sites that have a minimum of 60 data points over a maximum of five consecutive years of sampling (see MfE/MPI (2017) for details on calculating E.coli attribute states). Table 6 shows the overall attribute states for two sites SQ20332, a hill-fed site located in the upper catchment of the Waihi River at Waimarie, and SQ20318, a spring-fed – plains site located in the lower catchment downstream of the Geraldine Township on the Raukapuka Creek.

E.coli values were generally within the NPSFM Attribute State A and B at the Waihi River at Waimarie site (SQ20332) and Attribute State E for the Raukapuka Creek site (SQ20318). At this level the Waihi at Waimarie site had annual *E.coli* values that were low, and generally had a < 2 % of infection during recreational activities. However, the Raukapuka Creek site (SQ20318), which drains a predominantly agricultural catchment, had an Attribute State of E between 2013 and 2017, which indicates a greater risk of infection during recreational activities. This site is also generally not suitable for swimming from a physical perspective, and more than 30% of the time it is estimated that that the predicted average infection risk is > 7%.

Table 6: *E.coli* attribute state

	Waihi River at Waimarie SQ20332	**Raukapuka Creek SQ20318**
Year	Overall attribute state	Overall attribute state
2013	A (Blue)	E (Red)
2014	-	E (Red)
2015	B (Green)	E (Red)
2016	-	E (Red)
2017	B (Green)	E (Red)

3.6.4.6 *E coli* in the Wider Opihi Catchment

Eight long term monitoring sites have been identified in the upper catchments of the Opihi, Opuha, Kakahu and Hae Hae Te Moana Rivers as shown in Appendix A, Figure 6. A summary of the *E.coli* record is shown in Table 7 below.

Table 7: *E.coli* Monitoring Results from Opihi, Opuha, Kakahu and Hae Hae Te Moana River Monitoring Sites

Site	Waterway	Monitoring Period	Sample Count	Average Value (MPN/100 mL)
SQ20229	Opihi River	2000-2013	49	140
SQ20230	Opihi River	1998-1999	16	327
SQ20231	Opihi River	2000-2013	49	239
SQ20235	Opihi River	2000-2012	31	167
SQ20276	Kakahu River	2002-2003	10	537
SQ35790	Opuha River	2011-2014	22	43
SQ20725	Hae Hae Te Moana	2001-2018	107	158
SQ21315	Hae Hae Te Moana	1998-2017	297	117

Of these wider Opihi catchment sites only two, located on the Hae Hae Te Moana River, had adequate data sets to allow an assessment of *E.coli* values against the current NPS FM E.coli attribute states (Table 8). The assessment shows that the Gorge site (SQ21315) had a relatively stable *E.coli* Attribute States with only one year being outside of Attribute States A and B. This indicates that there is a < 2% chance of infection to swimmers. The South Branch site (SQ20725), which is located downstream of the Gorge site, had stable *E.coli* Attribute States until 2014. The post 2014, *E.coli* Attribute States have fluctuated and indicate an increased risk of infection to swimmers at this site.

The Land, Air, Water Aotearoa (LAWA) database shows that the Gorge site (SQ21315) has an overall bacterial risk result of '*Medium Risk*'. This result outlines that the site is usually suitable for swimming, however at times there may be an increased risk of infection.

Table 8: *E.coli* attribute state		
SQ21315 Hae Hae Te Moana River at Gorge		**SQ20725 Hae Hae Te Moana River South Branch**
Year	Overall attribute state	Overall attribute state
2013	E (Red)	A (Blue)
2014	A (Blue)	A (Blue)
2015	A (Blue)	D (Orange)
2016	B (Green)	C (Yellow)
2017	A (Blue)	E (Red)

3.7 Groundwater

3.7.1 Overview

Groundwater in the vicinity of Geraldine is within the unconfined alluvial aquifers of the Canterbury Plains. Additional groundwater is also present within fissures in the Geraldine Downs basalt although at low yielding quantities, but is important for the base flows in Serpentine Creek. Groundwater in the area is mainly recharged from rainfall and surface waterway losses.

Geraldine is located within the Orari-Opihi Groundwater Allocation Zone and information from ECan received on 1 November 2018 states that this zone is 93.59% allocated.

3.7.2 Groundwater Levels and Flow Direction

Groundwater levels and flow direction are different for the alluvial Waihi/Orari sourced aquifers and the aquifer within the Geraldine Basalt. Alluvial aquifers typically contain high quantities of groundwater within pore spaces in the gravels, whereas basaltic aquifers are typically low yielding and contain groundwater within the fracture space of the rock mass. As a result of basalt having a low storage potential, it is expected that rainfall response on base flows in Serpentine Creek will be more rapid than for the Waihi River which is surrounded by alluvial gravels with a high storage potential.

3.7.2.1 Alluvial Aquifers

ECan's online GIS piezometric contours indicate that the shallow groundwater flow direction in the vicinity of Geraldine Township is in a south-south-east direction.

The elevation of shallow groundwater based on these piezometric contours ranges from approximately 125 m above sea level (masl) on the northern margin of town near the intersection of Main North Road and Templer Street to approximately 95 masl at the southern end of town. The piezometric elevations drop approximately 30 m over a distance of 3.4 km, giving a piezometric gradient of approximately 0.0088.

A study undertaken by Wilson, (2013) indicates that groundwater near the Orari River is encountered within shallow quaternary deposits less than 20 m deep. The report mentions that deeper water bearing zones exist but are often lower yielding and hence the shallow groundwater in the Orari Catchment is highly connected to surface water bodies. There is a downward vertical hydraulic gradient through most of the catchment.

Bores with water level information within and within 2 km of the Geraldine SMA are shown in Appendix A, Figure 7. This indicates that shallow groundwater is typically in the range of 1 to 4 m bgl with some wells in the area recording levels as high as 0.6 m bgl and as low as 9 m bgl. To the south west of the SMA near the Te Moana River groundwater levels appear to be lower in this area with static water levels up to 16.5 m bgl.

Additionally there are several springs located on the eastern side of the Waihi River indicating that the shallow groundwater is closer to the surface in the Raukapuka area. Springs are also present downstream of Kennedy Street near the southernmost extent of the Geraldine SMA. Baseflows observed in the Waihi River during the PDP site visit in 2016 indicated that there is a receeding flow in both the Waihi River and Serpentine Creek in the Geraldine township. This suggests that there are surface waterway losses to ground in the Geraldine area and therefore spring sources are expected to originate higher up in the catchment.

3.7.2.2 Basaltic Aquifer

There is one known bore drilled within the Geraldine Downs Basalt (J38/0657), shown in red in Appendix A, Figure 7. This bore was drilled to a depth of 54 m and is part of the ECan monthly monitoring network. Water level records are available from February 2012 to October 2018 and indicate a groundwater level from 40.29 to 41.4 m bgl. This bore is listed as low yielding with a yield of 0.33 L/s and a drawdown of 10 m. Additionally a spring has been identified within the Geraldine Basalt on the southern flanks of the hill (J38/0728). However, details of this spring have not been confirmed but it is assumed this is derived from low elevation seepage from the basaltic aquifer which would be consistent with base flows observed in Serpentine Creek.

It is expected that there is some interaction with the Geraldine Basalt aquifer and the lowland alluvial aquifers however the relationship is currently unknown.

Additionally, there may be some input from lower hill seepage from the basalt into the headwaters of Serpentine Creek, however this is currently unknown.

3.7.3 Water Supply Wells

There are 47 active and proposed bores within the close vicinity and 2km down-gradient of the Geraldine SMA that are listed as used for domestic or community supply (not including stock water supply) either as a primary or secondary use. Seven of these bores are located within the management area. The location of these bores is shown in Appendix A, Figure 8. As shown, 22 of these bores are 10 m deep or less, with a further 7 being between 10 and 20 m deep.

3.7.4 Groundwater Quality

There are 9 bores with water quality data within 2 km down and across gradient of the Geraldine SMA. The locations of these bores are shown in Appendix A, Figure 9 and details are presented in Table 9 below.

Table 9: Bores with Groundwater Quality Data Near the Geraldine SMA

Bore	Depth	Number of Water Quality Samples	Sampling Period
J38/0004	4.85	7	2015 - 2018
J38/0615	30.4	1	2015
K38/0041	9	1	2015
K38/0468	5	33	1994 - 1999
K38/0469	6.5	34	1994 - 1999
K38/0472	5	33	1994 - 1999
K38/0712	9.5	1	2015
K38/0819	5.9	13	2006 - 2007
K38/1001	8.5	1	2006

As shown in Table 9, groundwater sampling in these bores is limited with no data from 2000 to 2005 and from 2008 to 2014. Additionally, only 5 of the 10 bores have more than one sample.

The groundwater quality sampling in these bores does not cover zinc which is a dominant contaminant found in stormwater runoff, but not typically at levels of concern to drinking water quality. However, the sampling covers nitrate, E. coli and faecal coliforms which are indicators of groundwater quality in the area.

A summary of nitrate nitrogen sampling in bores in Figure 9 are summarised in Table 10 below.

Table 10: Nitrate Nitrogen Summary				
Bore	**Minimum Concentration (mg/L)**	**Average Concentration (mg/L)**	**Maximum Concentration (mg/L)**	**NZDWS Maximum Acceptable Value (mg/L)**
J38/0004	0.7	1.89	4	11.3
J38/0615	0.89	0.89	0.89	
K38/0041	1.99	1.99	1.99	
K38/0712	1.39	1.39	1.39	
K38/0819	0.7	2.27	3.3	
K38/1001	0.5	0.5	0.5	

Table 10 shows that nitrate concentrations in groundwater are elevated, although still remain below the DWSNZ (2008) guideline value. This is likely a result of surrounding agricultural land use rather than from stormwater discharges.

A summary of the *E. coli* and faecal coliform sampling undertaken on the bores in Figure 9 are presented in Table 11 below.

Table 11: E. coli, Faecal Coliform and Total Coliform Summary					
Bore	**Parameter and Units**	**Minimum Concentration**	**Median Concentration**	**Maximum Concentration**	**DWSNZ (2008) Maximum Acceptable Value**
J38/0004	*E. coli* (MPN/100 mL)	< 1	6	35	< 1
	Total coliforms (MPN/100 mL)	< 1	19	313	
J38/0615	*E. coli* (MPN/100 mL)	< 1	< 1	< 1	
	Total coliforms (MPN/100 mL)	< 1	< 1	< 1	

Table 11: E. coli, Faecal Coliform and Total Coliform Summary					
Bore	**Parameter and Units**	**Minimum Concentration**	**Median Concentration**	**Maximum Concentration**	**DWSNZ (2008) Maximum Acceptable Value**
K38/0041	*E. coli* (MPN/100 mL)	< 1	< 1	< 1	
	Total coliforms (MPN/100 mL)	3	3	3	
K38/0468	Faecal coliforms (CFU/100 mL)	< 1	< 1	7	
K38/0469	Faecal coliforms (CFU/100 mL)	< 1	1	45	
K38/0472	Faecal coliforms (CFU/100 mL)	< 1	4	> 2000	
K38/0712	*E. coli* (MPN/100 mL)	< 1	< 1	< 1	
	Total coliforms (MPN/100 mL)	2	2	2	

Bacterial contaminants have been recorded in 6 of the 7 bores in Table 11, which exceed the DWSNZ (2008) criteria. The bacterial indicators presented in Table 3 do not display any spatial pattern and higher values appear to be caused by local influences. Opus (2014) evaluated that high bacterial concentrations are likely a result of possible bore head contamination and/or a result of surrounding agricultural use rather than from stormwater discharges.

A search of bacterial contaminant concentrations in groundwater monitoring bores in the wider Orari/Waihi catchment (Table 11) indicated that similar concentrations to the Geraldine area are present in the wider catchment. This would support the Opus (2014a) suggestion that the source of these contaminants is likely to be a result of surrounding rural land use or bore head contamination rather than principally from urban stormwater sources. A summary of the maximum bacterial contaminant concentrations in bores in the wider Orari/Waihi catchment are provided in Table 12 below and the location of these bores are presented in Appendix A, Figure 10.

Table 12: Maximum Bacterial Contaminant Concentration in Bores in the Wider Orari/Waihi Catchment

Bore Number	Maximum *E. coli* concentration (MPN/100mL)	Maximum Faecal coliform concentration (CFU/100mL)	Maximum total coliform concentration (MPN/100mL)
BY19/0013	< 1	-	< 1
BY19/0029	< 1	-	< 1
J37/0045	93	-	345
J37/0053	< 1	-	< 1
J37/0092	2	-	15
J37/0185	< 1	-	< 1
J37/0189	< 1	-	< 1
J37/0202	< 1	-	< 1
K37/0671	< 1	-	< 1
K38/0296	1	-	145
K38/0408	6	3	130

Although the highest concentrations of bacterial contaminants were observed in the downstream bores, this is likely to be a result of cumulative agricultural land use in the upstream catchment. Bacterial contaminants were also observed up-gradient of the Geraldine SMA.

While, zinc is a common contaminant found in stormwater discharges, it has not been sampled for in any of the groundwater monitoring wells in Table 9 or in the wider Waihi River catchment.

3.8 Ecological Description

3.8.1 Macroinvertebrate Community

3.8.1.1 Environment Canterbury State of the Environment Monitoring

ECan undertakes regular long term macroinvertebrate monitoring upstream of the Te Awa Road bridge in the lower Waihi River. Monitoring of the site began in the summer of 2003 – 2004, with the latest results obtained over the 2017 – 2018 summer. Likewise, NIWA historically undertook sampling of one site in the Waihi Gorge (in the upper Waihi catchment). Monitoring for this site began in the summer of 1999/2000 with sampling finishing in the summer of 2010/2011. Geraldine Township is located approximately halfway between these two sites.

Historically, results indicate that the macroinvertebrate community is healthier and dominated by sensitive taxa that are susceptible to changes in the in-stream environment at the Waihi Gorge site. While at the Te Awa Road site the macroinvertebrate community fluctuates from year to year. Sensitive taxa are generally less common at the Te Awa site than at Waihi Gorge site. The quantitative macroinvertebrate community index (QMCI) is a common statistic that calculates a single number to indicate the overall condition of a water body. QMCI values range from 1 through to > 6, a QMCI score > 6 indicates that the stream is of good quality with high biotic health. A QMCI value of 1 indicates that the stream is of low quality with the probability of pollution and poor biotic health. The Land and Water Regional Plan (LWRP) has a minimum QMCI score for hill fed lower rivers of 6, indicating clean water of excellent health. The Waihi River at the Gorge site achieved greater than the minimum LWRP value (mean QMCI = 7.7, Table 13) on all sampling occasions. At the Te Awa Bridge site the QMCI value was less than the LWRP outcome on multiple occasions (mean QMCI = 5.0), only during 31% (n=5) of sampling occasions did the QMCI value not exceed the LWRP minimum (Appendix A, Figure 11a).

Table 13: Summary macroinvertebrate statistics from Waihi River (ECan - aquatic ecosystem health programme only)

		N	Mean	Median	Min	Max
Waihi Gorge (NIWA)	QMCI[1]	12	7.7	7.8	6.8	8.2
	MCI[2]	12	130.2	129.1	120.0	145.8
	Taxa	12	208	132	85	687
	Abundance	12	18	17	11	26
	%EPT	12	85.2	85.3	71.2	97.2
	%EPTsensitive[3]	12	85.9	86.5	71.2	97.2
Lower Waihi – Te AWA Road (ECan)	QMCI[1]	16	5.0	5.4	2.8	6.6
	MCI[2]	16	98.2	98.1	77.1	121.2
	Taxa	16	19	18	12	24
	Abundance	16	121	111	102	236
	%EPT	16	57	71	7	92
	%EPTsensitive[3]	16	53	70	2	92

Note:

1. QMCI: Score >6 indicates clean water, 'excellent'; 5.0 – 5.99 mild pollution, 'good'; 4.0 – 4.99 moderate pollution 'fair'; <4.0 probable severe pollution, 'poor'.

2. MCI: Score >120 indicate clean water, 'excellent'; 100-119 mild pollution, 'good'; 80-99 moderate pollution, 'fair; <80 probable severe pollution, 'poor'.

3.%EPTsensitive refers to taxa within the mayfly, stonefly and caddisfly orders that are susceptible to changes in the in stream habitat and are not tolerant of pollution.

3.8.1.2 Pattle Delamore Partners Ltd Investigation

An investigation into the ecological characterisation of the receiving environment in the vicinity of Geraldine Stormwater discharges was undertaken in October 2016. Three sites on the Waihi River were sampled for aquatic macroinvertebrates, one site upstream of Geraldine (Site 11), one site within the vicinity of the Township (Site 9) and at one site downstream of the Serpentine Creek confluence (Site 10). Results are presented in Table 14 and sites are shown in Figure 5.

A total of 39 taxa, 27 of which were aquatic insects, were collected from the three sampling sites. Dominant species recorded include the caddisfly *Pycnocentrodes sp* (33 %), the mayfly *Deleatidium sp* (21 %). Other relatively common taxa (> 1 % of total abundance) include Chironomidae (16 %), the caddisflies *Oxyethira sp* (6 %), *Hudsonema amabile* (2 %) and *Psilochorema* sp (2 %), the mollusca *Potamopyrgus antipodarum* (5 %), segmented worms (3 %),

and the crustacea *Cladocera* (2 %). All other taxa had a relative abundance of < 1%. Dipterans were the most diverse order, with 12 different taxa identified, followed by caddisflies (ten taxa), crustacea and mollusca (four taxa), coleoptera (three taxa) and mayfly and stonefly taxa with one each.

Macroinvertebrates from mayfly, stonefly and caddisfly orders (EPT) are generally the most sensitive macroinvertebrates within the water body. Low EPT usually coincides with low MCI and low habitat health, and vice versa. The highest sensitive EPT abundance was observed at Site 11 (upstream of Geraldine) with 85 $\%EPT_{abundance}$. This was predominantly made up of two taxa; the caddisfly *Pycnocentrodes sp* (920 individuals) and the mayfly *Deleatidium sp* (490 individuals). Sensitive EPT abundance decreased at downstream sites with Site 10 (downstream of Serpentine Creek outlet) recording the lowest. To calculate sensitive $\%EPT_{abundance}$, less sensitive caddisfly taxa from the genera Hydroptilidae have been removed. Hydroptilidae taxa are more robust and tolerant of pollution (especially high nutrient concentrations and increased algae abundances) and are therefore not a good indicator of pollution.

MCI scores for the four sites range from 82.5 to 102.3. This indicates that these sites are affected by probable water quality issues with overall fair quality (MCI 80 - 99) through to sites with mild pollution and good quality (MCI 100 – 119).

A reduction in MCI score was evident between Sites 11 (Upstream of Geraldine) and Site 9 (Upstream of Serpentine Creek) with an MCI of 102.3 and 84.0, respectively. Little change was observed between Sites 9 and 10 (Downstream of the confluence with Serpentine Creek), with an MCI of 84.0 and 82.5, respectively. The differences between the two downstream sites are too close to make any meaningful assumptions on macroinvertebrate community composition upstream and downstream of the Serpentine Creek confluence. However, the reduction in MCI value between Site 11 and Site 9 does show that there is a change in the macroinvertebrate community between these sites. QMCI scores for the three sites range from 3.0 to 5.7. QMCI values < 4.00 were observed at Sites 9 and 10 and are indicative of being effected by probable water quality issues with overall poor quality, while at Site 11 the QMCI value was > 5.00 which is indicative of possible water quality issues with overall good quality.

Low flows and significant drying of downstream reaches occurred in the weeks preceding the PDP sampling. Low flows can significantly affect the macroinvertebrate community by restricting the available habitat for sensitive species (especially EPT taxa), increasing the presence of nuisance periphyton growth and reducing the amount of viable wetted habitat. These changes ultimately cause a shift in the macroinvertebrate community structure to one dominated by less sensitive habitat generalist species. This shift in the macroinvertebrate community, from one dominated by sensitive EPT taxa to one dominated by less sensitive taxa, is likely resulting in the lower QMCI and MCI values observed at the downstream Waihi River sites.

It should be noted that all sites were below the LWRP Hill-fed lower minimum QMCI value of 6.

Table 14: PDP summary macroinvertebrate results for three sites on the Waihi River

	Site 11	Site 9	Site 10
Total number of taxa	26	25	24
Number of individuals	1789	390	584
MCI	102	84	83
QMCI	**5.7**	**3.8**	**3.0**
$\%EPT_{taxa}$	38	24	21
$\%EPT_{abundance}$	85	22	7

Notes:
***Bold** values indicate samples that do not meet the LWRP Hill Fed lower QMCI outcome of 6*

3.8.1.3 Opus Ecological Investigation

In 2013 Opus undertook a similar macroinvertebrate investigation to PDP with the inclusion of two sites on Serpentine Creek. The Opus sampling was undertaken in July and August, and therefore is likely to represent a macroinvertebrate community that is present at higher flows than what was observed during the PDP sampling. Summary results are available in Table 15.

A total of 43 taxa, 27 of which were aquatic insects, were collected from the five sampling sites. Dominant species recorded include the mayfly *Deleatidium sp* (59 %) and the mollusca taxa *Potamopyrgus antipodarum* (21 %). Other relatively common taxa (> 1 % of total abundance at all sites) include ostracods (4 %) from the faunal grouping crustacea, the mollusc *Physa sp* (5 %) and segmented worms (2 %). All other taxa had a relative abundance of < 1%. Caddisflies were the most diverse order, with 11 different taxa identified, followed by dipterans (seven taxa), mollusca (six taxa), crustacea (five taxa), stoneflies (three taxa) and coleoptera (two taxa), the remaining faunal groupings only had one taxa each identified.

The highest sensitive EPT abundance was observed at the Cole Street Waihi River site and the upstream Waihi River site with 97 % and 96 $\%EPT_{abundance}$, respectively. This was predominantly made up by the mayfly *Deleatidium sp* (565 and 924 individuals, respectively). Sensitive EPT abundance decreased slightly at the furthest downstream site (upstream of Serpentine Creek confluence) with 92 $\%EPT_{abundance}$. Sensitive EPT abundance was low (1 %) to nil at the Serpentine Creek sites, indicating that the macroinvertebrate community within Serpentine Creek is dominated by taxa that are more tolerant of lower habitat and water quality.

MCI[1] scores at the two Serpentine Creek sites indicated that these sites were affected by probable severe water quality issues with overall poor quality (MCI 80 - 99). While the MCI scores at the Waihi River sites indicated that these sites were affected by mild pollution and good quality (MCI 100 – 119).

A reduction in MCI score was evident between the Upstream Waihi Rivers sites and the downstream site at Coles Street with an MCI of 115.8 and 104.6, respectively. The MCI score then increased at the furthest downstream Waihi River site to an MCI score of 110.

Within Serpentine Creek, there was an observable difference between the Upstream and Downstream sites, with an MCI of 53.2 and 70.7, respectively. The differences between the two Serpentine Creek sites show that there is potential for a change to a relatively more sensitive macroinvertebrate community at downstream habitats. The MCI scores observed within the Waihi River were relatively close between sites to make any meaningful assumptions on macroinvertebrate community composition.

QMCI[1] scores for the two Serpentine Creek sites were < 4.00 indicating sites affected by probable water quality issues with overall poor quality, while the sites on the Waihi River had QMCI value was > 5.99 which is indicative of clean water with excellent quality.

It should be noted that all sites the Waihi River sites were above the LWRP Hill-fed lower minimum QMCI value of 6, while the Serpentine Creek sites were less than the LWRP spring fed plains- urban river type.

[1] MCI and QMCI at Serpentine Creek sites was calculated as per MCI for soft-bottomed streams. This differs from the standard MCI calculation by allocating specific soft-bottomed stream macroinvertebrate taxa scores between 1 (pollution tolerant) and 10 (pollution intolerant) depending on each taxon's tolerance to organic enrichment and is based on presence/absence data.

Table 15: Opus (2013) summary macroinvertebrate results for sites on the Waihi River and Serpentine Creek

	Waihi River			Serpentine Creek	
	Upstream	Coles St	Downstream	Upstream	Downstream
Total number of taxa	19	13	22	10	23
Number of individuals	1029	660	1175	5354	3544
MCI	115.8	104.6	110	53.2[1]	70.7[1]
QMCI	7.8	7.5	7.6	**2.02**[1]	**2.17**[1]
$\%EPT_{taxa}$	52.6	61.5	50	0	13
$\%EPT_{abundance}$	96.4	96.67	92	0	1

Notes:
***Bold** values indicate samples that do not meet the LWRP Hill Fed lower QMCI minimum of 6 (Waihi River) or the spring-fed – plains urban (Serpentine Creek) QMCI minimum of 3.5.*
1) MCI and QMCI at Serpentine Creek sites was calculated as per MCI for soft-bottomed streams.

3.8.2 Fish Diversity

According to the New Zealand Freshwater Fish Database (NZFFD) the wider Waihi River catchment has been surveyed five times for fish communities between 1985 and 2012. Five species of native fish were identified within the catchment, three of which are classified as declining by Dunn *et al.* (2017) (see Table 16). One introduced species was identified within the catchment.

Due to the intermittent nature of the middle sections of the Waihi River, diadromous migration (e.g., species that must undertake a period of migration to the sea to complete their life cycle) is not a common life history trait of fish species identified in the upper catchment. However, the prevalence of diadromous fish species within the lower Waihi River identifies that this section of the catchment is an important habitat for diadromous species.

No fish species have been recorded in the NZFFD for Serpentine Creek. However, during a PDP site visit on the 18th October 2016 a small population of bully's (most likely common bully (*Gobiomorphus cotidianus*)) were identified within pooling water within the vicinity of the Geraldine Township.

Opus (2013) undertook electric fishing and trapping during an ecological investigation of the Waihi River and Serpentine Creek in July/ August 2013. Three sites on the Waihi River and two sites on Serpentine Creek were sampled. Four species of native fish were recorded within the Waihi River, including upland and common bully, Canterbury galaxias (*Galaxias vulgaris*) and koaro (*Galaxias brevipinnis*), of which koaro are described as being 'at risk – declining' by Dunn *et al* (2017). At the upstream Serpentine Creek site only shortfin eel (*Aquillia australis*) were recorded.

The culverts (associated with road/stream intersects) observed during the PDP site visit, were not considered to restrict fish passage. However, the outlet of the culvert at the confluence of Serpentine Creek and the Waihi River was perched and would restrict fish passage to the Serpentine Creek catchment. If remediation work is to be undertaken on the Serpentine Creek outlet to the Waihi River, then any potential increase in access to upstream habitats by fish is likely to be limited by the available aquatic habitat and water level/flows of the creek. PDP did not inspect the entire length of Serpentine Creek and therefore cannot confirm whether further restrictions to fish passage occur within the catchment.

Table 16: Fish species known to occur within the Waihi River and its tributaries (data sourced from the NZFFDB, threat status from Dunn *et al* (2018)).

Scientific name	Common Name/ Māori Name	Date identified range	Threat Status	Diadromous	Catchment
Anguilla australis	Shortfin eel	2006	Not Threatened	Y	Lower Waihi River
Anguilla dieffenbachia	Longfin eel / tuna	2006	At risk - Declining	Y	Lower Waihi River
Cheimarrichthys fosteri	Torrentfish / piripiripōhatu	2011 & 2012	At risk - Declining	Y	Lower Waihi River
Galaxias vulgaris	Canterbury galaxias	1985 & 1996	At risk - Declining	N	Upper Waihi River and Upper Waihi River Tributary
Gobiomorphus breviseps	Upland bully	1986 & 1996	Not Threatened	N	Upper and Lower Waihi River and Upper Waihi River Tributary
Gobiomorphus cotidianus	Common bully	1996	Not Threatened	N (dependant on locality)	Upper Waihi River Tributary
Salmo trutta	Brown trout	1986, 1996 & 2006	Introduced and naturalised	At times	Upper and Lower Waihi River and Upper Waihi River Tributary

3.8.3 Sediment Health of Serpentine Creek

There is relatively little sediment quality data available for Serpentine Creek in the vicinity of Geraldine Township. At present the PDP investigation represents the spring conditions in Serpentine Creek. Sediment quality results are available in Table 17 below.

Overall, the sediment quality results show that lead (Pb) and mercury (Hg) exceeded the ANZECC ISQG-low trigger value at Site 2 at Geraldine Domain (Pb and Hg) and Site 7 at Winchester Road (Pb only) (Table 17). There were no exceedances at Site 8 (upstream of the Waihi River confluence) (Table 17).

The upper Serpentine Creek site at the Geraldine Domain (Site 2), is more impacted by high levels of certain PAHs, with ten of the 18 standard PAHs assessed found to exceed the ANZECC ISQG-low trigger value (Table 17). The high levels of PAH's at Site 2 are likely to originate from the surrounding township. There were no exceedances of the ANZECC ISQC-low trigger values at the other two sites, and concentrations were typically similar at both sites or lower at Site 8.

Petroleum hydrocarbons were detectable within the surface sediments at all sites within Serpentine Creek. Site 2 and Site 8 above the confluence had higher concentrations compared to Site 7 (Table 17). All of the hydrocarbons detected were within the C_{15}-C_{36} range (appearing to originate from heavy fuel oils, lubricating oils and waxes and related products.

Sediment samples taken from three locations on Serpentine Creek showed elevated concentrations of Pb and Mg; and some PAHs. The highest readings were observed at the most upstream site (at the Geraldine Domain in the Geraldine Township). Concentrations of both the heavy metals and PAHs reduced downstream; potentially due to sediments having settled out and PAHs not being biologically available and/ or their bioavailability declining.

Surface sediment was not collected from the Waihi River sites due to the substrate both upstream and downstream of the Serpentine Creek confluence being dominated by cobbles and gravels.

Table 17: Sediment Quality

Sample Description	Serpentine Creek			ANZECC Guidelines (2018)	
	Site 2 at Domain	Site 7 at Winchester Rd	Site 8 above confluence	ISQG-Low (Trigger value)	ISQG-High
Metals (mg/kg dry wt)					
Arsenic (As)	5.19	3.74	3.33	20	70
Beryllium (Be)	0.62	0.93	0.96		
Boron (B)	2.13	3.47	4.72		
Cadmium (Cd)	0.15	0.17	0.20	1.5	10
Chromium (Cr)	10.40	15.90	15.60	80	370
Copper (Cu)	13.40	19.10	14.40	65	270
Lead (Pb)	**64.80**	**56.90**	34.10	50	220
Mercury (Hg)	**0.16**	0.12	0.10	0.15	1
Nickel (Ni)	5.51	8.25	8.89	21	52
Zinc (Zn)	149.00	127.00	171.00	200	410
Total Polycyclic Hydrocarbons (PAH) (µg/kg)					
1-Methylnaphthalene	<10	<10	<10		
2-Methylnaphthalene	<10	<10	<10		
Acenaphthene	10	<10	<10	16	500
Acenaphthylene	**240**	30	20	44	640
Anthracene	**200**	30	20	85	1100
Benz[a]anthracene	**680**	70	50	261	1600
Benzo[a]pyrene	**650**	70	60	430	1600
Benzo[b]&[j] fluoranthene	880	100	90		
Benzo[g,h,i]perylene	430	50	60		
Benzo[k]fluoranthene	320	40	40		
Chrysene	**590**	70	70	384	2800
Dibenz(a,h)anthracene	**90**	<10	10	63	260
Fluoranthene	**1240**	130	110	600	5100
Fluorene	**30**	<10	<10	19	540
Indeno(1,2,3-cd)pyrene	540	60	60		
Naphthalene	<10	<10	<10	160	2100
Phenanthrene	**400**	40	30	240	1500
Pyrene	**1150**	130	100	665	2600
Benzo[a]pyrene TEQ	1000	90	100		
Total petroleum hydrocarbons (TPH) (mg/kg dry wt)					
C7-C9	<10	<10	<10		
C10-C14	<15	<15	<15		
C15-C36	251	192	260		

Table 17: Sediment Quality

Sample Description	Serpentine Creek			ANZECC Guidelines (2018)	
	Site 2 at Domain	Site 7 at Winchester Rd	Site 8 above confluence	ISQG-Low (Trigger value)	ISQG-High
C7-C36 (Total)	251	192	260		

Note:
***Bold** values indicate concentrations that do not meet the ISQG-Low (trigger value)*
<u>Underlined</u> values indicate concentrations that do not meet the ISQG-high value

3.9 Bio-accumulation – Arowhenua Study

A NIWA 2010 study aimed to quantify the risk (i.e., "*allowable monthly meals*") to local iwi members of consuming wild foods (i.e., eel, trout, and water cress) gathered within the wider rohe of Arowhenua, including from the Waihi upstream of Winchester (E:1462136; N:5106617). The study investigated the potential health risk from of bio-accumulation in wild foods from organochlorine pesticides, polychlorinated biphenyls (PCBs), and dioxins and selected metals and metalloids such as mercury (Hg), arsenic (As), cadmium (Cd), lead (Pb), copper (Cu), chromium (Cr), nickel (Ni) and zinc (Zn).

The potential health risk from consuming wild foods at the Waihi River site upstream of Winchester are summarised below:

- Based on the NIWA, 2010, study the consumption of eel from the Waihi River upstream of Winchester should be limited to between 1-4 meals/month, i.e., ≤ 1 meal per week. DDE, dieldrin and PCBs were the predominant contaminant contributing to greater than 10% of the risk across the district
- There is less caution when consuming trout from the Waihi River site upstream of Winchester, on average trout had a consumption limit of 8.4 meals/month, with arsenic being the dominant contaminant component.
- Analysis of the amount of watercress that can be consumed at the Waihi River site upstream of Winchester showed that watercress can safely be consumed >9.7 meals/month, with arsenic being the dominant contaminant component across the district.

The NIWA, 2010, study concluded that:

- "…if harvesting was carried out randomly across all sites and consumption rates were as calculated from the questionnaire data, then there is no significant risk to Arowhenua iwi". There was a greater risk of consuming eels than other food sources, with trout also being a "*probable cause for concern*".

The NIWA study showed that consumption of tuna/eel form the Waihi River site should be restricted at this site (i.e., to $\leq$ 1 meal per week). Mercury was identified as the most significant contaminant associated with consumption of tuna/eel.

The results from both the PDP (2016) and Opus (2013) ecological studies showed that contaminants causing the observed bioaccumulation risks were low in both the Serpentine Creek and Waihi River, and also these contaminants are not typically prevalent in urban stormwater discharges to any significant concentrations.

3.10 Flooding History

3.10.1 Waihi River

PDP has undertaken a prelimilary flood frequency estimate in the Waihi River using ECan's *Technical Report R11/11 Review of Flood Frequency in Temuka and Orari Rivers* (ECan, 2011), utilising flood frequency estimates at Waimarie (Waihi) and Masons Road (Temuka) sites (Table 18). The stormwater flow estimates are based on the assumption that a 24 hour rainfall event causes peak flows in the Waihi River as a result of a triangular rainfall hyetograph (CCC 2003).

Table 18: Preliminary Evaluation of Flood Frequency of the Waihi River

Return Period (years)	Geraldine (0.8 km^2)	Waihi (99.5 km^2)	% Urban Discharge
Existing			
5	1.4 m^3/s	118 m^3/s	1.2%
10	1.8 m^3/s	171 m^3/s	1.1%
50	3.0 m^3/s	350 m^3/s	0.9%
100	3.5 m^3/s	460 m^3/s	0.8%
Future			
5	1.8 m^3/s	118 m^3/s	1.6%
10	2.4 m^3/s	171 m^3/s	1.4%
50	3.9 m^3/s	350 m^3/s	1.1%

Table 18: Preliminary Evaluation of Flood Frequency of the Waihi River			
Return Period (years)	**Geraldine (0.8 km^2)**	**Waihi (99.5 km^2)**	**% Urban Discharge**
100	4.6 m^3/s	460 m^3/s	1.0%

Table 18 shows that flood flows for a 20% AEP event is expected to be approximately 118 m^3/s and 171 m^3/s for a 10% AEP event.

The last major flood from the Waihi River in Geraldine occurred in 1986, when the worst flooding since 1929 occurred in South Canterbury (Thompson & Osborn, 1986).

3.10.2 Serpentine Creek

There are no flood flow measurements on Serpentine Creek, although water quantity modelling undertaken by Opus (2014b) indicates that the creek channel can accommodate flows for the 5 year return period flood event. However, larger events are expected to cause flooding, particularly downstream of Kennedy Street. The modelling indicates that flows in Serpentine Creek could be as high as 1,000 to 1,600 L/s depending on location during a 5 year return period event with a rainfall duration of 2 hours. During a 10 year return period event with a rainfall duration of 2 hours flows are predicted to be as high as approximately 2,400 L/s at Kennedy Street.

3.11 Receiving waterways land ownership and responsibilities

Waihi River bed is managed by Environment Canterbury under the Waihi Temuka Opihi Flood Control Scheme and the river bed is owned by the Crown.

The other waterway beds are largely privately owned, and there would appear no formal current maintenance or management arrangements or responsibilities.

It is understood that Environment Canterbury has historically undertaken channel clearance maintenance (which on occasions have been on behalf of Timaru District Council).

Any subsequent works in the downstream waterways required to facilitate implementation of this consent would be subject to separate resource consent applications to complete the works and agreement with legal title owners of the downstream waterways.

4.0 Nature of the Discharges

4.1 Discharge Volumes

The preliminary flood frequency estimate undertaken by PDP as discussed in Section 2.5provides stormwater volume estimates for direct discharges to the Waihi River for different return period events for both the current situation and accounting for future development.

During a 20% AEP event in which the scheme is designed for in the residential areas, the volume of stormwater directly discharged to the Waihi River is estimated to be approximately 1.4 m^3/s, which could increase to 1.8 m^3/s with future development.

During a 10% AEP event in which the scheme is designed for in the residential areas, the volume of stormwater directly discharged to the Waihi River is estimated to be approximately 1.8 m^3/s, which could increase to 2.4 m^3/s with future development.

Currently, stormwater discharge volumes to Serpentine Creek and to ground are unknown. The modelling outlined in Section 3.10 of this report indicates that the total flows in Serpentine Creek could be as high as 1,000 to 1,600 L/s depending on location during a 5 year return period event with a 2 hour rainfall duration. During a 10 year return period event with a 2 hour rainfall duration flows are predicted to be as high as approximately 2,400 L/s at Kennedy Street.

4.2 Discharge Quality

Stormwater runoff in the Geraldine SMA predominantly comes from residential areas and roads, with a smaller constituent originating from public spaces and commercial/industrial sites.

Stormwater quality can vary spatially depending on location, and also temporally depending on the duration of rainfall and the duration of the dry period preceding a rainfall event. The quantity of rainfall also affects the dilution factor of contaminants in stormwater.

The main potential contaminat sources from stormwater discharges are:

- Microbiological (typically from animal faeces, mainly associated with dogs and waterfowl);
- Nutrients;
- Toxic organic compounds;
- Hydrocarbons from vehicle exhaust fumes, oil leaks etc.;
- Sediment from pavement wear, rainfall erosion and vehicles;
- Heavy metals from tyre wear, vehicle exhaust, vehicle moving parts and roofs etc.;

- Organic matter from plant material such as grass clippings, leaves etc.; and
- Litter.

These potential contaminant sources identified are also applicable to the Waihi River as well as shallow groundwater serviced by soak pits.

The Opus (2014) report on contaminant load modelling in Serpentine Creek identified the expected contaminant concentrations in stormwater runoff. The results are provided in Table 19 below and have been compared with the Drinking Water Standards for New Zealand 2005 (revised 2008) and ANZECC surface water criteria.

Table 19: Summary of Typical Stormwater Quality Characteristics

Stormwater Parameter	Typical Concentration	DWSNZ[1]	ANZECC 95% Guideline
Suspended Solids (residential/commercial)	< 200	-	-
Hydrocarbons (mg/L)			
TPH	5	-	-
PAH	0.007	-	0.0016 (Napthalene)
Toxic Organics	< 0.004	-	-
Nutrients (mg/L)			
Nitrate Nitrogen	0.4 - 2.0	**11.3**	0.7
Total Nitrogen	4	-	0.614
Total Phosphorus	0.4	-	0.033
Total Metals (mg/L)			
Zinc	0.1 - 0.8	1.5	0.008
Copper	0.015 – 0.02	**2**	0.0014
Lead	0.01	**0.01**	0.0034
Bacterial Contaminants (cfu / 100 ml)			
Faecal Coliforms	8,000	**< 1**	-

Notes:

1. Values in bold represent Maximum Acceptable Values (MAV), other values represent Guideline Values (GV).

In addition to Table 19 above, Christchurch City Council (CCC) has provided typical discharge concentrations of various contaminants for different land use categories in New Zealand as outlined in Table 6-2 of their Waterways, Wetlands and Drainage Guide. An extract of this table is displayed below.

Table 20: Discharge Concentrations of Stormwater Contaminants Extracted from CCC Waterways, Wetlands and Drainage Guide (2003)

Table 6-2. Dishcarge concentrations of some stormwater contaminants for different land use categories in New Zealand and ANZECC (2000) trigger levels.

Site	Total Suspended Solids	Cadmium	Copper	Lead	Zinc	Nitrogen TN	Phosphorous TP
	g/m³	mg/m³	mg/m³	mg/m³	mg/m³	mg/m³	mg/m³
Urban (10%ile)[1]	50	-	15	-	90	1300	200
Urban (50%ile)[1]	170	-	40	-	260	2500	420
Mature New Urban (75%ile)[2]	70	-	7	4	80	1000	-
Mairangi Bay (residential)[3]	-	0.09	8	2.5	80	-	-
Pakuranga (residential)[4]	-	0.06	15	-	444	-	-
Hayman Park (commercial)[5]	30	-	38	-	249	-	140
Riccarton Main Drain (residential)[6]	62	-	-	-	400	1000	250
Milnes Drain (flat rural/residential)[6]	128	-	-	-	200	1800	400
Wigram Detention Basin (mixed)[7]	101	1.30	14	33.0	412	-	-
Tranzlink Pond (industrial/commercial)[8]	95	-	31	19.8	673	3688	-
ANZECC (2000) trigger level (90% protection)[9]	(25)[10]	0.4	1.8	5.6	15	-	-
ANZECC (2000) trigger level (for lowland rivers)	-	-	-	-	-	614	33

[1] Williamson (1993); [2] Brough *et al.* (2012); [3] Opus (2000, cited in Kingett Mitchell *et al.* 2001); [4] Auckland Regional Council (1992); [5] Leersnyder (1993); [6] Main (1994); [7] Brown *et al.* (1996); [8] McMurtrie & Lerner (2009); [9] Trigger values are for a water hardness of 30 g/m³ $CaCO_3$, and must be adjusted if hardness varies. [10] There are no ANZECC (2000) guidelines for Total Suspended Solids, with values relating to visual clarity instead. In the absence of any guideline value the CCC considers that anything under 25 g/m³ is acceptable, but this must be considered in context with other guidelines or standards for visual clarity.

As shown, the typical concentrations identified by PDP (2013) are generally in line with the CCC findings.

Further discussion on the source of these contaminants is provided below.

4.2.1 Microbial Contaminants

Microbial contaminants in the urban environment typically originate from animal faeces. These can originate from pets or wild animals. Typically pet faeces left on footpaths have the greatest potential to be discharged through the stormwater network to the downstream water body. In Geraldine, these contaminants can enter the Waihi River, Serpentine Creek, Downs Creek and the Raukapuka Stream as well as groundwater through various soak pits within the town.

Dead animals are also of concern as if these are decaying within a surface waterway catchment or over a soak pit grate, there is a high probability of contaminants entering surface or groundwater. These contaminants are

expected to be intermittent varying in quantity and location largely depending on unauthorised circumstances.

Additionally, intermittent sewage overflows could result in the deposition of microbial contaminants into surface waterways.

4.2.2 Nutrients

Nutrients in urban stormwater generally originate from organic matter. Nutrient sources can also originate from the surrounding agricultural land use. Serpentine Creek begins in rural land with unfenced and unplanted margins so there is potential for runoff to enter the waterway. The Waihi River runs through agricultural land both upstream and downstream of Geraldine and therefore a component of nutrient runoff is expected to enter the river as well.

4.2.3 Toxic Organic Compounds

Toxic organic compounds may potentially enter stormwater by the use of pesticides used mainly in residential areas for gardening. Pesticide use is also expected in public spaces particularly in parks, reserves and footpaths.

4.2.4 Hydrocarbons

Hydrocarbons originate from vehicle use and are expected to be present in stormwater discharge from roads and carparks. The Geraldine SMA includes a section of State Highway 79 as well as smaller streets within the residential area.

4.2.5 Sediment

Suspended sediments in stormwater mostly originate from soil erosion due to overland flow but also incorporate organic particles and eroded particles from human related structures and litter. The accumulation of sediment on roads and hardstand surfaces are currently discharged directly to surface waterways without any treatment.

Construction activities can also cause high sediment loadings in runoff.

4.2.6 Heavy Metals

Heavy metals in stormwater are derived from metal surfaces such as roofs. Particularly older style roofs are susceptible to leaching iron from rust and galvanised roofs contribute to the zinc concentrations found in stormwater.

Heavy metals are also derived from road surfaces and carparks due to vehicle activity. Zinc is deposited on hardstand surfaces from tyre wear and copper from brake pad wear.

4.2.7 Organic Matter

Organic matter entering stormwater comprises of leaves and branches deposited in stormwater drains as well as human induced deposits from horticultural activities such as lawn mowing, gardening and trimming bushes/trees. This organic matter has the potential to affect the pH of the receiving water as the organic matter is decomposed by bacteria that release CO_2 as they respire and consume dissolved oxygen. This disrupts the balance of CO_2 and dissolved oxygen in the waterway which can affect the acidity of the water (e.g., reducing the pH value to below 6.0).

4.2.8 Litter

Litter is expected to enter stormwater as expected with any built up environment. However, the main problems associated with litter are to do with aesthetics rather than water quality. Litter can also interfere with the operational capability of the stormwater network by blocking pipes, sumps, soak pits etc.

5.0 Activity Status

5.1 Resource Management Act 1991

Section 15(1)(a) of the Resource Management Act (RMA) states that:

"No person may discharge any contaminant or water into water, onto or into land in circumstances which may result in a contaminant entering water, unless the discharge is expressly allowed by a national environmental standard or other regulations, a rule in a regional plan as well as a rule in a proposed regional plan for the same region (if there is one), or a resource consent".

The proposed activity involves the discharge of stormwater into surface water, in circumstances which may result in contaminants entering this water body, and discharge of stormwater onto or into land, where contaminants may enter groundwater.

There are no current National Environmental Standards relevant to the proposed stormwater discharge, so unless a rule in an operative or proposed regional plan authorises the discharge, resource consent is required under Section 15 of the RMA.

Both the Land and Water Regional Plan (LWRP) and the Opihi River Regional Plan (ORRP) apply to the Geraldine SMA. It is stated in the LWRP that *"any objective, policy or rule on the same subject matter in the Opihi River Regional Plan prevails over the objectives, policies and rules contained in this Plan".* It is also stated in Section 14 of the LWRP (Orari-Opihi-Pareora) that the ORRP applies to this region.

The ORRP relates to the taking, use or discharge to surface waterways or hydraulically connected groundwater. Therefore the discharges to Serpentine Creek and the Waihi River are covered under this plan. The report conducted by Opus (2014a) identified that the discharges to ground occur above the water table and it is therefore considered that these discharges should be covered under the LWRP.

It should be noted that the ORRP provides water quality outcomes that are based on Schedule 3 of the RMA, and are not wholly in line with that contained in the National Policy Statement for Freshwater Management 2014 (NPS-FM 2014). The LWRP is more up to date and in line with the policies in the NPS-FM 2014 and it is expected that the ORRP will be incorporated into this in the future. Therefore this application should also have regard to the surface water requirements of the LWRP.

5.2 Opihi River Regional Plan

The ORRP contains rules around stormwater discharges in the Opihi catchment. These rules are specific to the Opihi catchment and override any rules contained in the LWRP.

The relevant rule in the ORRP is Rule 1, Chapter 6 which states that:

The discharge of contaminants, other than treated or untreated human sewage, into the Opihi River or its tributaries, or onto or into land in circumstances which may result in that contaminant (or any other contaminant emanating as a result of natural processes from that contaminant) entering these water bodies is a discretionary activity.

The activity shall comply with the following standards and terms:

a) The standards contained in Class OPIHI water shall be observed. The standards apply after reasonable mixing of any contaminant or water with the receiving water and disregards the effect of any natural perturbations that may affect the water body.

1) The maximum cover of stream or river beds by periphyton as filamentous growths or mats (greater than 3 millimetres thick) shall not exceed 40%, as a result of any discharge of contaminant.

Neither site visits conducted by Opus and PDP identified filamentous growths or mats in surface water bodies. As the discharge is of a temporary nature, it is not expected that these growths will occur as a result of stormwater discharge. It should be noted that the upstream Waihi catchment is particularly nutrient rich with high values recorded in Barkers Creek upstream of the Geraldine SMA (Kelly, 2015). Therefore, high nutrient levels in the Waihi River cannot be solely accounted for by stormwater inflow.

2) Bacterial or fungal slime growths shall not be visible to the naked eye as plumose growths or mats, as a result of any discharge of a contaminant.

Likewise, bacterial or fungal slime growths have not been observed on any site visits.

3) BOD_5 of GF/C-filtered water shall not exceed 2 grams per cubic metre, as a result of any discharge of a contaminant.

There is currently not enough data to determine the effects of stormwater discharge on the BOD of the receiving water. As outlined in Table 5 of this report, the BOD samples collected by ECan in the Waihi River indicated an average BOD of 0.8 mg/L at the upstream site near Waihi Gorge, with an increased average of 1.7 mg/L being recorded downstream of the Geraldine SMA approximately 1 km upstream of the confluence with the Hae Hae Te Moana River. Although this highlights an increase in BOD in the downstream reaches of the Waihi River, this is not likely as a result of stormwater discharges to the Waihi River because sampling is not expected to have been completed during stormwater events each time.

4) ***The visual clarity of the water shall not be rendered so low as to be unsuitable for bathing, by the presence of contaminants.***

Stormwater will only enter waterways during rainfall events, in which the visual clarity of the receiving waters is likely to be poor and not suitable for bathing under natural conditions. Under base flows, when the river is suitable for bathing, a minimal amount stormwater will enter any surface water bodies and bathing activities are highly unlikely to coincide with stormwater discharges.

5) ***The concentration of dissolved oxygen shall be not less than 80% of saturation concentration, as a result of any discharge of contaminant.***

Sampling undertaken by PDP (2016) yielded poor dissolved oxygen measurements in Serpentine Creek, with 4 out of 8 sampling sites recording less than 80% saturation concentration. However, the dissolved oxygen measurements ranged from 99.4% to 114% in the Waihi River. Low dissolved oxygen measurements in Serpentine Creek during base flows are a result of lack of water movement and are not related to stormwater discharges. It is expected that stormwater discharges are not adversely affect the concentration of dissolved oxygen in the receiving waterway.

6) ***Fish or other aquatic organisms shall not be rendered unsuitable for human consumption by the presence of contaminants.***

The NIWA bio-accumulation study outlined in Section 3.9 details the commonly consumed resources from various sites in the district indicate some bioaccumulation of contaminants affect the consumption rates of various food sources (eels and trout, and water cress). However, the contaminants contributing to the adverse bio-accumulation were not generally considered to be related to urban stormwater discharges.

7) ***There shall be no significant adverse effect on aquatic life as a result of any discharge of a contaminant.***

Ecological assessments undertaken by Opus (2013) and PDP (2016) outlined in Section 3.8 of this report indicated a depauperate level of aquatic life in Serpentine Creek. The site visit undertaken by PDP identified a macroinvertebrate community in Serpentine Creek dominated by snails (*Potamopyrgus antipodarum)* and non-biting midges *(Chironomidae sp)*. Additionally, a small (<10 individuals) population of upland bully *(Gobiomorphus breviceps*) was also identified in Serpentine Creek in the vicinity of the Geraldine Town centre.

Fish species have been historically identified and were identified by Opus (2013) in the Waihi River and although water quality in the Waihi shows signs of human influence, it is considered that much of this is a result of upstream land use.

It is clear that Serpentine Creek is in poor ecological condition. However, it is not yet fully established if this is due to stormwater discharges. Intermittent flows in

Serpentine Creek and the Waihi River are expected to have an adverse effect on aquatic life although there is currently no indication of further deterioration of surface water quality or ecological parameters.

The Waihi River is in a better ecological state than Serpentine Creek, however the reach within the Geraldine township is subject to intermittent drying so aquatic life is more limited within the township compared to the upstream and downstream reaches which have permanent flows. However, it is likely that when flows permit, aquatic life will inhabit these sections of river and migrate in and out of these reaches.

Generally, stormwater discharge contaminant concentrations outlined in Tables 19 and 20 exceed the ANZECC trigger values for the 90% or 95% protection level of species.

It is considered that the granting of this consent will allow for goals and objectives set out in the associated SWMP and consent conditions to be achieved so that water quality is either maintained or improved. However, currently this condition cannot be met.

8) The natural temperature of the water shall not be changed by more than 3º Celsius and shall not exceed 25º Celsius, and the temperature of the water shall not adversely affect the spawning of trout or salmon during the spawning season.

Water temperature is primarily influenced by water depth and the amount of solar radiation at a site. Both the Waihi River and Serpentine Creek are known to be intermittent water bodies and will naturally experience periods of reduced water depth as waters recede and become intermittently connected. The intermittent nature of the Waihi River and Serpentine Creek has the potential to increase the temperature to a greater extent than that posed by any potential increases to temperatures observed during times of stormwater inflow (i.e., during periods of increased rainfall).

However, there is potential for stormwater to have an effect on the temperature of the receiving waterway. Hardstand surfaces such as asphalt can absorb heat from solar radiation and transfer some of this heat to stormwater flowing over the surface (especially during periods of higher solar radiation). Any observed changes in water temperature in the Waihi River and Serpentine Creek from stormwater inputs are likely to be less than 3° C and less than the natural variation in the temperature of the receiving waters.

Surface water monitoring in the Waihi River at State Highway 79 (SQ20328) from 1980 to 2013 yielded an average water temperature of 11.4 degrees Celsius with a minimum temperature of 4.5 degrees Celsius and a maximum temperature of 19.7 degrees Celsius (i.e. a range of 15.2 degrees Celsius), there are no long term temperature records for Serpentine Creek. However, it is considered that the

temperature of surface waterways is not expected to exceed 25 degrees Celsius. Therefore Condition 8 can be met.

9) ***The median faecal coliform concentration, based on not less than 5 samples taken within any 30 day period, shall not exceed 200 faecal coliforms per 100 millilitres.***

The *E. Coli* samples taken by PDP (2016) yielded quantities of up to 980 MPN/100 mL in Serpentine Creek under base flow conditions. Additionally, the report conducted by Opus (2013) on the ecology of the Waihi River and Serpentine Creek indicated that historical ECan measurements of *E. coli* have been up to 820 cfu/100mL during the months of June from 2009 to 2012 in the Waihi River. However, it has been demonstrated that *E. coli* is present in Serpentine Creek and the Waihi River under base flow conditions with no stormwater discharges and as a result Condition 9 will likely not be met due to existing baseline conditions.

It should be noted that the wider Waihi catchment is susceptible to faecal coliform inputs with both dairy and deer farming occurring in the upstream catchment (Section 3.6 outlines *E.coli* conditions at an upstream site).

10) ***The water shall not be rendered unsuitable for treatment (equivalent to coagulation, filtration, and disinfection) for human consumption by the presence of contaminants.***

11) ***The water shall not be tainted or contaminated by the presence of contaminants, so as to make it unpalatable or unsuitable for consumption by humans after treatment (equivalent to coagulation, filtration, and disinfection), or unsuitable for irrigation.***

The Waihi River is not currently used as a public drinking water supply source.

It is considered that stormwater discharges to the Waihi River are not reducing the suitability of the water for treatment and use as a drinking water supply beyond the quality of the water in the upstream catchment. A report conducted by Kelly (2015) identified that Barkers Creek is a significant source of DIN, phosphorous, sediment and microbial contaminant loads to the Waihi River so the quality is considerd to be already degraded by upstream activities. Furthermore, the granting of this consent will allow for stormwater discharges to be better managed in the Geraldine area with long term goals of improving water quality.

Serpentine Creek is not considerd to be a potential source of drinking water due to low intermittent flows and an urbanised catchment. Although Conditions 10 and 11 cannot be met for Serpentine Creek, the goals set out in the associated SWMP aim to improve water quality over time. However, Serpentine Creek both in its current state and natural form would not be considerd a useful supply of drinking water as the Waihi River would provide a much better alternative. However, background *E.coli* concentrations under base flow conditions in

Serpentine Creek and the Waihi River indicate that treatment would be required for these waterways to be used as a drinking water source.

5.2.1 Summary

It is clear the surface water quality conditions in the ORRP are not possible to meet for stormwater discharges to Serpentine Creek, the Waihi River, Raukapuka Stream and Downs Creek. Therefore the activity is classified as a discretionary activity under the ORRP. Stormwater discharges are necessary as a consequence of urban environments and it is considered that the current scheme is the best practicable option at the present time. Rather than trying to downplay the effects of stormwater on the receiving environment, TDC acknowledge that stormwater can have a potentially adverse effect on the receiving environment, and aim to improve the quality of discharges in the future. This will be achieved by the implementation and ongoing review of the associated SWMP and via consent conditions which set water quality goals for stormwater discharge within the scheme.

5.3 Land and Water Regional Plan

The LWRP contains rules around stormwater that are applicable to the Geraldine SMA. The LWRP was made partially operative on 1 December 2015 with the exception of rules surrounding the take and use of surface water and dams and damming.

The relevant rule for the Geraldine Stormwater Management Scheme is Rule 5.93 which states that:

The discharge of stormwater from a reticulated stormwater system onto or into land or into or onto land in circumstances where a contaminant may enter water, or into groundwater or a surface waterbody is a restricted discretionary activity, provided the following conditions are met:

1. ***For a discharge that existed at 11 August 2012, an application for a discharge permit is lodged prior to 30 June 2018, or at a later date as agreed between the reticulated stormwater system operator and the CRC; and***
2. ***A stormwater management plan has been prepared to address the management of stormwater in the catchment and is lodged with the application; and***
3. ***The discharge will not cause a limit in Schedule 8 to be exceeded.***

Condition 1 is not met as the application has been lodged after to 30 June 2018.

A Stormwater Management Plan also accompanies this application to fulfil the requirements of Condition 2.

Condition 3 most likely cannot be met as the *E.coli* limits for groundwater are expected to be exceeded as a result of stormwater discharge to shallow soak pits. Groundwater quality results outlined in Section 3.7.4 of this report indicate that nearby bores have *E. coli* concentrations exceeding < 1 *E.coli* /100 mL. It is expected that this is likely to be predominantly a result of surrounding agricultural land use and potential bore head contamination. However as outlined in Table 19, typical faecal coliform concentrations of biological contaminants in urban stormwater discharges may be as high as 8,000 cfu/100 mL

Therefore, it is expected that *E.coli* will be present in groundwater as a result of rapid discharge of stormwater to ground at the point of discharge through various soak pits within the Geraldine SMA.

As a result of Condition 3 not being met, the activity is classified as a non-complying activity under the LWRP.

5.3.2 Potential Future Surface Water Requirements

Under Schedule 8 of the LWRP, the water quality limit for lowland streams in an annual median nitrate toxicity of 3.8 mgN/L or less. From the water quality results presented in Section 3.6 of this report, it is considered that this requirement is likely to be met if required in the future.

5.4 Summary of Activity Status

Discharges of stormwater to ground are governed by the rules in the LWRP. As stated above, it is expected that the Schedule 8 limits cannot be achieved particularly in regard to faecal coliform contaminants. It is considered that this requirement would be impossible to achieve for any discharge of stormwater so the activity is classified as ***non-complying***.

Currently, the rules contained within the ORRP are applicable to stormwater discharges to surface water bodies of Serpentine Creek and the Waihi River and as stated, it is not expected that the conditions of Rule 1, Chapter 6 can be met. Therefore the activity is classified as ***discretionary activity*** with the council having full discretion over the outcome of the application.

6.0 Section 104 – Planning Matters

6.1 Matters to be Considered

Section 104 of the RMA states:

(1) Subject to Part II, when considering an application for a resource consent and any submissions received, the consent authority shall have regard to:-

(a) Any actual and potential effects on the environment of allowing the activity;

(b) Any relevant regulations;

(c) Any relevant National Policy Statement, New Zealand Coastal Policy Statement, Regional Policy Statement, and Proposed Regional Policy Statement;

(d) Any relevant objectives, policies, rules, or other provisions of a regional plan or proposed regional plan;

(e) Any relevant District Plan or Proposed District Plan, where the application is made in accordance with a Regional Plan;

(f) Any relevant Regional Plan or Proposed Regional Plan, where the application is made in accordance with a District Plan;

(g) Any relevant Water Conservation Order or Draft Water Conservation Order;

(h) Any relevant designations or Heritage Orders or relevant requirements for designations of Heritage Orders; and

(i) Any other matters the consent authority considers relevant and reasonably necessary to determine the application.

Section 104D of the RMA requires that after considering an application, a consent authority may grant a resource consent for a non-complying activity only if it is satisfied that either:

- The adverse effects of the activity on the environment will be minor.
- The application is for an activity that will not be contrary to the objectives and policies of the relevant plan.

Actual and potential effects in accordance with subsection (a) are considered in full in Section 12.0 of this report.

The following sections consider the

- National Policy Statement for Freshwater Management (2017),
- National Environmental Standards for Sources of Drinking Water (2007),

- Canterbury Regional Policy Statement (2013) as required by subsection (c),
- the relevant objectives and policies of the Land and Water Regional Plan (LWRP),
- the relevant objectives and policies of the Opihi River Regional Plan (ORRP) as required by subsection (d),
- the Timaru District Plan (subsection (e)),
- the Iwi Management Plan of Kati Huirapa, Section 104D for non-complying activities (subsection (i)),
- and Section 107 for restrictions on granting certain discharge permits (subsection (2b).

There are no relevant Water Conservation Orders or Draft Water Conservation Orders (g), and no Heritage Orders or relevant requirements for designations of Heritage Orders relevant to this application (h).

6.2 National Policy Statement for Freshwater Management (2014)

This National Policy Statement (NPS) sets out objectives and policies that direct local government to manage water in an integrated and sustainable way, while providing for economic growth within set water quantity and quality limits.

The NPS covers water quality, water quantity and integrated management. Although not explicitly stated as doing so, the Land and Water Regional Plan (LWRP) implicitly gives effect to the requirements of the NPS to set long term objectives for both water quality and quantity. However, the Opihi River Regional Plan does not currently give effect to the requirements of the NPS.

Objective A1:

"To safeguard:

(a) the life-supporting capacity, ecosystem processes and indigenous species including their associated ecosystems of fresh water; and

(b) The health of people and communities, at least as affected by secondary contact with fresh water;

in sustainably managing the use and development of land, and of discharges of contaminants."

Objective A2 requires that:

"The overall quality of fresh water within a region is maintained or improved while:

(a) protecting the quality of outstanding freshwater bodies;

(b) protecting the significant values of wetlands; and

(c) improving the quality of fresh water in water bodies that have been degraded by human activities to the point of being over-allocated."

The policies that support these objectives direct regional councils to change plans and policy statements to be consistent with the Freshwater NPS. Policy A3(a) includes a requirement for regional councils to impose conditions on discharge permits to ensure the limits and targets specified in regional plans and policy statements (pursuant to other policies in the Freshwater NPS) can be met.

Given the proposed treatment systems for stormwater, and based on the assessment of effects, the proposal will not contravene Objectives A1 and A2. Consent conditions are proposed in relation to water quality targets, in accordance with Policy A3(a), Section (CC) of the NPS requires regional councils to document information on freshwater contaminant discharges in order to ensure information is available for freshwater objective and limit setting and freshwater management. The purpose of this application is to provide a detailed consent for the discharge of stormwater in the Geraldine SMA so that the quality of the discharge can be maintained or improved over time.

The involvement of tāngata whenua in freshwater management is also provided for by the Freshwater NPS. Objective D1 is to provide for the involvement of iwi and hapū, and to ensure that tāngata whenua values and interests are identified and reflected in the management of fresh water including associated ecosystems, and decision-making regarding freshwater planning, including on how all other objectives of the Freshwater NPS are given effect to.

Policy D1 requires local authorities to take reasonable steps to:

(a) "involve iwi and hapū in the management of fresh water and freshwater ecosystems in the region;

(b) work with iwi and hapū to identify tāngata whenua values and interests in fresh water and freshwater ecosystems in the region; and

(c) reflect tāngata whenua values and interests in the management of, and decision-making regarding, fresh water and freshwater ecosystems in the region."

Tāngata whenua interests have been taken into account when developing the proposed management scheme for the SMA consent via the engagement undertaken with local Papatipu Rūnanga as well as consideration of their recognised iwi management planning documents and the preparation of CIAs. TDC commit to ongoing partnership will seek to further provide for Policy D1 of the NPS through provision of annual reports as outlined in section 8.4.1 of the SWMP.

6.3 National Environmental Standards

The Resource Management (National Environmental Standard for Sources of Human Drinking Water) Regulations 2007 (Drinking Water NES) sets out what regional councils must do to comply with the standard. Its purpose is to reduce the risk of human drinking water sources becoming contaminated. The Drinking Water NES covers the requirements for issuing water and discharge permits where they have the potential to affect drinking-water supplies that provide no fewer than 501 people with drinking water for not less than 60 days each calendar year. Regulation 7 of the Drinking Water NES requires that a regional council must not grant a discharge permit for an activity that will occur upstream of an abstraction point, where the drinking water concerned meets the health quality criteria, if the activity is likely to introduce or increase contaminants in the drinking water to the extent that it would no longer meet the health quality criteria, or would exceed the guideline values. The Geraldine Stormwater Consent (GSC) does not propose to add additional stormwater to groundwater or surface water where it has the potential to affect community drinking water supplies. Proposed treatment of stormwater provided for under the framework of the GSC will provide additional mitigation to the existing contaminant loads in stormwater. The Geraldine community supply source is located approximately 2 km across gradient of the Geraldine SMA and is not expected to be affected by the stormwater discharges.

6.4 Canterbury Regional Policy Statement (2013)

The Canterbury Regional Policy Statement (CRPS) gives an overview of the significant resource management issues facing the region, including issues of resource management significance to Ngāi Tahu. The purpose of the CRPS is to set out objectives, policies, and methods to resolve those resource management issues and to achieve the integrated management of the natural and physical resources of Canterbury. The chapters relevant to this application are Chapter 5: Land Use and Infrastructure, Chapter 7: Fresh Water and Chapter 10: Beds of Lakes and Rivers and their Riparian Zones.

6.4.1 Land Use and Infrastructure

Policy 5.3.5 aims to ensure that development is appropriately and efficiently served for the collection, treatment, disposal or re-use of stormwater (and wastewater). Policy 5.3.6 – sewerage, stormwater and potable water infrastructure aims to, within the wider region, enable sewerage, stormwater and potable water infrastructure to be developed and used, provided that, as a result of its location and design the adverse effects on significant natural and physical resources are avoided, or where this is not practicable, mitigated, and other adverse effects on the environment are appropriately controlled. As discussed in this report, the SWMP and AMP have been developed for the Geraldine stormwater area in order to appropriately control any adverse effects on the environment which may arise from stormwater discharges.

6.4.2 Fresh Water

Policy 7.3.3 – Enhancing fresh water environments and biodiversity aims to promote, and where appropriate, requires the protection, restoration and improvement of lakes, rivers, wetlands and their riparian zones and associated Ngai Tahu values. It also requires the maintenance of, and promotes the enhancement of, indigenous biodiversity.

By having a portion of the scheme discharged to groundwater, the quality of surface waterways will be better protected. However, discharge to surface waterways is still considered necessary in the Geraldine area. It is recognised that stormwater discharges will not cause an improvement in surface water quality but this will be managed and adverse effects minimised as far as practicable through the associated SWMP and AMP.

Policy 7.3.5 deals with water quantity and land issues. It aims to avoid, remedy or mitigate the adverse effects of land uses on the flow of water in surface water bodies or on the recharge of groundwater. Clause (1) requires the control of the diversion of rainfall runoff over land, and changes in land uses, site coverage or land drainage patterns that will, either singularly or cumulatively, adversely affect the quantity or rate of water flowing into surface water bodies or the rate of groundwater recharge. The adverse effects on fresh water quality as a result of changing land use are covered by Policy 7.3.7. The policy aims to control changes in land use to ensure water quality standards are maintained or improved for both surface and groundwater.

It is considered that runoff from pre-development discharges would have consisted of overland flow to both Serpentine Creek and the Waihi River, with some component of seepage into the shallow groundwater. This shallow groundwater is expected to ultimately discharge into the Waihi River. Post development, urban stormwater is generated from hardstand surfaces. However it is considered that the current network provides a balance of discharge surface waterways as well as into ground via soak pits where feasible and provision of riparian buffers prior to discharge to the low flow channel of the Waihi River.

The discharge of stormwater to ground is considered the best disposal method for limiting adverse effects on water quality. As discussed in Section 12.4 of this report, heavy metals are expected to bind to the soils and microbial contaminants will be filtered and dispersed in groundwater so this is considered to be a valuable method for the disposal of stormwater.

In terms of surface water, as discussed in Section 3.6 of this report, the Waihi River has been deemed to be of better quality than Serpentine Creek indicating that adverse effects from the discharge of stormwater are limited. Much of the nutrient loads in the Waihi River that are affecting the water quality condition of the waterway are expected to originate from agricultural land use upstream of the Geraldine SMA.

The contaminant loads discharged to Serpentine Creek are higher than the discharges to the Waihi River. Opus (2013) identified high concentrations of metal contaminants in Serpentine Creek which are potentially as a result of residual stormwater contaminants. However, the water quality in Serpentine Creek does not appear to have an effect on the Waihi River downstream of the confluence. It is considered that the granting of a network management area resource consent will allow for better management of Serpentine Creek with objectives and goals around improving water quality in the creek and a clear process to provide on-going improvements as the level of knowledge on the water quality condition improves.

6.4.3 Beds of Lakes and Rivers and their Riparian Zones

Policy 10.3.1 provides for activities in river and lake beds and their riparian zones, including the planting and removal of vegetation and the removal of bed material, while: recognising the implications of the activity on the whole catchment; ensuring that significant bed and riparian zone values are maintained or enhanced; or avoiding significant adverse effects on the values of those beds and their riparian zones, unless they are necessary for the maintenance, operation, upgrade, and repair of essential structures, or for the prevention of losses from floods, in which case significant adverse effects should be mitigated or remedied.

It is considered that stormwater management in Geraldine is consistent with this policy as the activity of discharging to waterways is necessary for the operation of the stormwater management plan, significant adverse effects will be mitigated through the use of the SWMP, AMP and proposed consent conditions to allow for the management of stormwater quality discharge to surface waterways.

6.5 Opihi River Regional Plan

The Opihi River Regional Plan (ORRP) covers the Opihi River and its tributaries which includes the Waihi River (and Serpentine Creek) and their catchments. The ORRP contains policies around water quantity and water quality in the Opihi catchment.

6.5.1 Surface Water Quantity

Chapter 5 aims to achieve sufficient quantities of water to enable people to benefit from the water resource while natural and cultural values are protected. Objective 1 aims to achieve sufficient quantities of water in the Opihi River and its tributaries and hydraulically connected groundwater for future generations while protecting the natural character of the waterways. Policy 6 of the ORRP aims to protect water yields in the Opihi catchment as a result of changing land uses. The stormwater discharges are expected to facilitate flows in the Waihi River as a greater proportion of runoff is diverted to surface water than that which would be otherwise discharged to land) in the absence of hardstand

surfaces. However, the impact surface water stormwater discharges is considered minor and originate from less than 1% of the upstream catchment area. The impact of discharges to Serpentine Creek are controlled by the upstream detention dams, understanding the downstream channel capacity and maintenance of excess in channel vegetation in the modified waterway in the vicinity of Kennedys Road.

Therefore, the discharges from the stormwater network are expected to be managed to ensure that any significant negative effects on surface water flows in the Opihi catchment are limited and the discharges are considered to be in line with Chapter 5 of the ORRP.

The SWMP and AMP sets out that the stormwater discharges are not anticipated to cause any adverse flooding issues up to and including a 10% AEP rainfall event. Above this, some surface flooding is expected via flow through overland flow paths.

6.5.2 Surface Water Quality

Chapter 6 relates to surface water quality and Objective 1 aims to enable people to benefit from improved water quality while protecting both natural and cultural values. Policy 2 of the ORRP aims to promote land use practices that are beneficial to water quality such as riparian planting, the avoidance of ground disturbance near waterways and stock exclusion.

Riparian planting is generally to a high standard in the Waihi River and the residential area of Serpentine Creek, as a result, minimal disturbance to the ground occurs along the margins of these waterways. As the scheme covers the urban area, stock exclusion is not part of the scope of this application.

However, it is recognised that stormwater discharges to Serpentine Creek and the Waihi River are likely to be excess of the contaminants listed in schedule 5 of the LWRP and may be having potential negative effects on these water bodies and minimal mixing will be present in certain conditions. As stormwater discharges are both intermittent and variable in contaminants as well as the level of the dilution with the downstream receiving network, there is considerable uncertainty of the actual effects of the discharges. The SWMP seeks to manage these uncertainties and variabilities in a cost effective manner for the community and it is considered that the granting of this consent would allow for goals set out in the SWMP and associated consent requirements to be set and achieved in order to improve the quality of stormwater discharges in the future. This will be an ongoing goal to maintain or improve stormwater discharge that is in line with the objectives in the ORRP and LWRP.

6.6 Land and Water Regional Plan

The Land and Water Regional Plan (LWRP) is now been made operative. Under Table S5A of the LWRP, the Waihi River is considered to be in the water quality class of 'hill fed – lower'. Serpentine Creek is more urbanised, so is considered to be under the class of 'hill fed – lower – urban'. Therefore, under the LWRP, toxicants in the Waihi River shall not exceed concentrations for the 95% level of protection of species. Toxicants in Serpentine Creek shall not exceed concentrations for the 90% level of protection of species. However, Environment Canterbury has discretion over "the concentration of contaminants, and the resulting adverse and potential environmental effects…" To date there has yet to have been any significant environmental effects identified from the discharges

Section 3 of the LWRP contains the objectives relevant to this application. These objectives are designed to be read in their entirety and considered together. The majority of these objectives are relevant to this application and in general, they aim to manage the natural environment so that Ngai Tahu culture, social wellbeing, important infrastructure and the natural environment are maintained or enhanced for the greater good of the region. The purpose of this application is to ensure that stormwater discharges in the Geraldine SMA are properly managed to provide not only a high quality public service to the community, but also to reduce any adverse effects on the receiving environment. On the basis of the assessment in the AEE the proposal is considered consistent with those objectives and seeks to improve water quality.

Section 4 contains the policies relevant to this application. Specifically, strategic Policies 4.1 to 4.8 of the LWRP with respect to fresh water outcomes, effects of land uses and discharges, and management of water are relevant. The application as proposed and shown in this AEE is considered consistent with those policies.

6.6.1 Stormwater

The discharge of stormwater is covered by policies 4.15 to 4.17 of the LWRP. Policies 4.15 and 4.16 require that all stormwater is discharged in accordance with a SWMP.

A SWMP has been prepared in accordance with this application. This plan addresses matters set out in Policy 4.16 as much as practical which consists of the following:

a) The management of all discharges of stormwater into the stormwater system; and

b) For any reticulated stormwater system established after 11 August 2012, including any extension to any existing reticulated stormwater system, the discharge of stormwater being subject to a land-based or designed

treatment system, or wetland treatment prior to any discharge to a lake or river; and

c) How any discharge of stormwater, treated or untreated, into water or onto land where it may enter water meets or will meet, the water quality outcomes and standards and limits for that water body set out in Table 1, Schedule 5 and 8 and Sections 6 to 15, (whichever applies); and

d) The management of the discharge of stormwater from sites involving the use, storage or disposal of hazardous substances, and

e) Where the discharge is from an existing local authority network, demonstration of a commitment to progressively improve the quality of the discharge to meet condition (c) as soon as practicable but no later than 2025.

As outlined in the SWMP, it is unlikely that even implementation of best practical treatment measures across the entire network will completely meet the requirements in policy 4.16(c) & (e) without changes in land-use outside the control of the applicant. Notwithstanding, the SWMP seeks to limit adverse effects of stormwater discharges to the receiving waters within the affordability of the community. The SWMP outlines the approach to ensure the effects of the exceedances of these parameters are limited through the proposed environmental monitoring programme and adaptive management programme to provide improvements to the stormwater discharges. Rule 5.93 of the LWRP provides discretion to accept discharges based on actual effects, which will be monitored under the SWMP Policy 4.17 requires that stormwater runoff volumes and peak flows are managed so that they do not exacerbate the risk of inundation, erosion or damage to property or infrastructure downstream or risks to human safety.

The effects of the stormwater discharge volumes are provided in Section 12.0 of this report, and show that the proposed activities and the SWMP are consistent with this policy.

6.6.2 Diversion of Water Bodies

Policy 4.47 provides for small scale diversions of water within the beds of rivers and adjoining wetland as part of establishing infrastructure. The piping and realignment of runoff paths to direct flows more efficiently to the nearest water ways has been necessary to provide for the residential development around this waterway and to meet public expectations to limit excessive flooding. Where practical and conditions suit, options to limit diversions to the adjacent water way will be sought with discharge to ground.

6.6.3 Wetlands and Riparian Margins

Policy 4.85 aims to enhance water quality, indigenous biodiversity and ecosystem health in rivers and wetlands through establishing or restoring riparian planting.

As discussed in Section 3.6 of this report, riparian planting is abundant along both the Waihi River and Serpentine Creek within the residential areas, and its benefits in reducing the effects of stormwater discharges are recognised.

The SWMP seeks to maintain and enhance existing riparian buffers and seeks to provide options to develop engineered wetlands to enhance water quality improvements.

6.7 Timaru District Plan (2005)

The Timaru District Plan contains objectives and policies relevant to the proposal that must be considered.

Part B contains objectives that are relevant to the natural environment. Objective (1) seeks to safeguard the indigenous biodiversity and ecosystem functioning of the District through the protection and restoration of significant indigenous flora and fauna habitat; the maintenance and enhancement of natural biological and physical processes; and retention (as far as possible) of the remaining indigenous vegetation and habitat generally. The SWMP seeks to maintain and enhance existing riparian buffers and seeks to provide options to provide engineered wetlands to enhance water quality improvements.

Objective (2) aims to protect and enhance the natural character and functioning and habitat values of the coastal environment and wetlands, streams, rivers and their margins. The SWMP seeks to improve the quality of stormwater discharges into surface waterways and surface flooding is not expected under a 10% AEP rainfall event or inundation of buildings in a 0.5% AEP rainfall event.

Objective (3) aims to identify, protect and enhance outstanding landscape values of the District, and those natural processes, features and areas of significant natural value which contribute to its overall character and amenity. The associated CHI assessment identified sites that are of significance to iwi for their natural character. The SWMP seeks to improve the quality of stormwater discharges and the natural processes within the Waihi River and Serpentine Creek by providing future treatment options for existing and new portions of the network.

Part B, (4) relates to natural hazards. However, this section contains policies and objectives that aim to avoid the effects of flooding by avoiding building in these locations rather than altering the source of flooding. Therefore, this section is not relevant to the proposal.

Part B, 5(b) relates to the effects of liquid waste, including stormwater, on the environment and the threatened contamination of coastal and freshwater systems in the District. Policies 3 to 5, 7, 8, 10, 11, 13 and 14 are relevant to this application.

Policy (3) relates to the control, the collection, movement and discharge of precipitation and groundwater in a manner which avoids, remedies or mitigates

the adverse effects on the environment. The associated SWMP sets goals to improve the quality of stormwater discharge in the Geraldine SMA which includes provision of stormwater treatment for new developments and upgrades of the existing scheme to limit flooding issues.

Policy (4) aims to provide for the maintenance or extension of existing stormwater systems and for the development of new systems where required. The SWMP outlines stormwater management requirements for new developments as well as for the upgrade of existing structures.

Policy (5) requires parties to have regard for the cultural and spiritual values of the Takata Whenua when seeking to alter or improve present systems of liquid waste management. A Cultural impact assessment has been conducted prior to this application and Section 12.8 of this report provides an assessment of effects on Ngai Tahu values that are relevant to this application. Ongoing cultural monitoring is proposed with the consent conditions

Policy (7) seeks to ensure that any disposal of hazardous substances into stormwater and sewer systems is avoided and that any spillages into the sewers are controlled, contained or remedied. TDC will need to provide public education round illicit discharges to the stormwater system. If the public are made aware of the effects illicit discharges will have on their local river they are more likely to be cautious around the disposal of hazardous substances. Likewise, any reports of illicit discharges will need to be acted upon and investigated.

Policy (8) relates to financial contributions to cover costs of stormwater infrastructure, this is expected to be covered under the council rates charged to residents.

Policy (10) aims to manage the flow of stormwater through urban catchments by maximising opportunities to prevent or mitigate the generation of stormwater through the application of low impact design principles such as:

- Integrate stormwater management and design early in the site planning process.
- Manage stormwater as close to the point of origin as possible; minimise collection and conveyance.
- Rely on natural processes within the soil mantle and the plant community.

The associated SWMP contains objectives around stormwater management which includes stricter stormwater mitigation measures for new subdivisions including first flush treatment. Future upgrades of higher priority areas of the scheme are also outlined in the SWMP.

Policy (11) requires the use of a minimum design standard of a 50 year / 30 minute rainfall duration event at Gleniti in Timaru for the design of detention

dams within open drainage / waterway systems. The Opus (2014b) report on water quantity modelling in Serpentine Creek identified that Serpentine Creek is able to satisfactory contain flows from a 1% AEP event without excessive surface flooding, account for climate change and the buffering effect of the two detention dams.

Policy (13) seeks to promote the use of stormwater as a resource. Currently stormwater is not used as a resource in the Geraldine SMA apart from facilitating natural groundwater recharge through discharges to ground.

Lastly, Policy (14) aims to promote alternative design layouts for subdivision and building development that integrate development with natural water systems, enhance the quality of urban stormwater before discharge and minimise the amount of stormwater discharged from sites. The associated SWMP details the requirements for new subdivisions to provide treatment for stormwater.

Part B, (9) contains objectives and policies around services and infrastructure. Objective 1 aims to avoid, remedy or mitigate the adverse effects of development, including servicing infrastructure, on the environment and to ensure that adequate infrastructure is provided by recovering costs from developers and the community. Under the associated SWMP, new developments will require a higher standard of stormwater treatment than what is currently occurring in the network, including stormwater treatment facilities.

Policies 2 to 5 aim to ensure adequate provision of servicing infrastructure is provided for new subdivisions and paid for by the appropriate parties. TDC provide regulations for stormwater treatment in new subdivisions and any upgrades to the network will be paid for either by the district council, ratepayers or developers.

Objective 2 aims to provide effective and efficient services to the community. Policies 1 and 2 provide for the maintenance, enhancement and operation of stormwater infrastructure (among other services) to meet both existing and future needs while avoiding, remedying or mitigating any adverse environmental effects. Policies 3 and 4 suggest that the operational and locational requirements of utilities infrastructure are considered when selecting site suitability and that co-siting of utility facilities is encouraged. The associated SWMP provides requirements for new subdivisions to provide adequate stormwater treatment facilities as well as future upgrades to the existing network.

In summary, the associated SWMP for Geraldine has been prepared in accordance with objectives and policies within the Timaru District Plan.

6.8 Ngai Tahu Planning Matters

A cultural assessment of the Waihi catchment waterways has been undertaken to facilitate this application. This survey has been undertaken using the Cultural Health Index (CHI) assessment. This assessment has been used to provide information on the current state of surface waterways within the Geraldine SMA in relation to the Iwi Management Plan of Kati Huirapa and Te Whakatau Kaupapa (Ngai Tahu Resource Management Strategy for the Canterbury Region).

6.8.1 Iwi Management Plan of Kati Huirapa

The Iwi Management Plan of Kati Huirapa (IMP) covers the area of the Arowhenua Runanga from the Rakaia to Waitaki Rivers.

The policy surrounding discharges of contaminants aims to have no discharges into surface water bodies and that these water bodies should be of the highest standard. It is considered that this is difficult to meet for stormwater discharges as it is necessary as a consequence of existing urban environments, especially in Geraldine where discharge to ground is not viable in all areas of town. However, the granting of this consent is considered to help improve the quality of stormwater discharge in the future with goals set out in the SWMP and by having appropriate consent conditions for improving or maintaining water quality.

The SWMP seeks to maintain and enhance existing riparian buffers and to avoid direct discharges of stormwater to the Waihi River.

The IMP contains a policy regarding the diversion of water which states that all water should be returned to the rivers. The proposed activity is considered to be in line with this policy as the natural rainfall contribution to the Waihi River and Serpentine Creek is maintained by having stormwater discharges into these waterways. Soak pits are also beneficial to shallow groundwater levels and will aid in the natural seepage of shallow groundwater into the Waihi River.

The policy surrounding water levels states that water levels in all natural waters must be maintained at levels sufficiently high to sustain the life of these waters. The stormwater management scheme in Geraldine is not expected to reduce surface water flows and is therefore considered in line with this policy.

The policy relating to fish passage aims to provide adequate flows and pathways for fish migration in waterways. As previously stated, the stormwater scheme is not expected to reduce surface water flows and therefore any impedance of fish migration will arise from matters outside the scope of this application such as naturally drying streambeds.

Policies relating to breeding areas and wildlife corridors aims to provide space both within and surrounding waterways for birds, fish and other species for migration and reproduction. The Waihi River is in good ecological shape with riparian planting and trees adjacent to the waterway, and the existing riparian areas are considered an important buffer to prevent limit contaminants

discharged to the receiving waterway. The SWMP seeks to enhance and maintain riparian waterway buffers.

Groundwater levels or surface water flows are not expected to be lessened by the Geraldine stormwater discharges and consequently, any effects of low flows which may result in the worsening of the ecology in the surface waterways is beyond the scope of this application.

The CHI assessment indicated that the Mahinga Kai measure of surface waterways around Geraldine ranged from 1 to 3.45 with an average score of 1.94 with a score of 1 being poor and 5 being excellent. This indicates that the waterways are generally not ideal for fish species. The Waihi River sites scored higher, with several species identified as likely being present in the waterway. Serpentine Creek scored poorly for Mahinga Kai. Although most of the poor scores appear to be a result of lack of flow and surrounding land use, it is important that the Geraldine SMA is not further reducing the quality of surface waters in the area. The granting of this consent will allow for the better management of the receiving environment to help improve the quality of surface waterways.

The IMP contains a policy relating to natural habitats which aims to encourage the protection and restoration of natural habitats. Additionally, the policy relating to planting of native species aims to restore habitats and depleted natural areas by providing native riparian planting.

The Waihi River has abundant riparian planting and is in better ecological condition than Serpentine Creek as discussed in Section 3.6 of this report. Although Serpentine Creek is of poor ecological quality, riparian planting is present along much of the residential area.

The associated CHI assessment identified that riparian planting was abundant in many of the surface waterways. However, there was still a lack of native planting with many of the riparian plants consisting of willows and grass. Also, some areas adjacent to waterways had been sprayed. Although spraying is beyond the management of the Geraldine SMA, this highlights the need for public education surrounding public actions around surface waterways and stormwater discharge points.

The associated Geraldine SWMP outlines cultural objectives which aim to have no reported impact on Mahinga Kai, Wāhi Taonga sites or indigenous fish as a result of stormwater discharges as a short term target (1 to 3 years). This will be implemented by improving stormwater discharge quality by requiring first flush treatment for new developments, retrofitting stormwater treatment and when upgrading the existing system.

6.8.2 Te Whakatau Kaupapa

The Te Whakatau Kaupapa is the Ngai Tahu Resource Management Strategy for the Canterbury Region. This document has been formulated to provide assistance for planning authorities by outlining both general and particular attitudes, beliefs and policies which Maori have in regard to natural resources.

The forests section, Policy 6 aims to establish vegetation at the margins of lakes and rivers and Policy 7 aims to conserve, protect and enhance existing indigenous vegetation. As previously discussed, both the Waihi River and Serpentine Creek have abundant riparian planting along their margins, much of this is non-native however. Any new plantings along the margins of surface waterways should aim to consist of native flora.

Under the General Water Policy Statement, Policy 1 states that no discharge into any water body should be permitted if it will result in contamination of the receiving water. Policy 3 aims to improve the quality and quantity of water in all waterways to the point where it supports fish and plant populations that were sourced from them in the past and that these mahinga kai are fit for human consumption. Policy 15 aims to have the Canterbury Regional Council encouraging land owners or occupiers to plan riparian vegetation adjacent to waterways.

Under the mahinga kai section, Policy 1 aims to improve the quality and quantity in all waterways to support fish and plant populations that were sourced from them in the past which are fit for human consumption. Policy 4 aims to maintain and enhance sites where mahinga kai still remain.

As previously discussed, the associated Geraldine SWMP aims to have no impact from stormwater discharges on mahinga kai, wāhi taonga sites or indigenous fish and to progressively work to prove conditions for Mahinga Kai. This will be implemented by improving stormwater discharge quality by requiring first flush treatment for new developments, retrofitting stormwater treatment in the existing system and reducing imperviousness.

7.0 Section 104D – Particular Restrictions for Non-complying activities

The discharge of stormwater activity is classified as a non-complying activity. Section 104D of the RMA requires that after considering an application, a consent authority may grant a resource consent for a non-complying activity only if it is satisfied that either:

- The adverse effects of the activity on the environment will be minor.
- The application is for an activity that will not be contrary to the objectives and policies of the relevant plan.

As assessed in Section 5.0 of this application, the application is for a non-complying activity as a result of the non-compliance with various conditions of the rules contained in the LWRP. Section 104D is often referred to as the threshold test, whereby there are two 'gateways', one of which must be passed, in order for a resource consent for a non-complying activity to be granted by a consent authority. In this case, the effects of the application have been considered in Section 12.0 and it is concluded that the adverse effects of the activity on the environment will be minor, indeed the proposal provides for many positive effects such as maintenance and improvement of water quality overtime, whilst ensuring that there is no significant increase in adverse effects from flooding. The first gateway is therefore considered to be passed by the application. In terms of the second gateway, the relevant objectives and policies of the applicable plans have been assessed, and it is concluded that the activity will not be contrary to them. It is considered that the proposal is generally consistent with the objectives and policies of the applicable plans, as well as other relevant statutory documents such as the Resource Management (National Environmental Standard for Sources of Human Drinking Water) Regulations 2007 (Drinking Water NES), National Policy Statement for Freshwater Management and the CRPS. On this basis, the application passes both of the gateway tests of section 104D of the RMA and therefore this application can be assessed on its merits.

8.0 Section 105 – Matters Relevant to Discharge Permits

Section 105 of the RMA states:

> ***(1) If an application is for a discharge permit or coastal permit to do something that would contravene section 15 or section 15B, the consent authority must, in addition to the matters in section 104(1), have regard to:-***
>
> > ***(a) The nature of the discharge and the sensitivity of the receiving environment to adverse effects; and***
> >
> > ***(b) The applicant's reasons for the proposed choice; and***
> >
> > ***(c) Any possible alternative methods of discharge, including discharge into any other receiving environment.***

A detailed description of the receiving environment and the nature of the discharge have been provided in Sections 3.0 0 and 4.0 of this report.

It is considered that the current disposal method of discharging to ground and to surface waterways provides a balance to simulate natural discharge patterns. The option to discharge to ground is only viable in the Raukapuka area and limited locations of the western side of town due to the nature of the underlying lithology. Therefore discharges to surface waterways are necessary within the Geraldine SMA in areas of poor soil drainage.

In addition, the SWMP outlines methods to improve existing and future stormwater discharges in the scheme. The Waihi River is considered to be a more sensitive environment than Serpentine Creek and contains flora and fauna that should be considered when planning improvements to the discharge. Details in the SWMP provide for future maintenance and enhancement of riparian buffers along the Waihi River, this will help to provide a suitable habitat for aquatic life as well as improving the water quality in the Waihi River. Additionally, new developments greater than 4,000 m^2 will require adequate stormwater treatment facilities and any upgrades to the network will also incorporate treatment facilities.

It is considered that the proposed discharge methods with the proposed improvements are the most appropriate method for the current situation in Geraldine.

9.0 Section 107 – Restriction on Grant of Certain Discharge Permits

Section 107 of the RMA states:

> ***(2) A consent authority may grant a discharge permit or a coastal permit to do something that would otherwise contravene section 15 or section 15A that may allow any of the effects described in subsection (1) if it is satisfied:-***
>
> > ***(a) That exceptional circumstances justify the granting of the permit; or***
> >
> > ***(b) That the discharge is of a temporary nature; or***
> >
> > ***(c) That the discharge is associated with necessary maintenance work.***
> >
> > ***And that it is consistent with the purpose of this Act to do so.***
>
> ***(3) In addition to any other conditions imposed under this Act, a discharge permit or coastal permit may include conditions requiring the holder of the permit to undertake such works in such stages throughout the term of the permit as will ensure that upon the expiry of the permit the holder can meet the requirements of subsection (1) and of any relevant regional rules.***

As the granting of the discharge permit is expected to contravene section 15 of the RMA, the granting of global stormwater consent will need to be covered under subsection (2). Subsection (2a) applies to this application as the stormwater network is an essential component of the built environment and is considered to be necessary to avoid surface flooding. Additionally, the application can also be covered under subsection (2b) because stormwater discharges only occur intermittently during rainfall events, resulting in the discharge of contaminants being of temporary nature. The application also provides for subsection 2(C), with the actions included in the SWMP to improve and maintain the nature of the discharges.

There is currently no evidence to suggest than stormwater discharge is having an adverse effect on the Waihi River or on groundwater in the area. Additionally the Applicant is implementing a SWMP to confirm that the effect on the Waihi River and groundwater is no more than minor through the implementation of a monitoring plan. Work is on-going to improve the understanding of potential impacts to the receiving environments, which an adaptive approach included in the SWMP to provide for improvements to be implemented. This includes measures to minimise adverse effects of contaminants on the receiving environment. Treatment options are provided for both new developments and upgrades to the existing network. It is considered that not granting the stormwater discharge consent would be more detrimental to the receiving

environment and the community as an area consent would allow for the better management of stormwater as well as allowing for upgrade measures outlined in the SWMP to be implemented. It is expected that conditions will be included relevant to subsection (3) that allow for future improvement of the discharges so that discharges can eventually meet the quality requirements of subsection (1) of Section 107 of the RMA.

10.0 Part II Purpose and Principals of the Act

10.1 Purpose of the Act – Section 5

The purpose of the Act is to "promote the sustainable management of natural and physical resources… sustainable management means managing the use, development and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being". Promotion of sustainable land use practices are required as part of the management of the Geraldine stormwater network are considered essential limit adverse effects on the receiving environment. The social and economic well-being of the Geraldine community is provided for by the stormwater network as it provides a cost effective method of removing stormwater to minimise adverse effects on the community such as flooding and on the receiving water quality. Whether the purpose of the RMA is being achieved involves "an overall broad judgement" that allows for the comparison of conflicting considerations and the scale and degree of them and their relative significance or proportion in the final outcome. However[2], recent case law has questioned the applicability of this approach in respect of resource consent applications. It is considered that in this particular application, Part 2 matters are supported and that the proposal is consistent with sections 6, 7, 8 and the purpose of the Act.

10.2 Matters of National Importance – Section 6

Section 6 outlines matters of national importance that are to be recognised and provided for in achieving the purpose of the Act. These matters include, but are not restricted to, the preservation of the natural character of rivers and their margins, and the protection of inappropriate subdivision, use and development. The relationship of Maori, their culture and traditions to the environment must also be recognised.

The proposed activities and mitigation described in this AEE recognise and provide for the matters of national importance outlined in Section 6.

10.3 Other Matters – Section 7

Section 7 of the Act sets out those matters that have particular regard attributed to them in achieving the purpose of the Act. Those matters are as follows:

(a) Kaitiakitanga;

(aa) The ethic of stewardship;

(b) The efficient use and development of naturals and physical resources;

(ba) The efficiency of the end use of energy;

(c) The maintenance and enhancement of amenity values;

[2] '[2018] NZCA 316 - CoA Decision'

(d) Intrinsic values of ecosystems;

(e) [Repealed];

(f) Maintenance and enhancement of the quality of the environment;

(g) Any finite characteristics of natural and physical resources;

(h) The protection of the habitat of trout and salmon;

(i) The effects of climate change;

(j) The benefits to be derived from the use and development of renewable energy.

Relevant to this proposal are (b), (c), (d), (f), (h) and (i).

Subsection (b) is relevant because the stormwater network allows for the efficient disposal of stormwater originating as a result of the built environment.

Subsection (c) is directly applicable to the proposal as it provides a stormwater disposal service which improves amenity values by reducing flooding.

Subsections (d) and (f) have been taken into account for this proposal as the associated SWMP contains future objectives around improving the receiving environment by requiring first flush treatment in new subdivisions and treatment where upgrades to the network are undertaken. Ongoing environmental monitoring of the receiving waterways and the improvement of riparian buffers will also help to protect the intrinsic values of the receiving ecosystem.

The maintenance and enhancement of riparian buffers in the Waihi River, particularly around stormwater outlets, will provide additional habitat for trout and salmon. Stormwater treatment for new subdivision and network upgrades will also help to improve water quality in the Waihi River, enhancing the habitat for aquatic life. As a result, it is considered that subsection (h) has been adequately taken into account.

The effects of climate change (subsection (i)) have been taken into account during the stormwater quantity modelling undertaken by Opus (2014b) and referred to in the associated SWMP for future management of stormwater in Geraldine.

It is therefore considered that the relevant matters in Section 7 of the Act have been adequately taken into account through the associated SWMP, AMP, recommended mitigation measures and proposed consent conditions.

10.4 The Principles of the Treaty of Waitangi

The Act states in Section 8 that:

In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall take into account the principles of the Treaty of Waitangi (Te Tiriti o Waitangi).

The Court of Appeal has identified four principles, which form the basis of developing a relationship of partnership and communication. These are the Essential Bargain, Tribal Self-Regulation, The Treaty Relationship, and Active Protection. The third principle, the Treaty Relationship, accords Maori with special status as a Treaty Partner, distinct and separate from status as an 'affected party'. This AEE will be reviewed by the ECan iwi Liaison officer prior to any decision on the application being made.

The associated SWMP recognises the role of the Tangata Whenua and includes for their on-going input to the operation of the SWMP.

It is considered that the granting of this application will not compromise the principles contained in the Treaty.

10.5 Summary

Overall, the granting of this consent will promote the sustainable management of natural and physical resources whilst enhancing the economic and social benefits arising from the management of stormwater within the Geraldine SMA.

11.0 Consultation

11.1 Te Runanga o Arowhenua

Prior to the lodgement of this application, local iwi from Te Runanga o Arowhenua were invited to carry out a Cultural Health Index assessment of the waterways within the Geraldine area. Iwi were given the opportunity to identify areas of cultural importance by rating the waterway for mahinga kai, stream health and overall site importance. It is also expected that the ECan iwi liaison officer will review this application upon submission.

Input and feedback on the proposed SWMP was sought and received from Aoraki Environmental Consultancy Ltd as agents of Te Runanga o Arowhenua.

Concerns raised include:

- Relate to the lack of details of TDC's SW treatment requirements. In particular, this related to treatment of first flush discharges, sediment removal and riparian planning. This was prior to completion of TDC's stormwater treatment design guide.
- Inclusion of cultural monitoring requirements. It was agreed that the monitoring programme would be agreed and implemented in the first year of the consent. This was considered in line and complementary with the additional environmental monitoring included in the first year of the consent. It was preferred that both items would be completed within a 12 month period. While ECan's concerns about obtaining a representative period in a single year, it was considered more important to progress and the plan allowed this period to be adapted should unusual climate conditions exist in the first year of the consent
- Concerns about the various parties responsible for managing the water ways and AECL supported a single agency approach to manage the receiving waterways if possible. This issue was acknowledged by TDC, and AECL recognised that they did not necessarily have the ability to change the current legal and statutory arrangements. AECL indicated that they would like to see the management responsibilities clearly spelt out in the SWMP e.g. private landowners /ECan TDC.
- A desire was expressed for regular reporting as well as more detailed reviews of the plan. The annual reporting requirements provide for this purpose and it was agreed that Takata Whenua received the annual reporting summary for comment. It was expected that TDC would be acting on intermediate monitoring requirements.

11.2 Public Questionnaire

TDC have also conducted a public survey of the Geraldine community that highlighted community perspective of the receiving waterways and flooding risk and aimed to identify areas where upgrades to the network could help to improve issues highlighted by the survey.

11.3 Environment Canterbury

PDP and TDC staff met with ECan Staff on two occasions in early 2018. Comments from ECan included the following:

- More detail regarding a capital works programme to improve stormwater discharges. This has not been possible to provide as the applicants budgeting is dependent on the Long Term Plan Process that is governed by the Local Government Act and all funding requests need to be approved through this process.
- Inclusion of Site Pollution Control Plan / Site Environmental Management Plans to ensure that responsibilities for private property discharges are adequately captured and controlled. This has been included in the updated SWMP proposed for this consent application.
- It was suggested that a three year baseline monitoring programme would provide a better basis of defining baseline conditions

Details of the consultations are included in Appendix B.

12.0 Assessment of Effects on the Environment

12.1 Surface Water Quality

The principal surface water receiving environments of the stormwater discharge are Serpentine Creek and the Waihi River. Discharges to the Raukapuka Stream and Downs Creek also occur but are very minor. All these waterways flow into the Temuka River approximately 14 km downstream of the Geraldine Township. The Temuka River then flows into the Opihi River approximately 3 km downstream of Temuka Township before eventually being discharged to the Pacific Ocean.

The effect of stormwater on surface water quality has been discussed in Section 4.2 of this report. There has been no observable impact on surface water quality, but the SWMP recognises the potential impact of stormwater discharges especially at times of low flows in the Waihi River, and the accumulation of contaminants. The SWMP seeks to ensure that water quality in the receiving waterways does not deteriorate and seeks to achieve improvements over time.

TDC plan to implement an on-going monitoring programme to confirm the impacts of stormwater discharges on surface water quality and understand the nature and effects of the discharges better. This will help to determine measures to be included for network upgrades to reduce the impact on the environment.

Serpentine Creek currently has low water quality through low flows, nutrient enrichment and elevated dissolved zinc. The environment is likely to continue to be affected due to the continual chronic long-term input of heavy metals, especially dissolved metals, and inputs from agricultural run-off from adjacent land as well as the ephemeral flow regime. However, the impact from stormwater discharges is not yet confirmed, and ongoing assessment is programmed with solutions in hand if required. The associated SWMP and proposed consent conditions outline methods for the ongoing monitoring of waterways and treatment measures to be implemented for new developments and upgrades to the existing network.

Currently, the discharge of Serpentine Creek into the Waihi River does not appear to be having a negative impact on the downstream environment.

The Waihi River is typical of many small to medium hill – fed rivers in Canterbury in that the river can be divided into two distinct areas: the steeper, permanently flowing headwaters and the lower gradient, intermittent reaches below the Geraldine Township. During wetter periods, and therefore increased stormwater inputs, the Waihi River is likely to be flowing downstream of the Serpentine Creek confluence. Therefore, while the effects on surface water quality from stormwater discharges may be potentially more than minor, current observations suggest that the effects are no more than minor. However, it is believed that the granting of this consent would allow for the better management of stormwater quality and improvement through goals set within the SWMP and consent

conditions which allow for future improvement of the scheme. An ongoing monitoring programme of water quality in the receiving environment will help to better understand any adverse effects of stormwater discharges which can subsequently be targeted in future treatment upgrades to the network.

12.2 Surface Water Quantity

The Geraldine Stormwater Scheme provides a balance of discharges to ground and discharges to surface waterways. The use of groundwater soak pits reduces the effect of increasing surface water flows during stormwater events.

12.2.1 Waihi River

Section 2.5 of this report outlines the component of stormwater discharge within the Waihi River during stormwater events. This is currently expected to be around 1.2% of the flow during a 20% AEP event and around 0.8% of the flow during a 1% AEP event. In the future with additional town growth this is expected to increase to 1.6% for a 20% AEP event and 1% for a 1% AEP event. This component of stormwater is small and is expected to only have a minor effect on flood levels in the Waihi River as defined by the permitted activity rule in LWRP.

12.2.2 Serpentine Creek

The water quantity modelling report provided by Opus (2014b) indicates that that the critical duration for flooding in Serpentine Creek is 1-2 hours for the 20% and 10% AEP events. Serpentine Creek is predicted to be able to sufficiently convey a 20% AEP rainfall event, but during a 10% AEP event some flooding outside the waterway channel is expected to occur in the downstream portion of the creek below Kennedy Street. No flooding of buildings is anticipated.

Additionally, the Opus (2014b) report indicates that the component of stormwater in Serpentine Creek is predicted to increase considerably by 2070 (based on 300 new houses). The modelling indicated that the existing flow from Serpentine Creek into the Waihi River during a 20% AEP event could increase from 2.5 m^3/s to 3.4 m^3/s (a 36% increase) and likewise for a 1% AEP event flows could increase from 16.6 m^3/s to 22 m^3/s (a 33% increase).

The stormwater contribution to Serpentine Creek is higher than the Waihi River because approximately 44% of the Serpentine Creek catchment is located within the Geraldine SMA. As a result, the effects on surface water flows in Serpentine Creek as a result of stormwater discharge are more than minor as the flows are increased proportionally to the area of hardstanding. The adverse effects of this increase in flow are managed through operation of two detention dams attenuating runoff from the upstream rural catchment and assessment of the capacity of the downstream channel with the use of a hydraulic computer model to provide confidence that the effects are able to be managed. On-going maintenance of a computer model to reflect and understand the effects of

development levels is required along with proactive management of the in channel vegetation in Serpentine Creek. This is considered the best practicable option for stormwater discharge to avoid adverse flooding effects.

12.2.3 Soak Pit Related Flooding

As discussed in Section 2.5.3 of this report, soak pits are reported to be the poorest performing asset of the scheme. This is particularly evident in soak pits on the western side of the Waihi River where the soils are not as freely draining. However, soak pits on the eastern side of the river have also been identified as poor performing, often causing flooding in low intensity rainfall events. This is likely a result of lack of maintenance, with sediment and debris blocking the flow of water into the subsurface.

Soak pit maintenance is required to maintain a satisfactory level of protection from flooding for the discharges to ground. As such maintenance is reactive rather than proactive. This is acceptable as long as adequate secondary flow paths are provided is important in case of soak pit failure.

12.2.4 Overland Flow Management

Assessment of overland flow paths are provided within the SWMP to ensure new development does not impede overland flow paths and cause additional flooding issues.

12.2.5 Conclusions

It is clear that the current stormwater scheme for Geraldine does not meet the designed level of service as outlined in Section 2.5.3 of this report. However, the purpose of this application is to provide TDC with a framework and objectives that they can work towards to meet improve the performance of the network in a sustainable manner. It is expected that there will be an ongoing process of reviewing the SWMP, maintaining and upgrading certain parts of the scheme with the more critical issues acted upon first.

12.3 Ecological Effects

12.3.1 Macroinvertebrate Community

The macroinvertebrate community within the Waihi River is naturally variable, both spatially and temporally, and this is reflected in the biotic indicator fluctuations that have occurred. Downstream of the Geraldine Township the Waihi River is known to periodically go dry for periods of the year. Low flows can significantly affect the macroinvertebrate community by restricting the available habitat for sensitive species (especially EPT taxa), increasing the presence of nuisance periphyton growth and ultimately causing a shift in the macroinvertebrate community structure.

It is anticipated that the effects on the macroinvertebrate community of the Waihi River from stormwater in-flows will be less than minor.

The ecological values of the receiving environments are proposed to be monitored as part of the Monitoring Plan to ensure that any deterioration of the receiving environment may be addressed and ongoing improvements may be measured.

12.3.2 Fish Diversity

The fish species that are known to inhabit the Waihi River appear to be split into to two distinct groups. The diadromous species that need to migrate to the sea to complete their life cycle are located within the lower Waihi Catchment. While the upper catchment is dominated by non-diadromous fish species. Small populations of resident fish species were identified within Serpentine Creek. Currently, the aquatic habitat and water flow within Serpentine Creek do not provide adequate habitat for fish species known to inhabit the wider upper Waihi catchment.

The discharge of Geraldine's stormwater whether it is directly to or via tributaries of the Waihi River is not likely to have a negative effect on the fish species immediately downstream of the Geraldine Township. It is noted that there are some contaminants within the stormwater discharges may exceeded the relevant ANZECC trigger levels included in Schedule 5 of the LWRP. In the first instance, effects on the fish species in the receiving waterways are proposed to be assessed through water quality parameters and the health of the macroinveterbate community.

It is likely that the health of the fish communities may be affected by low flows in the Waihi River and Serpentine Creek. The low flows are not considered to be related to the stormwater discharges.

12.4 Groundwater Quality

The groundwater quality results in Section 3.7.4 of this report indicate that *E.coli* concentrations in groundwater up to 2 km downgradient of the SMA are elevated and additionally, nitrate concentrations are indicative of rural land use. It is considered that bacterial contaminants present in the shallow groundwater are a result of surrounding agricultural land use and possible contamination from stock either directly to the groundwater or at well heads. Therefore, it is considered that stormwater discharges to ground in the Geraldine SMA do not pose a significant increase to *E. coli* in groundwater beyond what is already occurring. Additionally, there are no public supply wells within the vicinity of the Geraldine SMA, and properties downgradient of the SMA are connected to the public water supply network .

Stormwater typically contains heavy metals which will be disposed to ground via the soak pits within the Geraldine SMA. However, current research suggests that

many heavy metals from stormwater discharges can be removed via soil infiltration by these metals being effectively bound to the soils. As a result, it is considered that discharging stormwater to ground is a better option than discharging to surface waterways.

As a result of the unlikely transport of heavy metals into groundwater, and given that *E.coli* concentrations in surrounding land appear elevated due to land use and possibly associated groundwater contamination, it is considered that the additional effects on groundwater quality from the discharge of stormwater to ground are no more than minor.

12.5 Groundwater Quantity

One consequence of stormwater generation is that the natural aquifer recharge characterisation is often lost due to runoff from hardstand surfaces being directed to surface waterways. Although this is partially the case in Geraldine, soak pits are still used across the area with heavy reliance in the Raukapuka area.

Much of the stormwater in the scheme will be discharged to ground and as discussed in Section 3.6.3 of this report, the portion of Waihi River in Geraldine is a losing reach so some of the stormwater discharged to the Waihi River is expected to further discharge to ground.

Consequently, the stormwater scheme is thought to simulate much of the natural discharge to ground that would be occurring in the absence of hardstand surfaces and there will be minimal effects on groundwater quantity in the area. As a result, the effects on groundwater quantity are expected to be no more than minor.

Further monitoring will allow for the determination of expected groundwater levels and mounding effects for the design of new discharges to ground.

12.6 Effects on Drinking Water Supplies

As discussed in Section 3.7.3 of this report, there are 47 active and proposed bores within the close vicinity and 2km down-gradient of the Geraldine SMA that are listed as used for domestic or community supply (not including stockwater supply) either as a primary or secondary use. Seven of these bores are located within the management area. However all bores located within the scheme area have access to reticulated drinking water supply connections with the remaining bores being located in rural areas.

The associated Opus (2014a) groundwater and contaminated sites report considered bores up to 1,000 m downgradient of the SMA.

The most obvious risk to drinking water supply bores is from bacterial contaminants entering groundwater via stormwater seepage through soak pits. Bacterial contaminants are expected to arise from animal faeces deposited on hardstand surfaces which subsequently enter the stormwater soakage systems.

It is considered that biological contaminants entering the soakage systems will be filtered through the unsaturated zone of the soils and then further disperse, dilute and decay once reaching groundwater.

The Opus (2014a) report states that for drinking water supply bores within 500 m of a soak pit, the associated dwellings are either connected to the public network or have the availability to in the future where there is no dwelling.

As stated in Section 12.4 of this report, high *E.coli* concentrations in nearby monitoring bores are expected to result from surrounding land use and possible groundwater contamination from the surrounding land uses rather than from stormwater discharges to ground. Therefore, it is considered that the additional effect on drinking water supplies as a result of stormwater discharges is no more than minor. Future groundwater bores will need to take into account the potential for contamination from both stormwater discharges to ground within the SMA depending on their proximity to the SMA as well as surrounding land use.

12.7 Effects on Archaeological Sites

There are no archaeological sites shown on the Environment Canterbury GIS database in or around the Geraldine SMA.

12.8 Effects on Ngai Tahu Values

The Papatipu Runanga in which the proposed activity will occur is Arowhenua. The location where the activity is to take place is not located on or adjacent to any Statutory Acknowledgement Areas or Silent File Areas as shown on the ECan online GIS database. However, Raukapuka Creek is identified as a Runanga sensitive area. This means that the creek has been identified as an area that has cultural values that may be more sensitive to adverse effects. As a result, it is important that the natural state of this creek is maintained and that adverse effects from stormwater do not impact on the creek.

Section 6.8 of this report contains an assessment against the policies contained in the Iwi Management Plan of Kati Huirapa – Arowhenua – Rakaia to Waitaki. This plan was released in July 1992 and reflects values in regards to natural resource management for Southern Canterbury.

In general, stormwater discharges contravene with some of Ngai Tahu's values although the discharge of stormwater is considered to be a necessary facility as a consequence of the built environment and cannot be avoided. Therefore, the associated SWMP and proposed consent conditions will allow for on-going future improvement of stormwater discharges within the SMA.

12.9 Benefits to the Community

Stormwater in the Geraldine area is currently not covered under any resource consent and as a result, is relatively unregulated. The granting of global resource

consent will allow for stormwater to be better managed in the Geraldine area where TDC can work with the associated SWMP and AMP and update these as necessary. The plans provide for the mitigation of current and future issues that may arise and help to manage stormwater in a more effective and sustainable way.

It is considered that by gaining resource consent for the stormwater management area for stormwater discharges in Geraldine, TDC will be bound by the proposed conditions set out in Appendix C of this report as well as objectives in the associated SWMP. Consequently, stormwater discharges will be far better managed than currently which will improve both the performance of the scheme and the quality of stormwater in the Geraldine area, providing a positive benefit to the community.

13.0 Mitigation Measures

13.1 Planning Documents

The associated SWMP and AMP have been implemented so that stormwater in Geraldine can be better managed to improve both the quality of the discharge and the performance of the scheme. It is expected that SWMP and resource consent for the SMA will allow for the better management of the scheme and will help to set achievable targets.

13.2 Stormwater Management Plan

The associated SWMP outlines the procedures that will be put in place to maintain or improve the overall stormwater network within Geraldine. This includes:

- Monitoring and Review;
- Education;
- Capacity upgrade options for improved protection from flooding;
- Treatment Requirements if adverse effects are observed;
- New development requirements;
- Maintenance Requirements;
- Site Management Requirements;
- Site Spill Management Requirements; and
- Construction Discharge Management.

Environmental monitoring will help to determine the actual effects of stormwater discharge on the receiving environment. This, with the addition of public involvement such as the previously completed customer satisfaction survey will allow for targeted upgrades to be completed. The SWMP also details the requirements for new developments that are expected to generate stormwater.

13.3 Consideration of Alternatives

It is generally considered that the discharge of stormwater to ground is the best practicable option as it mimics natural processes and allows for filtering of contaminants through the vadose zone rather than having these contaminants mobilised in surface waterways. This has been implemented where possible in the Geraldine SMA with the use of soak pits.

With soils on the western side of town being of low permeability compared to soils on the eastern side of the Waihi River, it is considered that stormwater discharge to ground is not viable in the western area of the scheme. As a result,

the most viable discharge source in this area is to Serpentine Creek and the Waihi River.

It should also be noted that any new developments within the SMA will be required to have first flush treatment in order to improve the quality of stormwater within the scheme in the future.

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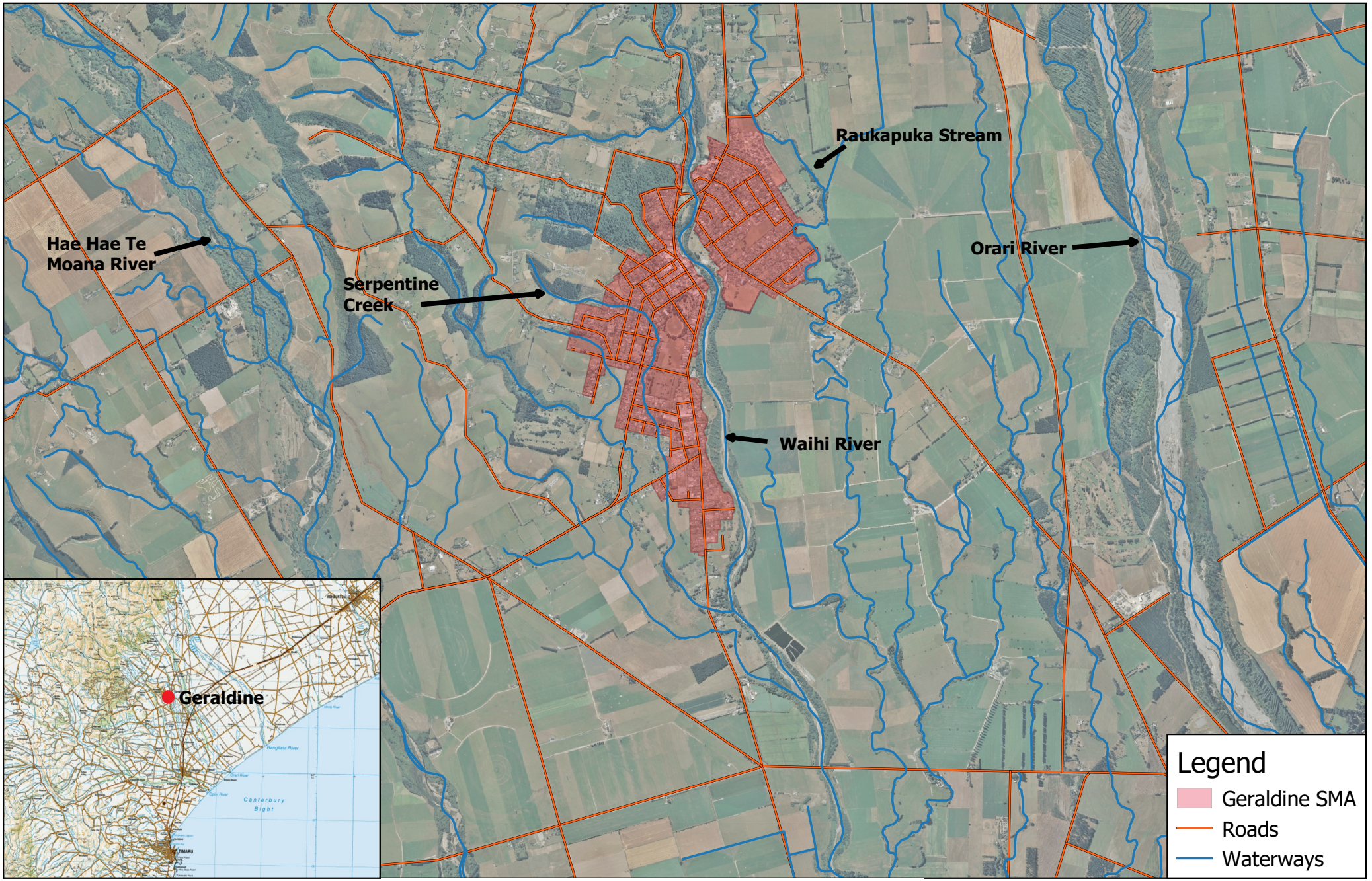
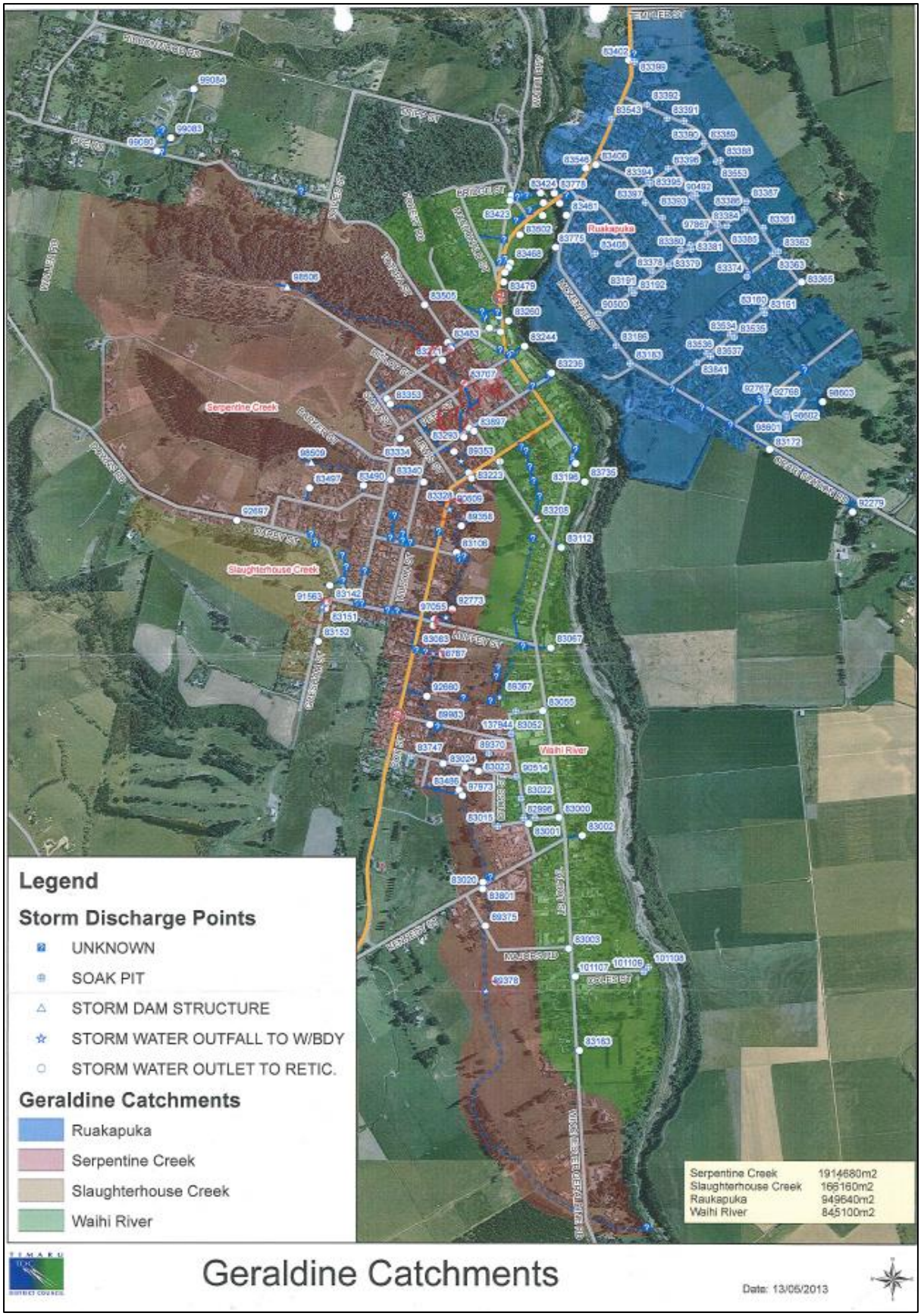
Appendix A

Figures



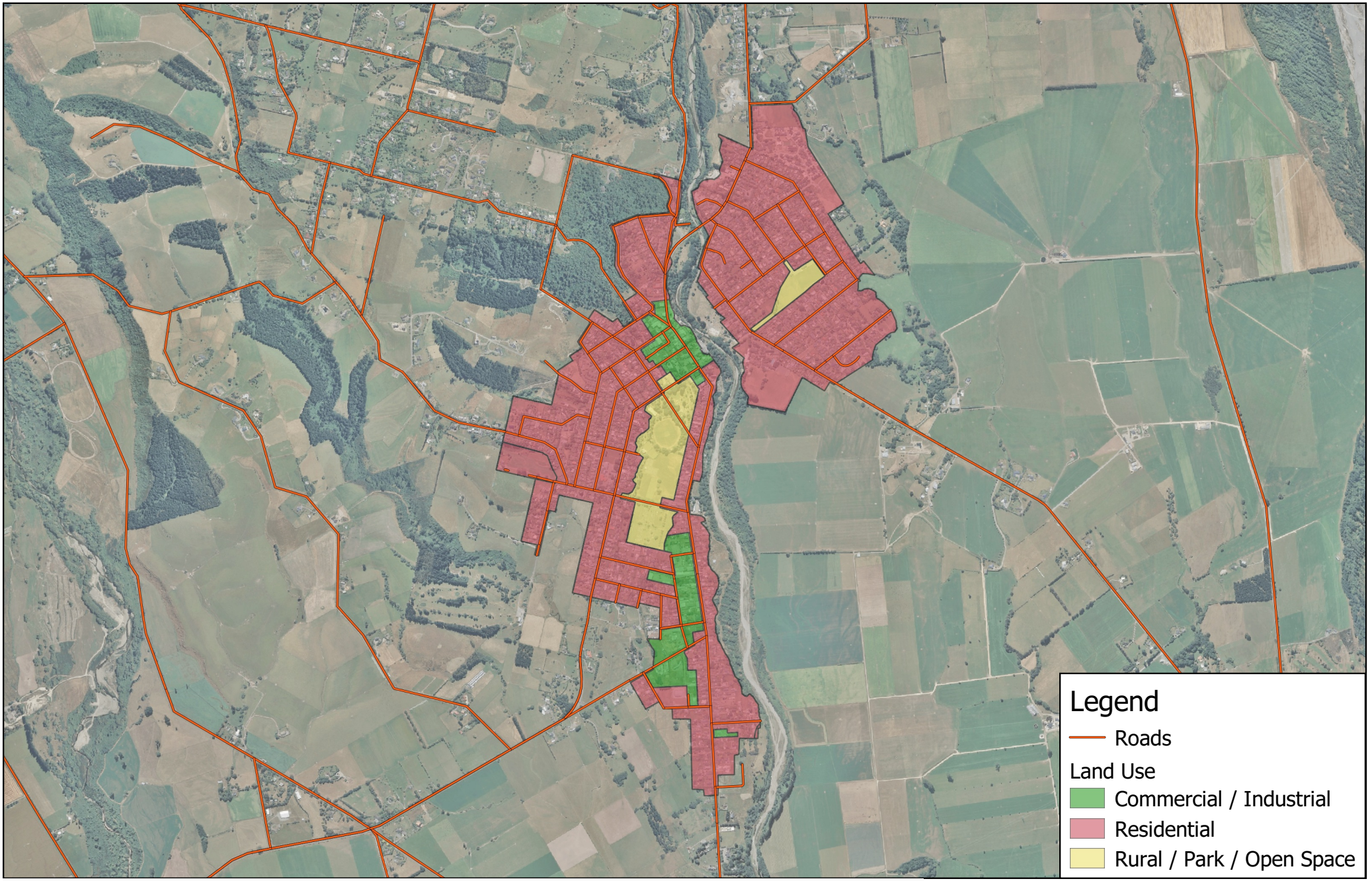
Note: Locations of features shown above are approximate. Background aerial, river and road information obtained from LINZ data service.

FIGURE 1: GERALDINE STORMWATER MANAGEMENT AREA



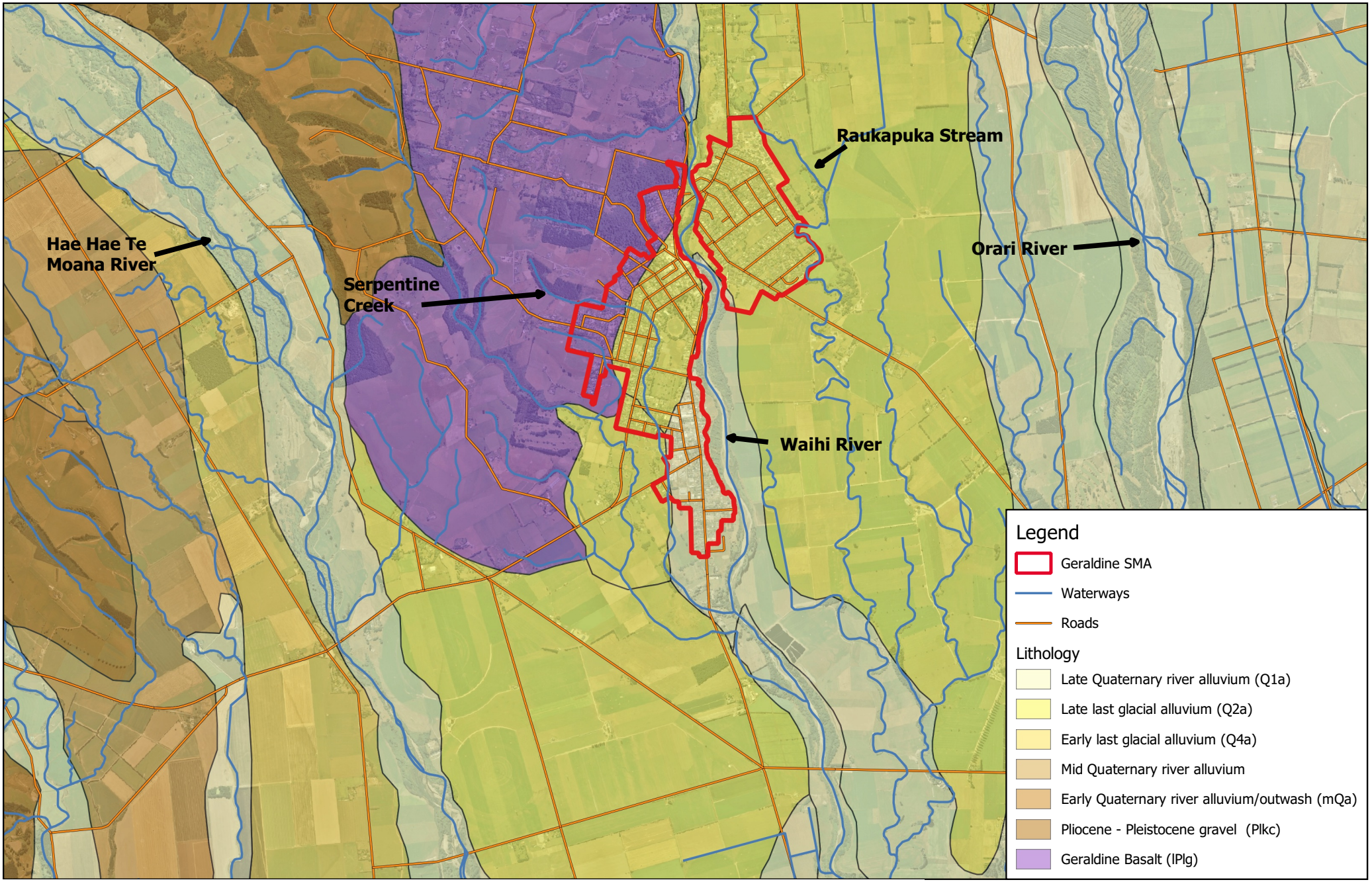
As supplied by TDC.

FIGURE 2: GERALDINE STORMWATER MANAGEMENT SCHEME



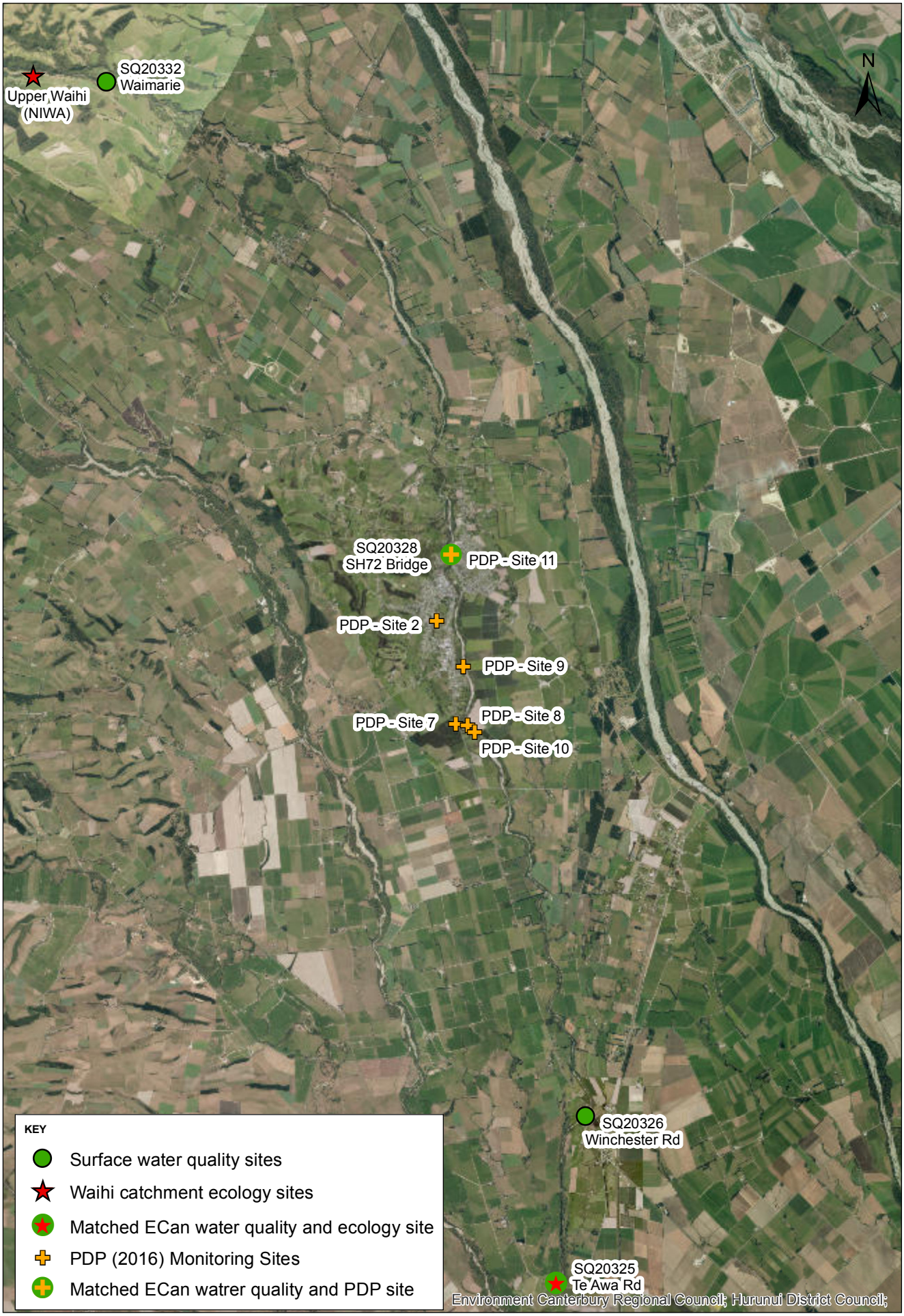
Note: Locations of features shown above are approximate. Background aerial, river and road information obtained from LINZ data service.

FIGURE 3: LAND USE WITHIN THE GERALDINE SMA



Note: Locations of features shown above are approximate. Background aerial, river and road information obtained from LINZ data service. Geological map obtained from GNS Science.

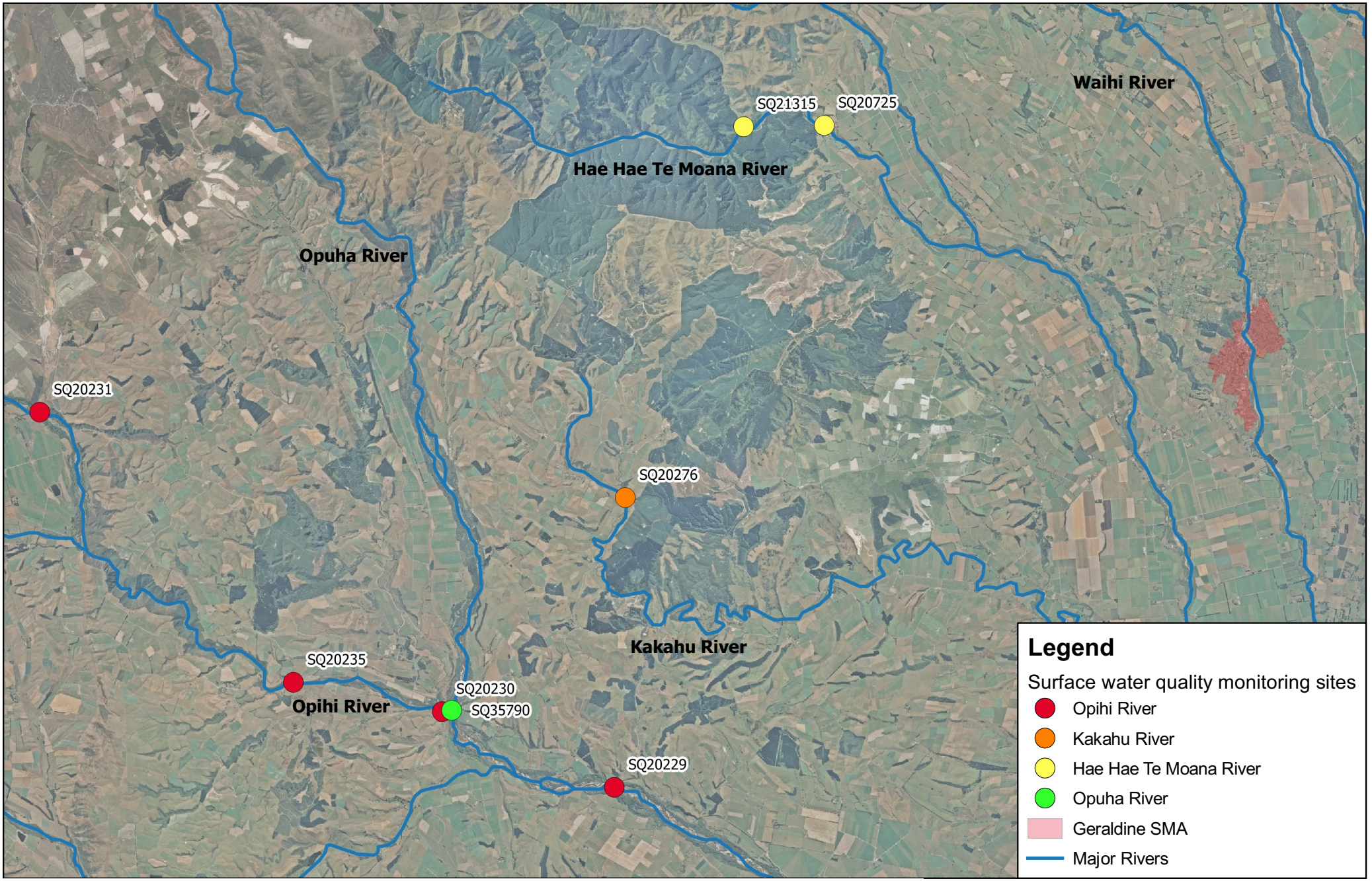
FIGURE 4: GEOLOGICAL MAP OF THE GERALDINE AREA



SOURCE:
1. AERIAL IMAGERY SOURCED FROM CANTERBURY MAP PARTNERS ADMINISTERED BY ENVIRONMENT CANTERBURY (MAY NOT BE SPATIALLY ACCURATE).

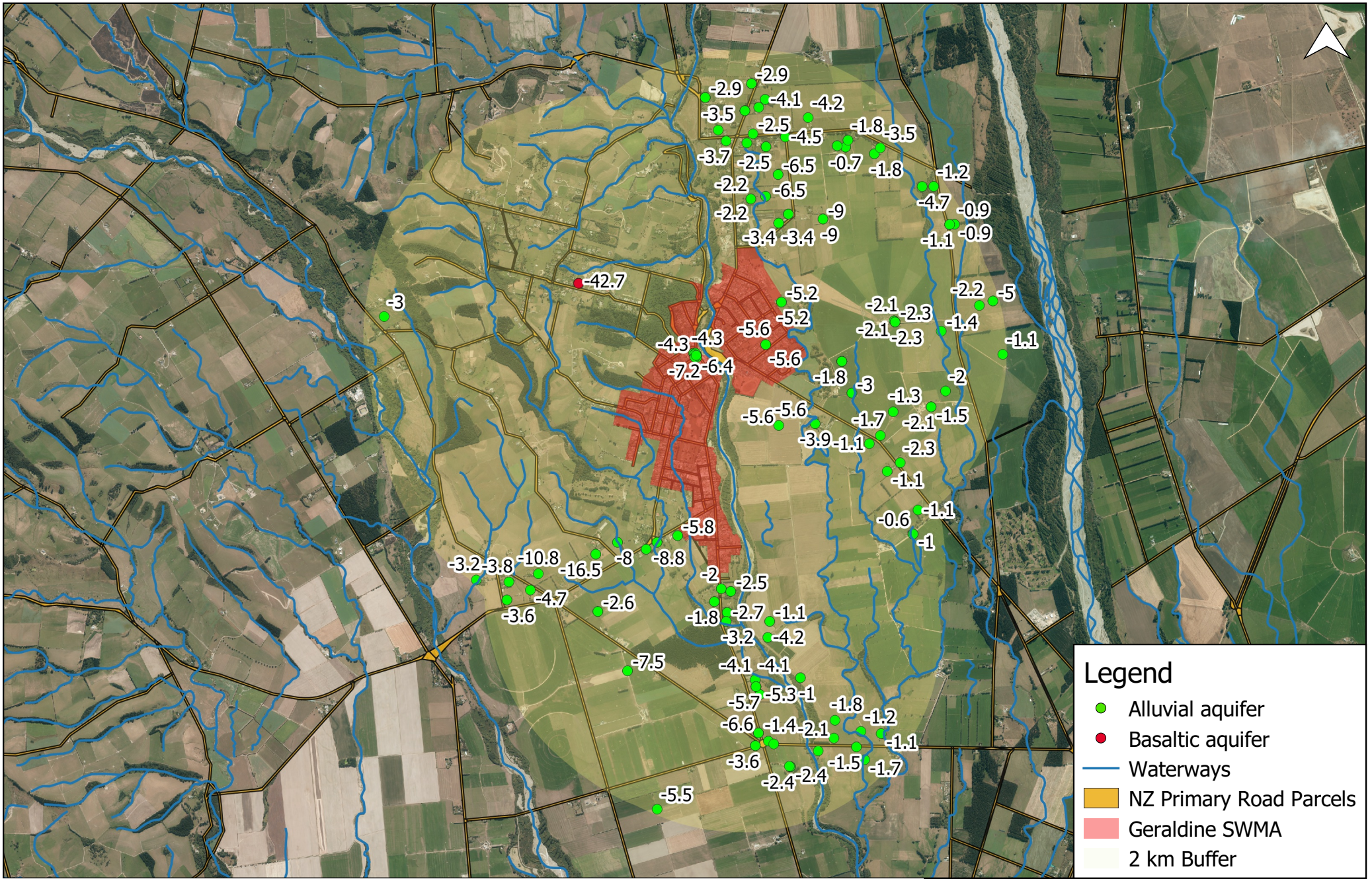
FIGURE 5 : Waihi River catchment monitoring sites

0 2 4 KM



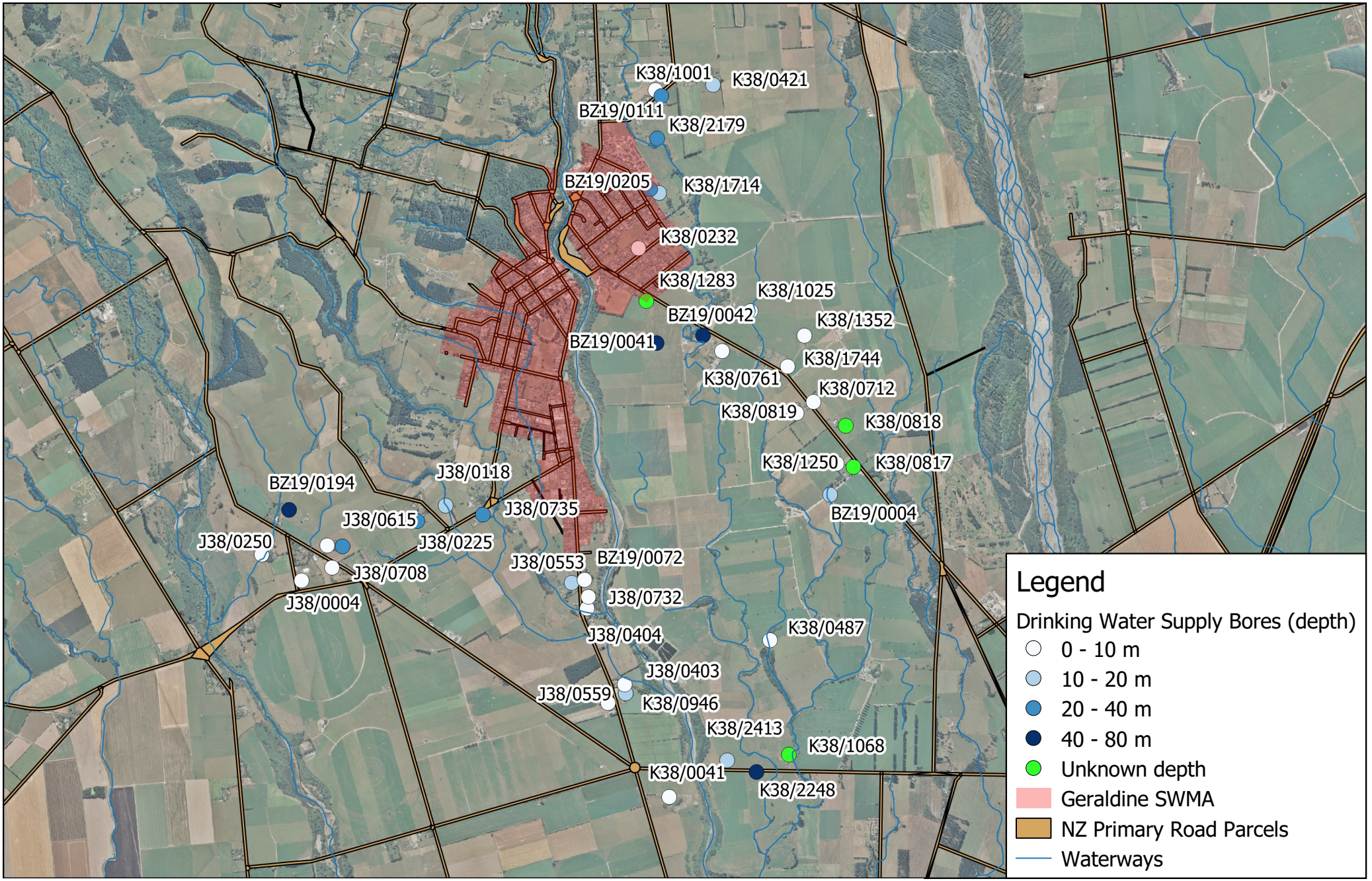
Note: Locations of features shown above are approximate. Site locations obtained from ECan's online GIS database. Background aerial imagery and river information obtained from LINZ data service.

FIGURE 6: SURFACE WATER QUALITY SITES FROM THE WIDER OPIHI CATCHMENT



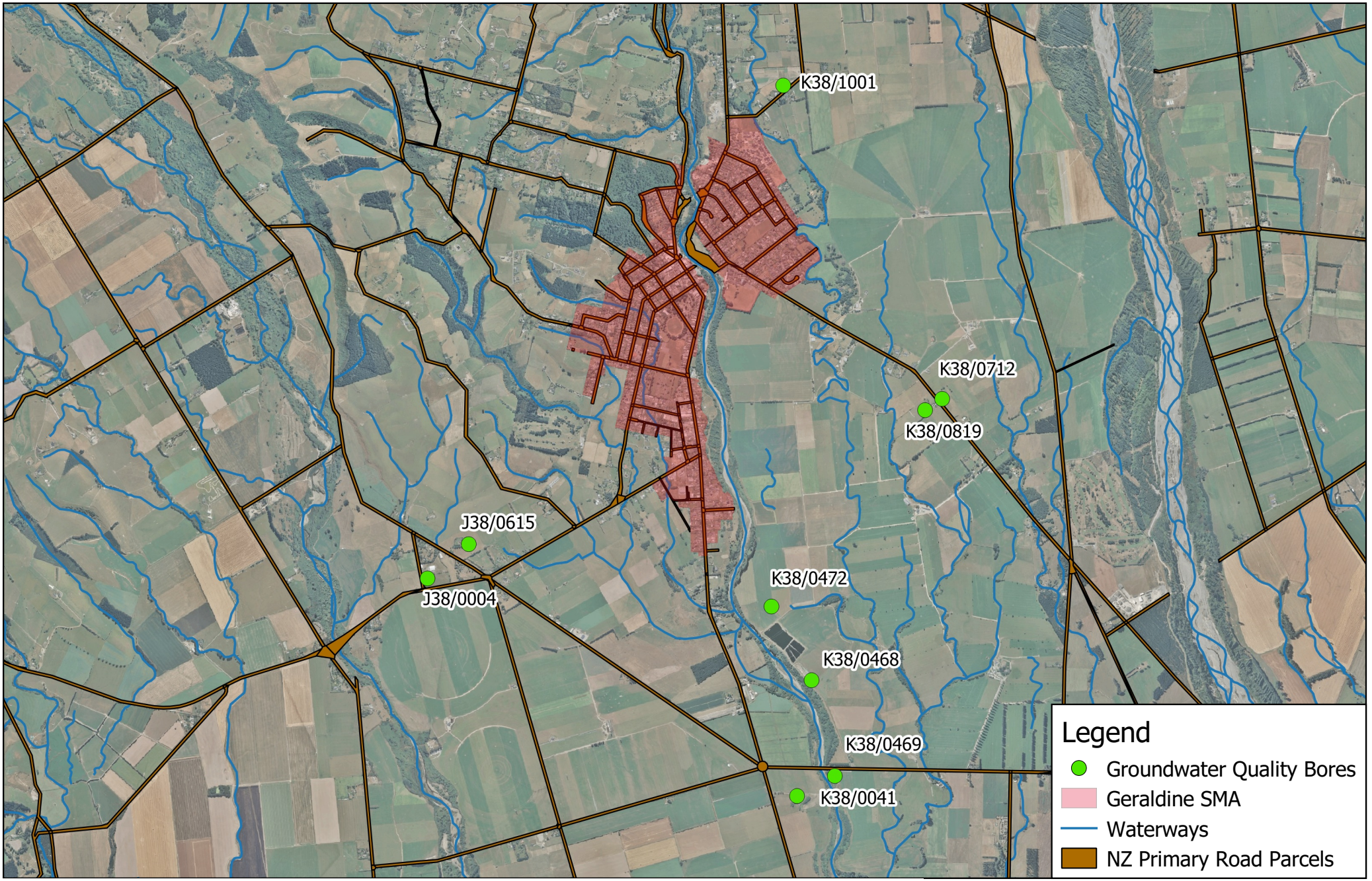
Note: Locations of features shown above are approximate. Bore locations obtained from ECan's online GIS database. Background aerial imagery, river and road information obtained from LINZ data service.

FIGURE 7: INITIAL STATIC WATER LEVELS IN BORES WITHIN 2 KM OF THE GERALDINE SWMA



Note: Locations of features shown above are approximate. Bore locations obtained from ECan's online GIS database. Background aerial imagery, road and river data obtained from LINZ data service.

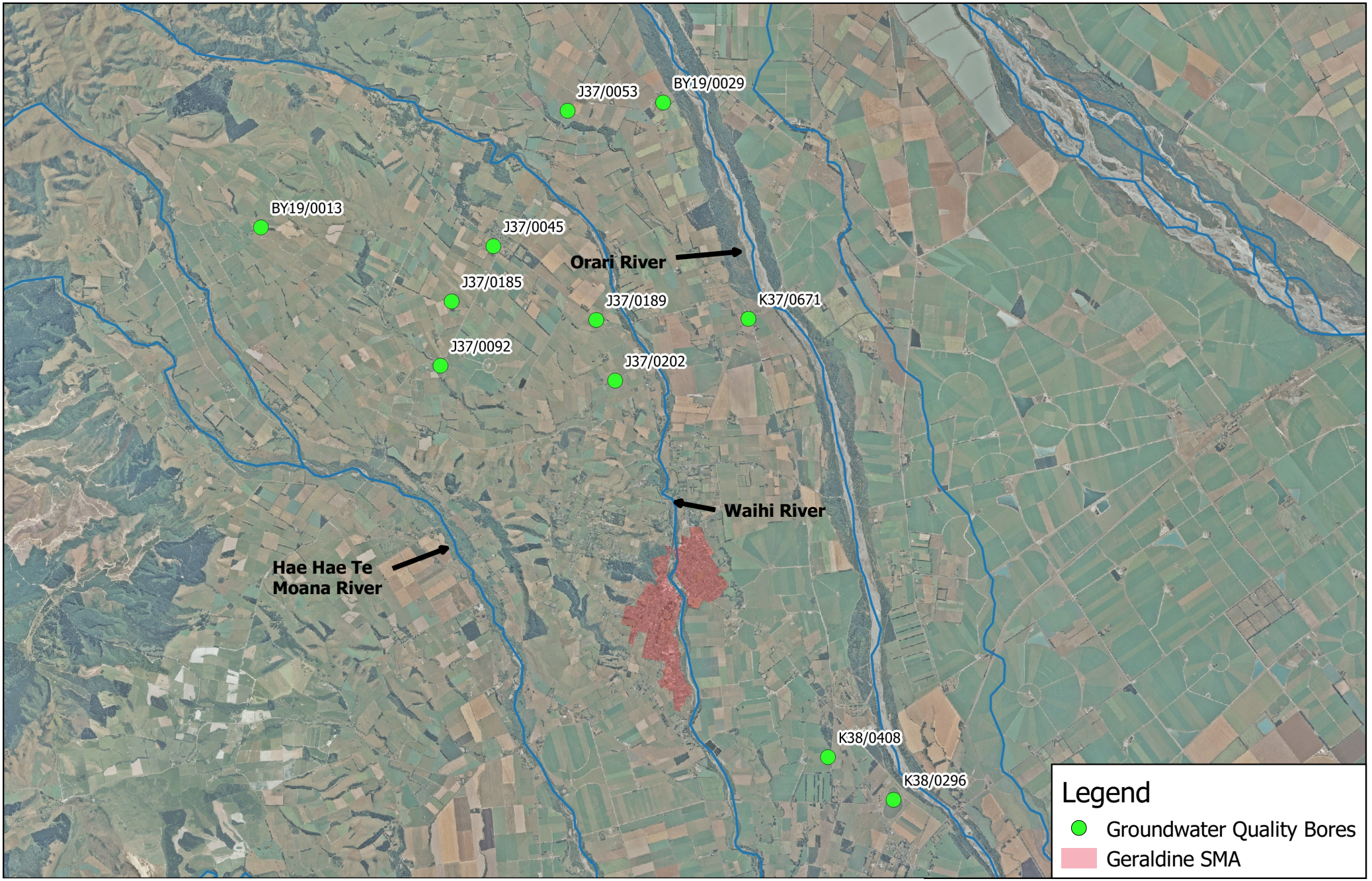
FIGURE 8: ACTIVE AND PROPOSED DRINKING WATER SUPPLY BORES NEAR THE GERALDINE SMA



Note: Locations of features shown above are approximate. Bore information obtained from ECan's online GIS database. Background aerial imagery, road and river information obtained from LINZ data service.

FIGURE 9: GROUNDWATER QUALITY BORES NEAR THE GERALDINE SMA

S:\C03489\C03489300\PROJECTS\C03489300_gw quality bores



Note: Locations of features shown above are approximate. Background aerial, river and road information obtained from LINZ data service. Geological map obtained from GNS Science.

FIGURE 10: GROUNDWATER QUALITY BORES IN THE WIDER ORARI/WAIHI CATCHMENT

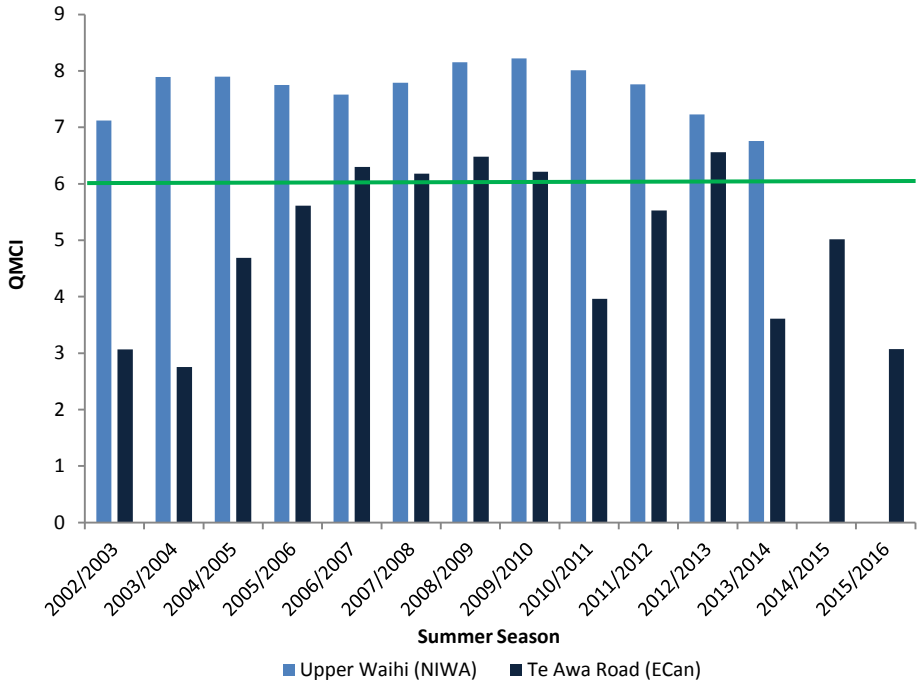


Figure 11a. QMCI scores for two sites on the Waihi River. Green line indicates the LWRP hill fed upper QMCI minimum score.

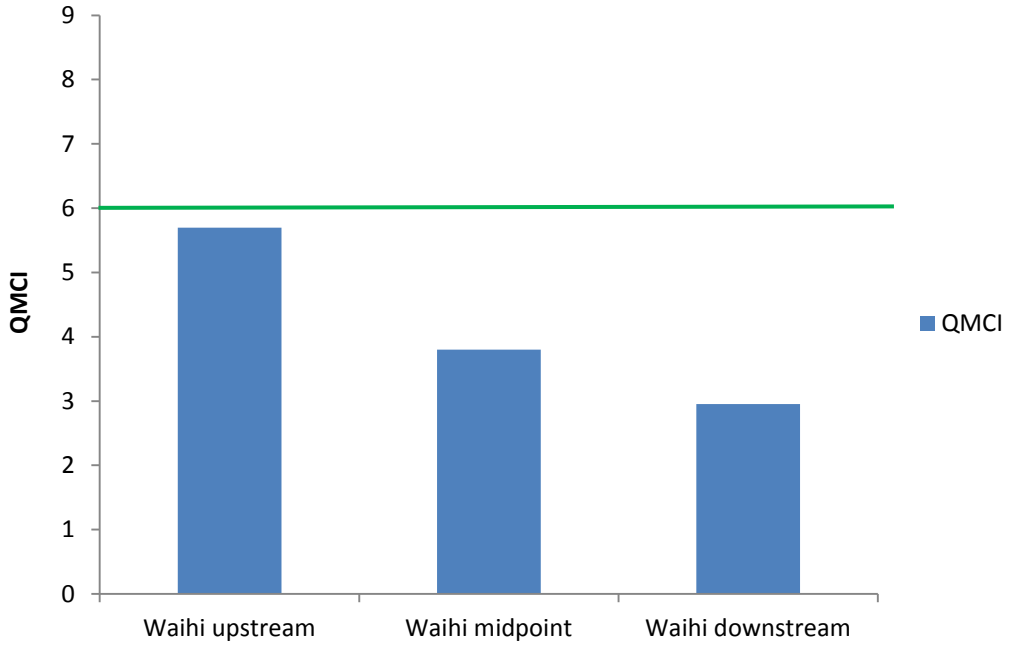


Figure 11b. QMCI scores for three sites on the Waihi River sampled during PDPs October 2016 investigation. Green line indicates the LWRP hill fed upper QMCI minimum score

Appendix B

Consultation Details

B1 ECan Consultation

B1.1 Meeting Minutes – Geraldine SWMP (1March 2018)

MINUTES of Meeting – Geraldine Stormwater Management Plan (SWMP)

Held: 1 March 2018

Present:

- PDP: Bill Noell, Sebastian Küng
- TDC: Grant Hall, Selwyn Chang, Rufino Guinto
- ECan: Paul Hopwood, Shirley Hayward, Ashley Robinson, Chris Fauth

	Implications/ ACTION
Bill presented an overview of the Geraldine SWMP (slides attached). • The SWMP is currently in the draft stage. The next steps will be consultation, the assessment of environmental effects (AEE) and drafting consent conditions. Quantity/Flooding: • Reports of flooding were generally related to blocked drains and blocked soakaways, however there were some persistent nuisance complaints. • The Opus assessment found that the existing system has a sufficient capacity for up to the 2% AEP event. • Critical area of Serpentine Majors Road, "Sun Dried" Bricks Site (Ground lower than stream and stream management issues with culvert blockages and flood gates etc) Detention dams • The existing detention dams were discussed. TDC explained that the dams work more for longer duration events, and benefits were to upstream of Cox Street • TDC investigated throttling the dams (via modelling), however the results indicated this would not have much of an effect (slight improvement for low intensity events) Water quality • Parts of Geraldine poorly connected to waterways which assists existing water quality • Existing riparian buffers considered important (limited if any "direct" discharges to water in the Waihi) • Within urban Geraldine, based on properties adjacent to waterways and proximity of stormwater network up to 20% of the stormwater discharges estimated to be directly into the waterway. • ECan queried if all outfalls identified It was discussed that TDC have identified discharge points from the TDC network, however not the discharge points from individual private properties (which either discharge to the kerb or directly to the waterways) Groundwater • No monitoring data is available within the stormwater management area. The performance status indicated in the table is based upon expected ranges. • It is expected that *E coli* targets will not be met in the shallow groundwater system.	Stream Management ECan / TDC Ongoing consideration by TDC how to best operate the dams Ongoing issue to be agreed Outside Schedule 8 Compliance in LWRP to be addressed in AEE

Adaptive Management approach • The approach will target known sources/effects. • Focuses on river water quality effects; it does not focus on wet weather, which is known to have variable conditions. • Provide best practice going forward for new development; new development is expected to mostly be infill development, with some greenfill development (note: new greenfield development will generally be outside of the stormwater management area, and would require their own new consents) • Paul noted that adaptive management approach was a good approach for the SWMP, however noted that there was limited information on the stormwater effect – how will that be demonstrated post granting of the consent • Shirley noted that she will want to look at some of the underlying technical reports. Shirley noted that the SWMP has a good toolbox for interventions and education. In terms of community, Shirley also advised that Geraldine has a strong "green" community who would likely be interested in the SWMP and would likely want to offer support (e.g. assistance with riparian planting).	BN to forward SH tech reports
Certainty of performance • Paul indicated that ECan sought a level of commitment in working towards the water quality standards and limits. Grant advised that this would be a matter of committing a budget, and noted that every 3 years there is the potential for budgets to be changed. • Noted that adaptive management approach is proposed to manage uncertainties (and impacts of other discharges)	Performance standard to be agreed ECan/ TDC (ongoing discussion?)
Triggers and targets • The SWMP includes a table ('Water Quality Performance') on the current water quality. The bottom line limits are based on the ANZECC/LWRP 90% trigger values. (Urban hill country) • Shirley queried if latest NIWA work included in target levels of Zinc and copper (not included but can be updated if appropriate now or later) • The results in this table are based upon baseflow sampling as a residual effect (i.e. not wet weather). • V limited dilution rates anticipated at low flows/summer conditions in both Waihi and Serpentine • PDP have undertaken a contaminant load model study; the CLM calculates contaminants loads. It was discussed that the model calculates loads only, and not resultant concentrations, given variable/low/unknown flows • Agreed may have to work out what if scenarios from monitoring for TDC/ECan to discuss to demonstrate how the adaptive meangement approach may work	Ongoing Discussion /agreement BN to forward TDC/ECan (following review/feedback on triggers and targets

Managing land use activity effects • ECan advised that after 2025 Territorial Authorities will become responsible for accepting stormwater (construction/post-construction) to the stormwater network and checking compliance. This will likely be via a Bylaw. • HAIL sites: it was discussed that after 2025, the District Council would be responsible for authorising discharges to the network from HAIL sites. It was discussed that ECan staff will be available to assist TDC with the approvals process. • If post-remediation it is shown that the discharge would be clean, the discharge would fall under the global consent and a new consent form ECan would not be require. • If a discharge is not approved under the global consent/Bylaw, ECan would be responsible for the approval and compliance of the discharge • Grant asked how it was expected land-use changes outside the resource consent or building consent process would be managed (not necessarily any no control of these changes) • Noted that these may be difficult to control but need to look at areas that may be controlled (and plan includes provisions to assist cultural change with education so people are aware of the impacts) • PH to forward details of approaches used elsewhere eg Waimak Cost-effectiveness of options • Shirley asked what areas would provide the best value for money. • Bill discussed this would be using best practicable options for existing and new developments and source control. However in terms of capital investment, no specific commitments have been made at this stage. These would be incorporated into LTP projects • Grant noted that upgrade works were planned at the boulevard entrance to Geraldine; when those works are undertaken, TDC would seek to address stormwater for that area at the same time. Notification • It was discussed whether the application would be notified. Paul indicated that ideally it would be non-notified, however this is to be determined. • Whether the application is notified will partly be dependent upon the level of consultation undertaken prior to lodgement. • TDC to commence consultation Timing for lodgement Time of lodgement will depend on the extent of consultation (which may include: Arowhenua, the Waihi catchment Group, zone committee, community board, etc.). However, TDC indicated that ideally they intend to lodge the application before June 2018.	PH to forward

Bill Noell

From: Bill Noell
Sent: Tuesday, 6 March 2018 10:31 AM
To: ashlee.robinson@ecan.govt.nz; Christopher.Fauth@ecan.govt.nz; 'paul.hopwood@ecan.govt.nz'; Shirley Hayward; 'grant.hall@timdc.govt.nz'; rufino.guinto@timdc.govt.nz
Cc: Sebastian Kung
Subject: Geraldine SWMP
Attachments: Presentation010318.pdf; C03489300_01032018_MeetingMinutes.pdf

Thanks for your time last week. I attach some notes of the meeting and a copy of the slides

Ongoing actions include

1) PDP – forward tech reports to SH
2) Shirley - comment/discussion required on performance stds from ECan's perspective - could be developed with a what if scenario's so TDC/ECan can get understanding of adaptive approach proposed ? I will contact you about this to confirm how you wish to proceed/approach this
3) Paul – if you can forward details that have been used elsewhere to control land use activities (Grant has also asked PDP to provide comment to TDC on implications for TDC)
4) Any other ECan Stakeholder issues to be identified eg ECan NPS Catchment management plan, waterway management issues
5) TDC finalising and adoption of SW stds
6) Consultation – TDC (Iwi ongoing with AEL)
7) Consent Conditions and AEE to be finalised based on above

Let me know if we have anything wrong or if it should be different. Feel free to call to discuss

Regards

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B1.2 Evidence Prepared for WDC Stormwater Consent Hearing 2018

Bill Noell

From: Bill Noell
Sent: Friday, 16 March 2018 2:48 PM
To: Paul Hopwood
Subject: RE: Evidence prepared for Bylaw Hearing

Thanks Paul

Seems pretty straight forward for the HAIL sites

SQEP will be required anyway - one concern may be that the SQEP are qualified for environmental/ecological risks as well as human health risks (which are more defined through the NES).

Risk to environment will be non hail sites eg unsealed hard standing etc and existing. both quantity/no of discharges and controls on discharges

Pollution control plan = O &M Plan for stormwater drainage to be provided with drainage design - could be seen as additional paperwork to provide but TDC were quite enthusiastic about using education as mitigation measure (possibly seen as low cost compared to capital) - one tool that may be useful on a regional wide basis is to provide set of standard tools to use for site stormwater practice to include in PCP's eg cleaning, sumps, gutters - measures require for unsealed surfaces - is anything available ? - has this been thought of?

The PCP can be used as the control for change of use for new sistes after adoption of the SWMP

The SWMP proposes an auditing programme - would you have anything else terms of monitoring performance and for existing sites?

Performance of education programme - any thoughts?

Construction Stormwater
I take it that you are looking for TDC to assess proposals and checking compliance for smaller building sites -- this is probably the larger issue for TDC to get their heads around for resourcing and risk

Comments thoughts welcome

Regards

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From: Paul Hopwood <Paul.Hopwood@ecan.govt.nz>
Sent: Friday, 16 March 2018 10:39 a.m.
To: Bill Noell
Subject: FW: Evidence prepared for Bylaw Hearing

Hi Bill,

Here are the ECan submissions for the bylaw hearing with recommended approach.

Cheers
Paul

From: Sam Leonard
Sent: Friday, 16 March 2018 10:36 AM
To: Paul Hopwood <Paul.Hopwood@ecan.govt.nz>
Subject: Evidence prepared for Bylaw Hearing

Hi Paul,

3 pieces attached. One frrm planning, one from contaminated sites, one from Wynn Williams.

Cheers,

Sam

Sam Leonard
Senior Planner
Planning
027 801 7849

BEFORE THE WAIMAKARIRI DISTRICT COUNCIL

IN THE MATTER of the proposed Stormwater Drainage Bylaw 2018

BETWEEN **WAIMAKARIRI DISTRICT COUNCIL**

AND **CANTERBURY REGIONAL COUNCIL**

Submitter

LEGAL SUBMISSIONS ON BEHALF OF CANTERBURY REGIONAL COUNCIL
16 February 2018

WYNN WILLIAMS
LAWYERS
CHRISTCHURCH

Solicitor: L F de Latour
(lucy.delatour@wynnwilliams.co.nz)

Canterbury Regional Council's Solicitor
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47 Hereford Street,
P O Box 4341, DX WX11179,
CHRISTCHURCH 8140
Tel 0064 3 3797622
Fax 0064 3 3792467

MAY IT PLEASE THE HEARING COMMISSIONERS

1 These legal submissions are given on behalf of the Canterbury Regional Council (**Environment Canterbury**) to:

(a) Support the amendments sought by Environment Canterbury to the draft Stormwater Drainage Bylaw 2018 (**draft Bylaw**); and

(b) Assist the Waimakariri District Council (**WDC**) in relation to its Bylaw, insofar as it relates to Environment Canterbury's planning documents.

2 These submissions address:

(a) The statutory and planning context for stormwater management in Canterbury;

(b) An overview of the changes to the draft Bylaw sought by Environment Canterbury;

(c) The lawfulness of the additional approval mechanisms and proposed ability to revoke an approval granted under the draft Bylaw suggested by Environment Canterbury; and

(d) Enforcement under the draft Bylaw and how this might interact with Environment Canterbury's enforcement powers under the Canterbury Land and Water Regional Plan (**LWRP**).

3 In addition to these legal submissions, evidence is being presented on behalf of Environment Canterbury by:

(a) Rowan Freeman (Principal Contaminated Sites Advisor): Mr Freeman's evidence provides technical contaminated land evidence. He recommends changes to the 'medium risk' and 'high risk' classifications under the draft Bylaw and some changes to the provisions relating to Pollution Prevention Plans; and

(b) Sam Leonard (Senior Planner): Mr Leonard's evidence outlines the planning and policy context for stormwater management in Canterbury. His evidence sets out the specific changes to the draft Bylaw sought by Environment Canterbury.

Statutory and planning context

Statutory context

4 Stormwater management is a major issue for territorial authorities and regional councils alike.

5 In accordance with their functions, territorial authority stormwater management is principally concerned with the physical infrastructure. As you will be well aware, WDC is responsible for the public stormwater system (such as gutters and drains in public roads, and the piped system below ground), and for ensuring stormwater discharges at the reticulated system outlet meet Environment Canterbury requirements.

6 Under the Resource Management Act 1991 (**RMA**), Environment Canterbury is responsible for controlling discharges of contaminants (including stormwater) to land, water, and the coastal marine area.

7 Environment Canterbury does this through the Regional Policy Statement, and its regional planning documents. Overall, these regulatory documents seek to maintain water quality and improve it where it is degraded. Most discharges of stormwater are permitted (subject to meeting certain conditions), but some require a resource consent. The specific planning framework put in place under the LWRP is set out below.

8 In order to manage stormwater infrastructure, territorial authorities are given a power to make bylaws in relation to stormwater under section 146 of the Local Government Act 2002 (**LGA**). In relation to WDC's powers to make bylaws, section 155 of the LGA provides that a local authority must, before commencing the process for making a bylaw, determine whether a bylaw is the most appropriate way of addressing the perceived problem.

9 Before making the Bylaw, WDC must also be satisfied that the Bylaw is the most appropriate form of the bylaw (amongst other matters).

10 The respective functions of territorial authorities and regional councils in relation to stormwater must also be considered in light of the broader obligations of local authorities under the LGA.

11 In particular, these obligations include meeting the current and future needs of communities for good quality local infrastructure, local public

services, and performance of regulatory functions in a way that is most cost-effective for households and businesses (section 10 of the LGA). Good quality in the context of section 10 means infrastructure, services and performance of regulatory functions that are efficient, effective and appropriate to present and anticipated future circumstances.

12 The explicit role of a local authority is to give effect to the purpose of local government as stated in section 10 of the LGA.

13 In addition, the principles relating to local government set out in section 14 of the LGA relevantly provide that a local authority should:[1]

(a) give effect to its identified priorities and desired outcomes in an efficient and effective manner;

(b) actively seek to collaborate and co-operate with other local authorities and bodies to improve the effectiveness and efficiency with which it achieves its identified priorities and desired outcomes; and

(c) ensure prudent stewardship and the efficient and effective use of its resources in the interests of its district or region, including by planning effectively for the future management of its assets.

14 These purposes and principles of local government are relevant in the context of some of the changes sought by Environment Canterbury and are also relevant to the appropriateness of the provisions of the draft Bylaw.

Planning context

15 As Mr Leonard's evidence explains, the LWRP, which is Environment Canterbury's key regulatory tool for managing the effects associated with stormwater discharges, seeks to control stormwater by regulating the end of pipe discharge, with the operators of reticulated stormwater systems being expected to manage the quantity and quality of all stormwater directed to and conveyed by the reticulated stormwater system (Policy 4.16A). From 1 January 2025 network operators must account for and are responsible for the quality and quantity of all stormwater discharged from that reticulated stormwater system.

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[1] LGA 2002, s14(1)(a)(ii), (e), (g).

16 The policy framework is implemented by a rule framework which also focuses on the end of pipe discharge from reticulated systems.

17 Rule 5.93A is critical. It provides that the discharge of stormwater or construction phase stormwater into a reticulated stormwater system is a permitted activity provided that "*written permission has been obtained from the owner of the reticulated stormwater system that allows entry of the stormwater into the reticulated stormwater system*."

18 The discharge of stormwater into the reticulated system, without the permission of WDC, requires resource consent from Environment Canterbury as a discretionary activity under Rule 5.97 of the LWRP.

19 The draft Bylaw is the primary mechanism by which WDC can control what stormwater is discharged into its reticulated stormwater system (and provide permission for the entry of the stormwater). This is relevant as if WDC permits the discharge, no resource consent is required from Environment Canterbury. If WDC does not permit the discharge to its system, a resource consent is required from Environment Canterbury.

20 Environment Canterbury appreciates that there has been some reluctance on WDC's part to regulate all stormwater discharges into the reticulated system. This appears to have been driven by concerns about processing approvals, issues associated with compliance monitoring, funding and potential inefficiencies.[2] Notably, as owner of the reticulated system, WDC is already regulating aspects of the discharge i.e. ensuring that there is sufficient capacity in the system.

21 Environment Canterbury considers that the changes it is seeking will better achieve and integrate with the policy position in the LWRP, whilst acknowledging and addressing WDC's concerns about controlling the quality of discharges into the reticulated system.

22 The changes sought by Environment Canterbury provide a platform for WDC to lead the way in relation to stormwater management in Canterbury, whilst in most situations resulting in a more efficient process for landowners and developers, avoiding the need for a dual consenting/approval process in all but the most complicated scenarios.

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[2] See evidence of Kalley Simpson on Plan Change 4 of the LWRP, page 4.

23 The approach proposed is also flexible and does not create an arbitrary distinction simply based on the classification of a site on the Listed Land Use Register, when in reality the risks are much more nuanced than that.

24 Environment Canterbury's submission on the draft Bylaw, and its evidence and legal submissions presented to WDC should be considered in light of this statutory and policy context.

Changes to the draft Bylaw sought by Environment Canterbury

25 The draft Bylaw provides that every premises shall be entitled to have its stormwater or land drainage water accepted by WDC subject to conditions (clause 5). The conditions include (among other things) that the owner of the premise has prior written approval from WDC for the new connection; there is sufficient capacity within the Council system to accommodate the additional connections; and, fulfilment of the requirements of the draft Bylaw, including obtaining any relevant consent, implementing any Pollution Prevention Plan that the customer is required to obtain, and meeting all requirements of the RMA, Building Act 2004, or any other acts or regulations. The effect of clause 5 of the draft Bylaw is that every person wanting to connect to WDC's reticulated system requires its written approval, whether or not a separate resource consent from Environment Canterbury is also required.

26 Overlaying this approval process (which is primarily concerned with the quantity of stormwater, rather than its quality), for medium risk sites,[3] the draft Bylaw provides for discharges to be accepted into the reticulated system, provided that Pollution Prevention Plans are used. The draft Bylaw requires owners of 'high risk'[4] sites to obtain a resource consent

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[3] Schedule 1 of the draft Bylaw defines "medium risk" activities and sites as including any of the following, Aggregate and material storage/stockpiled yards which are subject to erosion and/or leaching of contaminants, ii. Commercial analytical laboratory sites, iii. Construction and maintenance depots (that exclude areas used for refueling or bulk storage of hazardous substances), iv. Demolition yards that exclude hazardous wastes,
v. Dry cleaning premises, vi. Engineering workshops with metal fabrication, vii. Engine reconditioning workshops, viii. Food and beverage manufacturers, ix. Motor vehicle workshops, x. Any other activity or premises that has failed to meet the requirements of Section 8, unless that activity or site is otherwise defined as a “high risk” in Schedule 1(a).

[4] Schedule 1 of the draft Bylaw defines "high risk" activities and sites as including (i) any activity listed in the LWRP Schedule 3 HAIL; or any site on the LLUR; or any new development site, or re-development of an existing site that is not permitted u under the Resource Management (National Environmental Standard for Assessing and
Managing Contaminants in Soil to Protect Human Health) Regulations 2011 – unless any such activity or site is specifically identified as a "medium risk".

from Environment Canterbury for a discharge into any WDC or private stormwater or land drainage system. Any consented discharges from a high risk site must also comply with the requirements of the draft Bylaw, aside from the requirement to submit a Pollution Prevention Plan.

27 Environment Canterbury considers that only in exceptional circumstances should Environment Canterbury consent the discharge of stormwater into the reticulated system and that stormwater from a wider range of sites should be accepted into the WDC system, rather than having a default position that the discharge of stormwater from any site on the Listed Land Use Register or Schedule 3 of the LWRP requires resource consent from Environment Canterbury. This is consistent with the policy framework under the LWRP and will help achieve efficiencies between WDC's and Environment Canterbury's processes and regulatory functions.

28 The changes to the draft Bylaw sought by Environment Canterbury to achieve this outcome are summarised as follows (a detailed summary of these changes is set out in **Appendix A** to Mr Leonard's evidence):

(a) Removing the ‘Medium’ and ‘High Risk’ categories proposed in the draft Bylaw, and replacing these with a single ‘at-risk’ category which includes any activity or site listed on the Hazardous Activities and Industries List (excluding those discharges comprising of operational phase stormwater from residential activities);

(b) It is proposed that all 'at-risk' sites would be required to prepare a Pollution Prevention Plan. Some technical changes to the Pollution Prevention Plan clauses are also proposed.

(c) The draft Bylaw should include clauses providing for WDC to grant its approval under the draft Bylaw for 'at-risk' sites to discharge into the system under a specific process. This will enable an assessment on a case by case basis as to whether WDC will accept a discharge (or whether a resource consent from Environment Canterbury will be required), rather than having a somewhat arbitrary position that all sites on the Listed Land Use Register or on a HAIL site in Schedule 3 of the LWRP require a separate stormwater consent from Environment Canterbury. The approval clauses would need to include clauses addressing the

matters to which conditions may be attached and explicitly providing that approvals can be revoked in some situations where the terms of the draft Bylaw or the conditions of any approval granted under the draft Bylaw are not being met. As is explained below in the context of enforcement, this is important if Environment Canterbury is to retain a regulatory backstop.

29 The changes Environment Canterbury is proposing be made to the draft Bylaw would not result in all discharges to the reticulated system being approved by WDC, but rather would enable a more flexible approach, recognising that the distinction between high risk and medium risk sites is somewhat arbitrary. Further, over time, as WDC develops its expertise, it may wish to approve a wider range of 'at risk' discharges than it currently approves be discharged into the system.

The rationale for a single risk category and the need for clearer approval clauses

30 The scientific and planning rationale for a single 'at risk' category is explained in the evidence of Mr Leonard and Mr Freeman.

31 From a legal perspective, the approach proposed by Environment Canterbury will more flexible, compared to simply providing that all 'high risk' sites require a resource consent from Environment Canterbury as is currently the case under the draft Bylaw.

32 In this respect, the approach is more in line with LGA purposes for local government and provides a further opportunity for Environment Canterbury and WDC to work together.

33 Importantly, it has the potential to provide a more efficient process for the end 'customer' seeking approval to connect to the reticulated system from 'higher' risk sites. This is because it will not automatically require these sites to obtain a resource consent from Environment Canterbury (as well as the approvals required under the draft Bylaw to connect to the system (particularly under clauses 5 and 8 of the draft Bylaw)).

34 As set out above, Environment Canterbury is seeking changes to the draft Bylaw to provide further robustness to the approval process under the draft Bylaw, and to enable WDC to revoke its approval for a discharge of stormwater into the reticulated system where the terms of the draft Bylaw or an approval granted under it are not being met.

35 A clearer approval process for 'at risk' sites is also important because the LWRP only makes the discharge of stormwater into a reticulated system a permitted activity where the network utility operator has provided written permission to discharge into the system. Under the draft Bylaw as currently drafted, it is unclear whether an approval given under clause 5.1 of the Bylaw will in fact constitute a written permission to discharge into the system, thereby making the discharge a permitted activity under the LWRP?

36 Given the importance of WDC's approval under the draft Bylaw and how this links to the LWRP rules, the following section of these submissions addresses the legality of WDC granting approvals under the draft Bylaw, including the discretion it will confer on WDC whether to accept the discharge, and the implications for WDC in terms of cost recovery.

37 Four elements are essential to the validity of a bylaw. A bylaw:[5]

(a) should be intra vires the powers of the local authority;

(b) should not be repugnant to the laws of New Zealand;

(c) should be certain; and

(d) should be reasonable.

38 In particular, section 13 of the draft Bylaws Act 1910 (which applies to bylaws made by local authorities)[6] states:

> **13 Bylaw not invalid because of discretionary power left to local authority, etc**
>
> (1) No bylaw shall be invalid because it requires anything to be done within a time or in a manner to be directed or approved in any particular case by the local authority making the bylaw, or by any officer or servant of the local authority, or by any other person, or because the bylaw leaves any matter or thing to be determined, applied, dispensed with, ordered, or prohibited from time to time in any particular case by the local authority making the bylaw, or by any officer or servant of the local authority, or by any other person.
>
> (2) This section shall not apply to any case in which the discretion so left by the bylaw to the local authority, or to any officer, servant, or other person, is so great as to be unreasonable.

---

[5] Under section 17 of the Bylaws Act 1920, if a bylaw is severable, separate parts may be upheld though other parts are declared invalid. Further, the provisions of the Bylaws Act 1910 prevail over Part 8 of the LGA, which contains the empowering sections for local authorities to make bylaws, and also prevail over Part 9, which deals with offences and enforcement.

[6] Section 144 of the LGA provides that the Bylaws Act 1910 prevails over Part 8 and Part 9 of the LGA.

39 Under section 13(2) of the Bylaws Act 1910, a discretion in a bylaw can be held to be unlawful if it is found to be so great as to be unreasonable.[7]

40 The High Court has held that the purpose of section 13 of the Bylaws Act 1910 is to invalidate bylaws that impart to the Council discretions that are so unfettered that those affected cannot reasonably measure Council actions against any criteria or benchmark.[8] The High Court held that while "particular cases" can be left to be determined, general guidelines should be provided in a bylaw. In that case, the discretion created by the bylaw was largely unfettered and a number of key aspects were left to the discretionary process of the relevant local authorities. The Court considered that the width of the discretion in itself did not create unreasonableness in accordance with section 13(2) of the Bylaws Act 1910. However, as the broad discretion included a discretion to tax waste without parameters, this created unreasonableness.[9]

41 In addition, section 151 of the LGA specifically contemplates that bylaws may prescribe an obligation to be performed in a manner or within a time required by a person referred to in the bylaw. Similarly, section 151(1) of the LGA recognises that a valid bylaw may contain a discretion as to performance or performance standards, to be determined by the local authority or an officer.

42 Given that there is some risk associated with including a very wide discretion whether to accept a discharge under the draft Bylaw, it will be important that the draft Bylaw contains some guidance on the matters WDC will consider when deciding whether to grant an approval.

43 Mr Freeman's evidence sets out the types of matters that will be relevant to a case by case assessment (and the risk associated with the discharge).

44 From a legal perspective, including an explicit approval clause within the draft Bylaw which outlines the matters that WDC will consider when

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[7] That principle of interpretation still applies by virtue of section 144 of the LGA, which provides that the Bylaws Act 1910 prevails over Part 8 and Part 9 of the LGA.
[8] *Carter Holt Harvey v North Shore City Council* [2006] 2 NZLR 787 (HC) at [63]-[64]. Although parts of the High Court's decision was overturned on appeal in *Carter Holt Harvey v North Shore City Council* [2007] NZCA 420, they are irrelevant for the purposes of these submissions.
[9] *Carter Holt Harvey v North Shore City Council* [2006] 2 NZLR 787 (HC) at [63]-[73].

deciding whether to grant an approval will result in a more legally robust Bylaw.

45 Ideally the draft Bylaw would also consolidate the various approvals referred to in the draft Bylaw (for example under clause 5 and clause 9) into one approval clause addressing discharges from 'at risk' sites (both in terms of the quantity of the discharge (i.e. there being sufficient capacity in the system) and any issues associated with 'quality', including the need for a Pollution Prevention Plan.

46 Alongside the matters that are to be considered when deciding whether to grant an approval, the draft Bylaw should include an explicit clause regarding the matters which WDC can place conditions on any approval. This is likely to include matters such as the location of the discharge, the type and nature of the discharge approved, construction, design, and maintenance requirements for the work or activity, compliance with specified water quality limits, implementation of and compliance with a Pollution Prevention Plan, including any specified mitigation measures; and monitoring requirements.

47 As is explained further below in the context of enforcement, it is important for WDC to ensure that any approval to discharge into the reticulated system granted under the draft Bylaw clearly sets out the terms or conditions of the approval. This would mean that if a person is discharging stormwater into the system outside of the limits provided by the approval, that the approval will not apply to or authorise that discharge.

48 We note that the LGA provides the ability for WDC to recover a charge for issuing an approval granted under a bylaw (under section 150 of the LGA) and that the draft Bylaw already provides for this.

49 In this sense WDC's ability to charge for processing and granting an approval under the Bylaw is no different to Environment Canterbury's powers to charge for processing a resource consent under section 36 of the RMA.

Revocation clauses

50 One other matter that Environment Canterbury considers should be explicitly addressed by the Bylaw is the ability to revoke an approval granted under the Bylaw.

Legality of revocation clauses

51 Bylaws may include clauses that enable an approval granted under a Bylaw to be revoked.

52 However, the grounds for revoking its approval should be specified in the draft Bylaw, to ensure that the draft Bylaw is certain, reasonable, and to avoid issues of natural justice.

53 The grounds and process only needs to be set out in general terms, so as to ensure that the discretion to revoke the approval provided by the draft Bylaw is not unreasonable.

54 The grounds that need to be established for the revocation of the approval will depend, in part, on the content of the draft Bylaw itself. For example, general grounds may include:

(a) failure to comply with any condition of an approval;

(b) if the continuance of the discharge puts at risk the ability of WDC to comply with any conditions of resource consent and/or requires additional treatment measures or costs to seek to avoid a breach of any such resource consent;

(c) in the event that the discharge results in a breach of a resource consent held by the WDC; or

(d) if at any point in time the discharge contains contaminants in excess of specified levels or limits.

55 In respect of the process, and timing, for revoking its approval, this is related to reasonableness, which must be considered in light of the particular context. For example, it may be appropriate to first provide written notice to a person that their approval is to be reviewed and potentially subject to amended terms and conditions, or to be revoked. In some situations, particularly where the discharge causes a breach of WDC's resource consent, it may be appropriate to immediately revoke the approval, particularly where these grounds are specified in the draft Bylaw.

56 Revoking an approval without a proper process may also give rise to issues of natural justice. In some circumstances this could form the

basis of a successful challenge to the validity of the WDC's decision to revoke its approval (by way of judicial review in the High Court).[10]

Enforcement

57 Environment Canterbury appreciates that there may be some reluctance on the part of WDC to take more responsibility for the approval of discharges into its reticulated systems, particularly from 'riskier' sites, due to its enforcement options under the LGA for a breach of the draft Bylaw being more limited, compared to Environment Canterbury's enforcement powers under the RMA.

58 Although these submissions cannot pre-empt any future decisions of Environment Canterbury as to enforcement, they are intended to explain the wider enforcement framework, given the overlap between the regulatory mechanisms and powers related to the draft Bylaw (under the LGA) and the LWRP (under the RMA).

59 In particular, this section of the legal submissions addresses:

(a) enforcement of the draft Bylaw under the LGA; and

(b) how that fits with the LWRP provisions and Environment Canterbury's enforcement powers under the RMA and the importance of revocation clauses and conditions on any approval.

60 Enforcement under a Bylaw is different to enforcement under the RMA.

61 Assuming that a person breaches the requirements of the draft Bylaw, under the LGA the penalty for a person convicted of an offence for breaching a bylaw is a fine not exceeding $20,000.[11]

62 The LGA also contains a regime for issuing infringement notices.[12] An infringement offence must be specified in regulations, and currently, no such regulations have been made. At this point in time, the infringement notice regime would not be available for breaches of the draft Bylaw, but may be available in the future (should regulations be made). Under the LGA, the maximum infringement fee payable under an infringement

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[10] *Shotover Jet (Queenstown) Ltd v Kawarau Jet Services Ltd* HC Christchurch CP175/95, 26 July 1996; *Templeton v Kapiti Coast District Council* HC Wellington CIV-2004-485-1686, 28 June 2005.
[11] LGA, s 239.
[12] LGA, s245.

notice is $1,000. We understand that WDC intends to seek that an order in council be made for this purpose.

63 The LGA does contain other potential mechanisms. For example:

(a) The Council may apply to the District Court for an injunction to stop the breach under section 162 of the LGA.

(b) Section 176 provides that any person convicted of an offence against a bylaw is liable to pay the costs of remedying any damage caused in the course of the breach (with the costs to be assessed by a District Court Judge).

64 In addition to the powers of WDC in the LGA, a number of other statutes contain provisions in relation to breaches of bylaws. Relevantly, WDC is considering fines under the Litter Act as a possibility. However, generally speaking the fines under these alternative mechanisms are minimal ($100 to $500).

65 By contrast, the RMA contains a wider range of tools (such as abatement notices, infringement notices or a prosecution) and much higher penalties.[13] In this respect there may be some benefit if Environment Canterbury was able to take enforcement action under the RMA for unauthorised discharges to the reticulated system (or the ultimate end of pipe discharge).

66 As discussed above, the discharge of stormwater into the reticulated system with the written permission of WDC is a permitted activity under the LWRP. Any failure to comply with the terms of WDC's permission (in this case an approval under the draft Bylaw), or where WDC has revoked its permission, would mean that the person no longer held written permission from the owner of the reticulated stormwater system that allows entry of the stormwater into the reticulated stormwater system. The discharge of stormwater into the reticulated system, without the permission of WDC, would require resource consent from Environment Canterbury as a discretionary activity under Rule 5.97 of the LWRP.

67 Accordingly, if a person continues to discharge stormwater to the reticulated system without obtaining the necessary resource consent,

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[13] The maximum penalties under the RMA (including a maximum fine of $300,000 or up to 2 years imprisonment for a natural person) are larger than the penalties available under the LGA.

Environment Canterbury could potentially take enforcement action for a breach of section 15(1)(b) of the RMA,[14] as the discharge would not be expressly allowed by a rule in a regional plan[15] (as well as a proposed plan), or a resource consent. There is case law authority that supports enforcement action being taken at the point of discharge into the reticulated system as a discharge of contaminant onto or into land in circumstances that may result in the contaminant entering water.[16] Alternatively, depending on the circumstances, enforcement action may be able to be taken for the end of pipe discharge.

68 Importantly, where the person discharging to the system did not have a resource consent and was relying on an approval granted by WDC, Environment Canterbury would only be able to take enforcement action under the RMA for an unlawful discharge once WDC has revoked its permission, or if the discharge occurred in circumstances outside the scope of WDC's permission. Otherwise, the discharge would be permitted by Rule 5.93A of the LWRP.

69 For this reason, it will be very important that the terms of the written approval granted by WDC are clear and set the terms or conditions upon which a discharge into the system may occur. It is for this reason that Environment Canterbury also suggests that explicit approval and revocation clauses be included within the draft Bylaw.

Conclusion

70 Managing WDC and Environment Canterbury's respective obligations in relation to the management of stormwater, stormwater infrastructure, and its effects on the environment in the most efficient manner possible requires collaboration and co-ordination between the two agencies.

71 The changes proposed to the draft Bylaw will help simplify the process and ensure that only in exceptional circumstances will discharges from at risk sites require resource consent from Environment Canterbury

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[14] We note that in respect of industrial or trade premises there may also be the option of taking enforcement action due to a breach of section 15(1)(d) of the RMA.
[15] Assuming it is not permitted by WDC under the draft Bylaw
[16] See e.g. *Manawatu Wanganui Regional Council v Thurston* (DC Palmerston North CRI-2007-054-2550, 20/02/2009 at [85]); *Southland Regional Council v Southern Delight Ice-cream Company* (District Court, Invercargill, 15/09/95 CRN5025003972, Judge Sheppard); *Gisborne District Council v McKendry* (2005) 11 ELRNZ 458 at 463.

(therefore avoiding the need for dual approvals under the draft Bylaw and from Environment Canterbury in most situations).

72 The proposed amendments to include an 'at risk' site classification and to include explicit approval and revocation clauses will also help support a more flexible approach to stormwater and will remove the somewhat arbitrary distinction set out in the current draft Bylaw.

73 Environment Canterbury looks forward to working with WDC and is happy to provide any further assistance or clarification in relation to the approach it seeks.

DATED 16 February 2018

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L F de Latour / K J Wyss

Counsel for Canterbury Regional Council

BEFORE THE WAIMAKARIRI DISTRICT COUNCIL

IN THE MATTER	of the draft Waimakariri District Council Stormwater Drainage Bylaw 2018
BETWEEN	**WAIMAKARIRI DISTRICT COUNCIL**
AND	**CANTERBURY REGIONAL COUNCIL**
	Submitter

STATEMENT OF EVIDENCE OF ROWAN VINCELL CAUDELL FREEMAN ON BEHALF OF THE CANTERBURY REGIONAL COUNCIL
16 February 2018

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Introduction

1 My full name is Rowan Vincell Caudell Freeman.

Qualifications and Experience

2 I am a Principal Contaminated Sites Advisor at the Canterbury Regional Council (**Regional Council**).

3 I hold a Batchelor of Science degree in Geology (Tennessee Technological University, Tennessee, USA), a Post Graduate Diploma in Environmental Science (University of Canterbury, New Zealand), and I hold a Certified Environmental Practitioner (Site Contamination) certificate.

4 I have been a member of the Regional Council's Contaminated Sites Team since September 2009. Throughout my term at the Regional Council, I have provided technical advice on matters relating to the identification, investigation, remediation, management, and policy improvements for contaminated sites in Canterbury. I regularly offer technical advice to Regional Council consent planners for resource consents related to construction and operational phase stormwater discharges from contaminated sites in Canterbury. Prior to 2009, I worked as an environmental consultant in the United States of America, leading soil and groundwater environmental investigations on municipal, commercial and private sites.

5 I have been the Principal Contaminated Sites Advisor at the Regional Council since 2016. Prior to that I worked as a Regional Council Contaminated Sites Officer II (2009 – 2011) and Senior Contaminated Sites Officer (2011-2016).

6 Although this is a Council level hearing, and not a hearing under the Resource Management Act 1991, I confirm that I have read and am familiar with the Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2014. I agree to comply with that code. Other than where I state I am relying on the evidence of another person, my evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Scope of Evidence

7 I have been asked to give evidence in relation to the Regional Council's submission on the draft Waimakariri District Council Stormwater Drainage Bylaw 2018 (**draft Bylaw**).

8 My evidence will focus on the following matters:

(a) Hazardous activities and industries categories (as set out under Schedule 1 of the draft Bylaw).

(b) Pollution Prevention Plans (as under Part 1, Section 5.1 (e) of the draft Bylaw).

(c) Regional Council technical support to the Waimakariri District Council.

9 I have reviewed the following documents in preparing my evidence:

(a) the draft Bylaw;

(b) the Regional Council's submission on the draft Bylaw; and

(c) Mr Leonard's evidence.

Hazardous activities and industries categories

10 Part 2 of the draft Bylaw addresses discharge of contaminants to the Waimakariri District Council stormwater system from “medium” and “high risk” activities as defined under Schedule 1 of the draft Bylaw.

11 My evidence addresses:

(a) the draft Bylaw’s use of risk categories; and

(b) references in the draft Bylaw to Schedule 3 of the Canterbury Land and Water Regional Plan (**LWRP**) (as per Schedule 1 of the draft Bylaw).

Risk Categories

12 With respect to stormwater discharges, Schedule 1(A) of the draft Bylaw currently provides that any Hazardous Industries and Activities List (**HAIL**) activity (as per Schedule 3 of the Canterbury LWRP); or any site included on the Regional Council’s Listed Land Use Register (**LLUR**) should be categorised as “high risk”. The draft Bylaw proposes that all “high risk” sites should seek resource consent from the Regional Council. Under Schedule 1(B), the draft Bylaw identifies ten activities as posing “medium risk” and proposes that such activities can be consented by the Waimakariri District Council, contingent upon approval of a Pollution Prevention Plan (**PPP**).

13 In my professional experience, risk categories cannot not be assigned to HAIL sites, with acceptable certainty, without case by case evaluations by a suitably qualified and experienced practitioner (**SQEP**). Failure to engage a SQEP may

result in critical oversights and result in unacceptable risk to ecological receptors. The Regional Council's Contaminated Sites Team has SQEP expertise; however, independent SQEPs are also available throughout Canterbury. As further explained below the Regional Council is prepared to workshop a formal approach to managing hazardous activity and industry sites with the Waimakariri District Council.

14 To determine the risk that a site poses to stormwater receptors, the following matters should be considered (as relevant):

a) The types, sources and distribution of contaminants associated with a hazardous activity on a site;

b) The presence or absence of scientific evidence of environmental conditions on a site where hazardous activities have occurred or are occurring;

c) The proximity of proposed stormwater discharges in relation to areas prone to hold contamination and or hazardous substance containments;

d) The proximity, sensitivity and types of stormwater receptors;

e) Ease of contaminant migration to stormwater receptors;

f) The nature of proposed construction works;

g) The type of activities from which stormwater discharges may be generated;

h) The robustness of the site-specific construction management plan (CMP); and

i) The appropriateness of construction and operational stormwater treatment

15 This process develops what the Ministry for the Environment describes as a 'conceptual site model' (**CSM**). In specific instances, a site shown to match a high-risk category can be transitioned to a lower category of risk where site-specific controls (e.g. **CMP**) are prepared by a SQEP and implemented. A CMP takes the CSM into consideration and puts protocols in place which ensure contaminants of concern do not pose an unacceptable risk to vulnerable receptors.

16 On the other hand, a HAIL site which at face value is considered to pose a low to medium risk, may end up posing a high risk if controls informed by a CSM are not implemented. In my opinion, there are activities listed under Schedule 1(B) in the draft Bylaw which may pose more of a risk to stormwater discharges than activities under Schedule 1(A), after consideration of the matters that I have identified above.

17 Therefore, I consider that use of "medium risk" and "high risk" activities as set out in the draft Bylaw is not appropriate. Instead, I consider that the draft Bylaw should use a single risk category of "at-risk", which refers to the Hazardous Industries and Activities List. Stormwater discharges from at risk sties would then be assessed on a case-by-case basis, which I discuss below.

18 Further, I consider that operational phase residential stormwater discharges, even from HAIL sites, pose a low risk and should be excluded from the definition of "at-risk". Since 2013, members of my team and I have provided technical advice to the Christchurch City Council (regarding their Interim Global Stormwater Consent) on many residential rebuild sites on HAIL land. It has been my experience that stormwater generated from residential sites pose a low risk for operational phase discharges since the majority of stormwater entering Christchurch City's network originates from roof and hardstand areas via sealed conveyance. I recommend that the proposed Bylaw allows the Waimakariri District Council to permit operational phase residential stormwater discharges, even where these occur on HAIL sites. To do so would not pose an unacceptable risk to the environment and would result in a significantly decreased workload for the Waimakariri District Council.

HAIL sites requiring case by case review

19 I recommend that the proposed Bylaw enables a process for stormwater discharges from commercial industrial (development and operational phase) and residential development phase HAIL sites be evaluated on a case by case basis. A case by case review would:

a) identify which sites can appropriately manage stormwater discharges through a Waimakariri District Council authorisation (and PPP) process and which sites would require a resource consent from the Regional Council;

b) facilitate more informed decision making by the Waimakariri District Council;

c) allow contaminated land specialist involvement in the approval and implementation of CMPs and site-specific PPPs, which address unique circumstances on sites; and

d) demonstrate that the Waimakariri District Council has exercised due diligence in processing stormwater discharge authorisations.

Justification for a case by case approach – Commercial / Industrial

20 Commercial / industrial sites are by their nature complex because they may host one or more hazardous activities simultaneously. In some cases, commercial / industrial land may have transitioned through a series of hazardous activities over decades resulting in the release of environmentally persistent contaminants of concern. As such, commercial / industrial sites require elevated scrutiny for construction and operational phase stormwater discharges.

Justification for a case by case approach – Residential (construction phase)

21 My experience with residential construction phase stormwater discharges in Christchurch City has shown that a wide range of HAIL activities may be associated with residential properties. Usually, the highest risk related to disturbing potentially contaminated soil during construction phase development is for contaminants to become entrained in stormwater and discharged into surface water bodies (directly or via drains). In circumstances where earthworks on HAIL sites resulted in soil disturbance less than 25 cubic metres (m^3), I recommended that Christchurch City authorise the construction phase discharge. On limited occasions, soil disturbances amounting to less than 25 m^3 required resource consent from the Regional Council because mine or my colleagues' evaluation of scientific information about environmental conditions showed the site posed too high a risk to be authorised by the district council.

Definition of "at-risk" site

22 It is my understanding that the Ministry for the Environment is currently reviewing the HAIL, which is incorporated by reference into the NES for Assessing and Managing Contaminants in Soil to Protect Human Health. If this review does result in change/s to the categories or activities on the HAIL it could mean that Schedule 3 of the LWRP is not consistent with the HAIL.

23 Where the draft Bylaw refers to risk associated with the categories listed in LWRP Schedule 3 it would also place the draft Bylaw out of step with the HAIL. I consider that the definition of "risk" in the draft Bylaw should refer directly to the HAIL, and the reference to Schedule 3 of the LWRP be deleted. This would avoid the draft Bylaw being inconsistent with the HAIL.

Construction Phase Management and Operational Pollution Prevention Plans

24 Section 9 of the draft Bylaw sets out the considerations and requirements for PPPs. The Waimakariri District Council Draft Bylaw proposes the use of "PPPs" to:

(a) identify known or potential risks posed by stormwater discharges from medium risk sites, and

(b) provide mitigation measures to manage those risks.

25 My understanding is that PPPs are directed only towards operational phase stormwater discharges and I agree with the terms laid out under Section 9 of the draft Bylaw. However, I propose that the Waimakariri District Council commit ensuring that PPPs are specified as living documents which are updated from time to time (to reflect changes on a site that were not relevant at the time the PPP was first prepared). Council should also verify that responsible parties; lines of reporting (on-site, and, to the district and regional councils) are stated clearly in PPPs. If a site subject to a PPP is transferred to a new owner, that PPP will have to be transferred as well, assuming the hazardous activity at the site does not cease or change. I support the use of clauses 9.5 and 9.6 in the draft Bylaw which require 3 yearly reviews and that any PPP be revised where there have been any significant changes to an activity.

Regional Council technical support to the Waimakariri District Council

26 The Regional Council's contaminated sites specialists are prepared to workshop a formal approach to managing hazardous activity and industry sites with the Waimakariri District Council. This approach could be confirmed outside of the draft Bylaw, for example establishing a process for assigning risk categories and determining whether resource consent should be managed through the Regional Council or the Waimakariri District Council on a case by case basis. I believe that the format the Regional Council used to support the Christchurch City Council was successful and could be applied to Waimakariri District Council stormwater management. A critical component of Regional Council support would be enabling the Waimakariri District Council to recognise when a site requiring a stormwater discharge should be forwarded to the Regional Council or an independent specialist for a decision about which authority is better suited to manage or authorise the discharge.

Conclusion

27 Assignment of risk categories to sites discharging stormwater is achievable but requires evaluation of multiple factors on a case by case basis (excluding operational phase residential discharges). On this basis, I consider that replacing the medium and high-risk categories in the draft Bylaw with a regime that uses a single "at risk" category, which is defined by the HAIL list (excluding operational

phase residential discharges), and assessed on a case-by-case basis, is more appropriate.

28 I also consider that some amendments should be made to the contents and requirements for PPPs, including using a SQEP to assist with the preparation of a PPP.

29 I believe specialist technical support could assist the Waimakariri District Council in demonstrating that it has exercised due diligence in authorising stormwater discharges OR requesting that stormwater discharges are administered through the Regional Council. The Regional Council's Contaminated Sites Team has experience gained through the provision of advice to the Christchurch City Council on a case by case basis in relation to their Interim Global Stormwater Consent. We are willing to extend specialist support to the Waimakariri District Council.

Rowan Vincell Caudell Freeman

16 February 2018

BEFORE THE WAIMAKARIRI DISTRICT COUNCIL

IN THE MATTER	of the draft Waimakariri District Council Stormwater Drainage Bylaw 2018
BETWEEN	**WAIMAKARIRI DISTRICT COUNCIL**
AND	**CANTERBURY REGIONAL COUNCIL**
	Submitter

STATEMENT OF EVIDENCE OF SAMUEL PETER LEONARD ON BEHALF OF THE CANTERBURY REGIONAL COUNCIL

16 February 2018

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Introduction

1 My full name is Samuel Peter Leonard.

2 I hold a Bachelor of Laws and Bachelor of Science with a major in Environmental Studies and minor in Biology from Victoria University of Wellington.

3 I am a Senior Planner at the Canterbury Regional Council (**Regional Council**) a position I have held since August 2016. My previous role with the Regional Council was in the Implementation Team which I held from March 2015 until beginning my current role. In that role I was responsible for providing planning interpretation and implementation advice to colleagues, stakeholders, and the general public.

4 My relevant work experience includes providing regional policy advice and planning assistance to the Canterbury territorial authorities. I work closely with the planning teams at Waimakariri District Council and Selwyn District Council to assist with district plan reviews and the obligations to give effect to the Canterbury Regional Policy Statement (**CRPS**). I have been responsible for co-ordinating the Regional Council's response to the draft Stormwater Drainage Bylaw 2018 and preparing the Regional Council's submission.

5 Although this is a Council level hearing, and not a hearing under the Resource Management Act 1991, I confirm that I have read and am familiar with the Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2014. I agree to comply with that code. Other than where I state I am relying on the evidence of another person, my evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Key Conclusions

6 The automatic requirement in the draft Waimakariri District Council Stormwater Drainage Bylaw 2018 (**draft Bylaw**) for 'High Risk' sites to obtain resource consent from the Regional Council to discharge into Waimakariri District Council's stormwater system is inconsistent with the direction indicated in the Canterbury Land and Water Regional Plan (**LWRP**) regarding the management of stormwater discharges.

7 There is an opportunity for the draft Bylaw to implement a management framework that draws upon the Regional Council's expertise for managing the quality of stormwater entering its reticulated stormwater systems that will effectively and efficiently integrate with the LWRP framework.

8 Some recommended amendments to the draft Bylaw that would help achieve an efficient integration with the LWRP include:

(a) Reference to a single category of risk;

(b) A clear process for approving and revoking permission to discharge stormwater into reticulated stormwater systems; and

(c) Additional requirements to be included in Pollution Prevention Plans.

9 The key changes sought by the Regional Council are set out in **Appendix A** to my evidence.

Scope of Evidence

10 I am giving evidence in relation to the Regional Council's submission on the draft Waimakariri District Council Stormwater Drainage Bylaw 2018 (**draft Bylaw**)

11 My evidence will focus on the following matters:

(a) Regional Council policy framework

(b) Integration of the draft Bylaw with the LWRP

(c) Recommended amendments to the draft Bylaw

12 I have reviewed the following documents in preparing my evidence:

(a) The draft Bylaw; and

(b) The Regional Council's submission on the draft Bylaw;

(c) The Canterbury Regional Policy Statement (**CPRS**);

(d) The Canterbury Land and Water Regional Plan (**LWRP**);

(e) Mr Freeman's evidence.

Regional Council Policy Framework

13 The environmental issue at stake in relation to the management of stormwater discharges is the maintenance and improvement of water quality in surface and groundwater bodies. The management challenge is developing an integrated policy framework between regional and territorial legislative instruments, namely the LWRP developed under the RMA, and bylaws developed under the LGA.

14 Directives for manging the effects of stormwater discharges come from a national level, the Resource Management Act 1991 (**RMA**) and the National Policy Statement for Freshwater Management 2014 (**NPSFM**), as well as a regional level from the CRPS.

15 The CRPS is particularly relevant in this context as it set out objectives, policies and methods to resolve the significant resource management issues facing the Canterbury region. The maintenance and improvement of freshwater quality is one of these significant issues. This includes integrated management between different agencies to ensure that a holistic approach to freshwater management is achieved.

16 To resolve this issue the CRPS requires the establishment of minimum water quality standards and the management of activities that may cause adverse effects on water quality. Stormwater discharges are one such activity that require management to achieve water quality goals.[1] The Regional Council and territorial authorities are directed to work together, as well as to have regard for and give effect to the goals of holistic freshwater management.[2]

17 The main regulatory instruments that manage stormwater discharges in Canterbury are the LWRP, district plans and territorial authority bylaws, and resource consents (both discharge permits and land use consents). The LWRP manages the effects of stormwater discharges on the environment, district plans manage the effects of land use activities, and stormwater bylaws enable the management, protection and control of council owned and operated reticulated stormwater systems.

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[1] The most relevant CRPS objectives and policies are 7.2.1, 7.2.3, 7.3.1, 7.3.6, & 7.3.7.

[2] CRPS Objective 7.1.4 & Policy 7.3.9.

The Canterbury Land and Water Regional Plan

18 The essence of the LWRP objectives can be summarised as directing the integrated management of land, water, and the protection of cultural values. The LWRP takes a mountains-to-the-sea approach, acknowledging the connectivity between surface water, groundwater, freshwater, land, and the coastal environment. The LWRP implements an activity based approach to ensure that the water quality and quantity in fresh waterbodies is managed to protect ecosystems, indigenous biodiversity, and human health, as well as economic and social wellbeing.

19 Freshwater bodies are to be maintained in a healthy state. The quantity and quality of water in freshwater bodies directly relates to the health of the environment and its capacity to support ecosystems and biodiversity. All activities, including stormwater discharges, are to operate at good environmental practice or better, to optimise efficient resource use and protect the region's freshwater resources from quality and quantity degradation.[3]

20 Resource consents are one of the tools under the LWRP that are used to manage activities that might otherwise cause unacceptable effects on the environment. The resource consent process focuses on achieving the environmental outcomes required by the objectives and policies in the Plan. There are many matters that will be considered when assessing a proposal to discharge stormwater (whether from a reticulated stormwater system, or directly to land or a waterbody). The consent authority will consider the terms and conditions upon which a resource consent might be granted and how effective these might be in achieving the environmental outcomes established in the LWRP objectives and policies.[4]

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[3] LWRP Objectives 3.8, 3.16, 3.18, & 3.24 are particularly important for the management of stormwater discharges.

[4] LWRP Policy 4.13 states that the effects of discharges will be minimised by a combination of measures including avoidance, recovery, recycling, minimisation, and treatment. Where a contaminant may enter groundwater, Policy 4.14 has conditions to manage that risk.

21 The LWRP has strong policy guidance about what activities may be granted a resource consent and what assessments must be undertaken to satisfy the requirements of the Plan. Resource consents for stormwater discharges will not be granted if they will cause the water quality limits in the Plan to be breached. When considering stormwater discharge consent applications the Regional Council must have regard to the potential adverse effects on the life-supporting capacity of freshwater, freshwater ecosystems, and the health of people and communities. The Regional Council must also consider the extent to which it is feasible and dependable to avoid any more than minor effects on freshwater or associated ecosystems, or human health.[5]

Reticulated Stormwater System Discharges under the LWRP

22 In relation to urban stormwater discharges it is LWRP policy that the cumulative effects of a discharge are to be managed by directing all stormwater discharges to land, or into reticulated systems where they are available.[6] Operators of reticulated stormwater systems (generally territorial authorities) are required to apply for resource consents for discharges from their systems by 30 June 2018.

23 There is a requirement for reticulated stormwater system operators to prepare and submit stormwater management plans with their consent applications. Stormwater management plans are required to set out (amongst other things) how they will manage discharges into and from their stormwater systems to meet water quality outcomes, standards and limits in the LWRP by 2025.[7] Any discharges of hazardous substances

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[5] LWRP Policies 4.7 & 4.8A impose these requirements on any discharge consent application. Policy 4.8A is a requirement that comes directly from the National Policy Statement for Freshwater Management 2014. Water quality limits are set in the catchment specific sections of the plan (sections 6-15) as well as in Schedules 5 and 8.

[6] LWRP Policy 4.15.

[7] The matters to be addressed by a stormwater management plan under LWRP Policy 4.16 are: all discharges of stormwater into the stormwater system, treatment prior to discharge into a river or lake, how the water quality limits in Schedules 5 & 8 or Sections 6-15, storage or disposal of hazardous substances, progressive improvement of water quality as soon as practical but no later than 2025.

associated with contaminated land must also be managed to ensure that adverse effects beyond the site boundary are avoided.[8]

Policy 4.16A

24 Policy 4.16A in the LWRP states that:

Operators of reticulated stormwater systems implement methods to manage the quantity and quality of all stormwater directed to and conveyed by the reticulated stormwater system, and from 1 January 2025 network operators account for and are responsible for the quality and quantity of all stormwater discharged from that reticulated stormwater system.

25 The intent of this policy is to direct territorial authorities to manage and control all inputs into reticulated systems. This will avoid any inconsistencies that might arise between the conditions on different resource consents that permit discharges into and out of the reticulated system. For example, the conditions controlling a discharge into the reticulated system might be different from the conditions controlling a discharge out of the system. The policy seeks to avoid duplication, encourages integrated management, and should make the application process to discharge to a reticulated system simpler. An applicant would not require approval from both the Regional Council and the relevant territorial authority or be sent back and forth between councils. The Regional Council's focus is on the ultimate receiving environment.

LWRP Rule Framework

26 Policy 4.16A of the LWRP is implemented by a range of rules. Rule 5.93A provides that the discharge of stormwater or construction-phase stormwater into a reticulated system is a permitted activity if written permission has been obtained from the owner of the reticulated stormwater system. If the written permission of the owner of the reticulated system is not obtained, then the discharge of stormwater into a reticulated system requires resource consent as a discretionary activity (in Waimakariri).[9]

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[8] LWRP Policy 4.26. The adverse effects to be avoided are those on people's health or safety, human or stock water supplies, and on surface water.

[9] LWRP Rules 5.93A & 5.97.

27 The discharge of stormwater or construction phase stormwater from a reticulated stormwater system requires resource consent as a restricted discretionary activity (provided certain conditions are met, including that the discharge will not cause a limit in Schedule 8 of the LWRP to be exceeded) or as a non-complying activity.[10]

28 Under the LWRP rule framework, the Regional Council controls the discharge from reticulated systems into the receiving environment while territorial authorities are enabled by LWRP permitted activity rule 5.93A to set the parameters around what will and will not be received by the reticulated system. This includes the volume and rate of a discharge in addition to its contents. Stormwater bylaws can be used to set the requirements for obtaining written permission to discharge into a reticulated system. For example, permission might only be granted if the contents and quantity of the discharge will not result in a breach of the district council's reticulated stormwater system discharge consent.

29 The Regional Council has invested significant time to encourage the operators of reticulated stormwater systems to be responsible for managing all stormwater entering reticulated stormwater systems.

The draft Bylaw

30 The draft Bylaw seeks to improve the management and operation of Waimakariri District Council (**WDC**) stormwater and land drainage systems. It focuses on health, safety, and protecting the environment by regulating the management of the quality and quantity of stormwater discharges entering WDC stormwater systems.

31 The objectives in the draft Bylaw align with the LWRP framework but the automatic requirement to apply to the Regional Council for resource consent in certain circumstances does not. Objectives 3.1 a. and 3.1 b. of the draft Bylaw indicate that the purpose of the draft Bylaw will integrate with the LWRP. The draft Bylaw will enable WDC to control the discharge of contaminants into any WDC stormwater system and meet the relevant management standards for the discharge from those systems into the receiving environment. These objectives indicate that the draft Bylaw can be used as the tool to ensure compliance with

[10] LWRP Rules 5.93 and 5.94.

Regional Council requirements, such as any reticulated stormwater discharge consent.

32 However, the automatic requirement in Part 2 section 10 of the draft Bylaw for 'high risk activities or sites' to apply for and obtain any necessary resource consent from the Regional Council to discharge into any WDC stormwater system is not effectively aligned with the LWRP, in particular with Policy 4.16A. This automatic requirement adds an extra layer of administration that might unnecessarily complicate the holistic and integrated freshwater management that is sought by the LWRP.

33 The automatic requirement would mean that the Regional Council would be controlling all the inputs into WDC stormwater systems classified as 'High Risk' (subject to whether a resource consent would be granted). This would create a duplication in approval (one from the Regional Council and one from WDC), as well complicating the resource consent landscape, particularly for the ultimate end of pipe discharge, when a Pollution Prevention Plan could provide the same management mechanism in appropriate circumstances.

34 Consenting a discharge at both the point it enters the reticulated stormwater system and the point it exits the system creates two points of management along the same reticulated discharge system. A breach of consent conditions may occur at the point of entry to the pipe as well as the exit from the pipe, which could make either or both consent holders liable for the breach. Minimising the creation of these circumstances, except in exceptional circumstances, would provide more efficient protection of freshwater quality in relation to reticulated stormwater management.

Integration of the draft Bylaw with LWRP Policy

35 In light of the above framework, I consider that some amendments could be made to the draft Bylaw to provide for more efficient and effective management of stormwater discharges in Waimakariri, and better integration with the regional framework (including the LWRP). I discuss these amendments in further detail below.

36 The reference to the year 2025 in LWRP Policy 4.16A sets out a clear direction of travel and a clear timeframe for achieving a new management regime. The policy framework in the LWRP represents a shift in the integrated management of stormwater discharges with the

Regional Council controlling end of pipe discharges in to the environment and territorial authorities controlling inputs into reticulated systems.

37 The Regional Council's submission is seeking some amendments to the Bylaw to reflect an approach that more effectively integrates with LWRP policy. Some suggested amendments are set out in **Appendix A** to my evidence. I agree with the amendments sought. A simpler approval process for discharges into WDC reticulated stormwater systems would make it easier for individual property owners to understand and meet their stormwater obligations, while avoiding the creation of a complicated resource consent landscape.

38 A more integrated approach would provide WDC with an opportunity to explore the resourcing and expertise requirements that would be required to implement a more independent approach to the management of reticulated stormwater. A site by site approval process, based around the use of Pollution Prevention Plans and utilisation of Regional Council resources and expertise, could assist WDC with the assessment of discharges into WDC reticulated stormwater systems. This process could effectively integrate with the LWRP as opposed to an automatic requirement for a resource consent for high risk sites. As Mr Freeman's evidence explains, the current distinction between medium risk and high risk sites does not always reflect the risks associated with stormwater discharges (i.e. some high risk sites will have lesser risks than medium risk sites).

39 It is my opinion (and based on the evidence of Mr Freeman) that the following amendments to the draft Bylaw would create a more integrated, robust, and simple to implement stormwater bylaw:

- Substitution of the 'medium' and high' risk categories with one 'at risk' category that is based on the Hazardous Industries and Activities List, but which excludes operational phase stormwater discharges from residential activities;
- Development of an approval process for discharges into reticulated stormwater systems that would enable case by case assessments of 'at risk' discharges to determine whether the rate, volume, and contents of a discharge should be accepted

or not, while also providing a mechanism to revoke such approvals;

- Additional requirements to be contained in Pollution Prevention Plans.

40 Reference to a single category of risk and the use of case by case assessments would remove any arbitrary classifications of stormwater discharges that may or may not be appropriately discharged into a reticulated stormwater system. In combination with some additional requirements for Pollution Prevention Plans this would enable a wider range of stormwater discharges to be appropriately assessed and managed directly by WDC. It is my understanding that the Regional Council is prepared to provide specialised technical advice to assist with the assessment of 'at risk' sites.

41 I have read the evidence of Rowan Freeman from the Regional Council's Contaminated Sites Team and agree that what is proposed is workable in the context of the Regional Council's submission on the Bylaw. I agree that these recommendations would enable WDC to more effectively integrate the draft Bylaw into the LWRP framework.

42 The development of a clear approval process that integrates with LWRP permitted activity rule 5.93A would enable WDC to approve stormwater discharges into reticulated systems in accordance with a case by case assessment of the discharge. This approval could cover all aspects of the stormwater discharges including the volume, rate and contents of stormwater discharges, which would remove the need to grant several separate approvals. It is anticipated that the approval would require an associated PPP.

43 The approval under the Bylaw would also be the "written permission" of WDC to discharge stormwater into the reticulated system for the purposes of the Rule 5.93A of the LWRP. This means that where a person has an approval under the draft Bylaw, the discharge to the reticulated system would be a permitted activity under the LWRP.

44 It is my understanding that if the draft Bylaw set clear terms around the revocation of an approval granted under the draft Bylaw, then if it is revoked a stormwater discharge would no longer meet the conditions of LWRP permitted activity rule 5.93A. In the absence of a relevant resource consent, the Regional Council would be entitled to take

enforcement action under the RMA for any ongoing stormwater discharge that was in breach of the rules in the LWRP. If the lack of enforcement powers under the LGA is a concern for WDC then this mechanism would create an avenue of recourse to enforcement action under the RMA.

45 Further details of the recommended amendments to the draft Bylaw are set out in **Appendix A**. It is also my understanding that the Regional Council would be interested in discussing how these suggested amendments could work in practice and how we could provide technical advice and assistance in the future.

Conclusion

46 The legislative framework and policy in Canterbury provides a platform for the integrated management of stormwater discharges between the Regional Council and territorial authorities. The objectives of the draft Bylaw are directed towards the same management goals as the Regional Council but the Regional Council's submission notes that the draft Bylaw does not consistently align with the regional planning framework.

47 If some small amendments are made to the draft Bylaw, most specifically to the categorisation of risk, content of Pollution Prevention Plans and approval process, it would enable WDC to manage stormwater inputs into reticulated systems in a way that effectively integrates with the LWRP.

48 A simpler approval process for discharges into WDC reticulated stormwater systems would make it easier for individual property owners to understand and meet their stormwater obligations while avoiding the creation of an overly complicated resource consent and stormwater approval regime. A case by case approval process would also provide WDC with an opportunity to explore the resourcing and expertise requirements that would be required to implement an independent management regime that is integrated and aligned with the direction indicated in the LWRP.

49 The Regional Council would like to assist WDC by providing specialised resources and expertise to assist WDC with the assessment of applications to discharge into WDC stormwater systems. The Regional

Council would be interested in continuing the conversation about mechanisms for providing this in practice.

Samuel Peter Leonard

16 February 2018

Appendix A

Amendments sought to the draft Bylaw

1 The Regional Council is seeking that amendments be made to the draft Bylaw in relation to:

(a) The risk categories;

(b) The development of an approval process; and

(c) Additional requirements for Pollution Prevention Plans

2 A summary of the amendments sought are set out below.

Risk categories

3 The Regional Council is seeking that the medium and high risk classification regime used in the Bylaw is replaced by one "at risk" category, this would encompass the following amendments:

(a) Deletion of the definitions of "medium risk activities" and "high risk activities" and Schedule 1 of the draft Bylaw.

(b) Inserting a new definition of "at risk activities" that means those activities that are listed on the 'Hazardous Industries and Activities List'; excluding those activities that consist of operational phase stormwater from residential activities.

(c) Amendments to the clause 9 of the Bylaw to reflect the change to a single "at risk activity" category.

(d) Deletion of clause 10 of the Bylaw.

Approval Process

4 The Regional Council is seeking that the Bylaw contains an approval process by which WDC is to approve discharges into its reticulated stormwater system. The amendments to the draft Bylaw would consist of:

(a) The addition of an approval process, by which WDC would approve all aspects of the discharge of stormwater into its reticulated system for which WDC's approval is required under the

draft Bylaw, including the acceptance of the stormwater, the discharge of contaminants, discharges from "at-risk" activities, new connections, and any works required.

(b) The draft Bylaw should indicate that the approval of the discharge of stormwater from "at-risk" activities will be determined on a case-by-case basis after considering a range of factors, including (as relevant):

(i) The types, sources and distribution of contaminants associated with a hazardous activity on a site;

(ii) The presence or absence of scientific evidence of environmental conditions on a site where hazardous activities have occurred or are occurring;

(iii) The proximity of proposed stormwater discharges in relation to areas prone to hold contamination and or hazardous substance containments;

(iv) The proximity, sensitivity and types of stormwater receptors;

(v) Ease of contaminant migration to stormwater receptors;

(vi) The nature of proposed construction works;

(vii) The type of activities from which stormwater discharges may be generated;

(viii) The robustness of the site-specific construction management plan (CMP); and

(ix) The appropriateness of construction and operational stormwater treatment;

(c) The draft Bylaw should also indicate that any approval that is granted may include conditions to be met that address (among other things):

(i) the location of the work or activity;

(ii) the type and nature of the discharge approved;

(iii) construction, design, and maintenance requirements for the work or activity;

(iv) compliance with specified water quality limits;

(v) implementation of and compliance with a Pollution Prevention Plan, including any specified mitigation measures; and

(vi) monitoring requirements.

(d) The addition of a clause specifying a revocation regime, including provisions to explicitly enable WDC to revoke its approval to for a discharge of stormwater into the reticulated system, for example where the terms of the draft Bylaw (or any other regulatory control), or the conditions of any approval granted under the draft Bylaw, are not being met.

Pollution Prevention Plans

5 The Regional Council is seeking amendments to the use and content of Pollution Prevention Plans, as follows:

(a) Requiring the use of Pollution Prevention Plans by all "at-risk" activities;

(b) Amendments to clause 9 of the draft Bylaw to require a Pollution Prevention Plan to include protocols for responding to the accidental discovery of contamination at a site;

(c) Requiring site owners to use scientific evidence to justify the content and appropriateness of Pollution Prevention Plans; and

(d) Amendments to require a suitably qualified and experienced practitioner to provide input on the minimum requirements of a Pollution Prevention Plan for any "at risk" activity.

B1.3 ECan Water Quality Feedback on Draft Geraldine SWMP (4 April 2018)

Bill Noell

From: Shirley Hayward <Shirley.Hayward@ecan.govt.nz>
Sent: Wednesday, 4 April 2018 10:28 PM
To: Bill Noell
Cc: Ashlee Robinson; Paul Hopwood; Grant Hall; Rufino Guinto; Chris Fauth; Michele Stevenson
Subject: Feedback on draft Geraldine SMP - water quality aspects
Attachments: Memo detailing river water quality classification approach_final.pdf

Hi Bill,
Thanks for giving us the opportunity to comment on the draft SMP for Geraldine. Overall, the general approach seems pretty comprehensive and well thought out. It provides a pragmatic approach to improved management of stormwater discharges over time, although some timebound commitments or targets could enhance this approach. I've provided some comments below, but these are not exhaustive, and I'm happy to discuss these further.

LWRP River classification and Schedule 5 receiving water standards
Table 3 in the draft SMP lists the main waterways that receive stormwater run-off from the Geraldine township and their tentative water quality classes. This was based on an early conversation (email exchange) between myself and PDP. However, through a process described in the attached memo (Gray, 2017), it is proposed that the Serpentine Creek (below Peel Street) is classified as Spring-fed Plains – urban and that Downs Creek is classified as Hill-fed lower (because only a small proportion (<40%) of its catchment area is urbanised). Based on Gray (2017), it has been proposed in the OTOP zone committee's draft ZIP addendum that the river and streams are classified in the Opihi catchment in a consistent manner to the rest of the LWRP classes. This means for the rivers that flow through Geraldine the following water quality classes are proposed:
Waihi River – Hill-fed lower
Downs Creek – Hill-fed lower
Serpentine Creek below Peel Street - Spring-fed Plains urban
Raukapuka Creek – spring fed plains.

Water Quality Triggers
From my understanding of the draft SMP, a 3-tier trigger response framework is proposed. The first trigger is the bottom-line standard, which aims to at least maintain current water quality and quantity, and meet minimum requirements for avoidance of visual and objectionable contamination. In these trigger tables (Table C1), the trigger values for the zinc and copper in Waihi R and Serpentine Ck appear to be the same, and are carried through to the third tier trigger responses. It might be preferable to distinguish the current state of these two main receiving environments into the Waihi R, which based on albeit limited data, appears to already meet the LWRP Sch. 5 std for copper and zinc (95% level of protection) and Serpentine Ck which currently does not appear to meet the 90% level of protection standard at all sites. The first tier trigger may aim to ensure that no increases above current level occurs, while long term management aims to achieve those tier 3 targets.

The triggers appear to be focussed on receiving water quality, rather than discharge quality, which could be appropriate because of multiple small discharges that occur along the waterways. However the triggers target base flows (ie at least 3 days after rainfall), which only characterises the water quality when no discharge is occurring. While, this reflects the long-term exposure risk to the aquatic environment, there is also value in understanding the water quality during discharge events ie during rainfall, and therefore, some of the monitoring should also target rainfall events. The water quality contaminant triggers can be appropriately applied as annual medians (or averages), rather than single sample triggers.

Temperature – there is little value in including a temperature difference trigger for receiving waters, if this is being monitored under base flow conditions. This will only reflect seasonal and climatic factors.

Invertebrate indicators – there is considerable merit in including invertebrate indicators to assess the impact on ecosystem health, however a 20% reduction in indicator value between upstream and downstream sites is quite a difference although there is naturally considerable site to site variability and monitoring protocols will be needed to reduce micro habitat factors. A earlier, 2nd tier trigger of 10% chance could be used to initiate a review of data to ascertain likely causes.

In addition, for the quantitative triggers proposed, another trigger could be used that considers trends over time -eg if the monitoring indicates a decline in receiving water quality or ecological health indicators, then some investigation and identification of possible actions is required.

Monitoring programme
A very comprehensive monitoring programme has been proposed. There may be some merit in adjusting some of the frequency and number of sites to maximise the understanding of the contaminant inputs, against the impact on ecosystem health (eg invertebrate community indicators), which will be very difficult to identify causal factors for any changes between sites or over time that may occur.
For the baseline monitoring, 3 years of quarterly monitoring will provide a greater representation of the range of seasonal and annual variations in water quality than 1 year of monthly data (for the same effort and cost). It would be preferable that at least some of the sampling includes during a rainfall event.

Happy to discuss any of this further.

Kind regards
Shirley

Shirley Hayward
Principal Scientist
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B2 AECL Consultation

B2.1 Geraldine SWMP AECL Response

Aoraki Environmental Consultancy Limited

P.O. Box 885 Timaru 7940

12 July 2018

Grant Hall
Timaru District Council
By Email: Grant.Hall@timdc.govt.nz

Geraldine Stormwater Management Plan

Tēnā koe Grant

Thank you for the opportunity to review the Geraldine Stormwater management plan (SMP).

We have reviewed the plan, and we support the Council approach of improving the quality of the stormwater discharge over time and improving the values and quality of the streams in, and affected by, the SMP. The key points of our response are included below, and we make a number of suggestions in the text of the report that would improve recognition of, or better provide for, Arowhenua's relationship with the Waihi River and its catchment.

Council approach to stormwater management

The Timaru District Council includes a number of management objectives, processes and actions, specifying how the stormwater network and discharge will be managed. Te Rūnanga o Arowhenua believes that the SMP can be significantly improved by considering the following:

1. The SMP does not address contaminant management in the first flush of a storm event. Given that the majority of contaminants are entrained in the first flush, we consider this is a major knowledge gap that should be addressed. While we understand that during a storm event the majority of contamination arises from surrounding rural land use, stormwater contaminants have the potential to bio-accumulate in kai species, and pose the risk of acute adverse effects on aquatic life. Finally, given the expectation over the life of this consent that surrounding farmers will adopt good management practices (which reduce loads of sediment, nitrogen and phosphorus), contaminants entrained in stormwater may become relatively more significant.
2. The SMP does not specify how Council will ensure that the discharge will comply with the outcomes. Council should adopt a bylaw, and consider proposing land use controls in the upcoming district plan review. We would prefer that these actions are identified upfront in the SMP, to provide greater certainty and demonstrate a proactive approach to improving stormwater quality.
3. The SMP recognises that the inclusion of water quality outcomes and includes auditable actions which are undertaken if these outcomes are not being met. We support this approach. Additionally, Te Rūnanga o Arowhenua considers that these should, from 2025, be

applied at the point of discharge and that these triggers should be consistent with the relevant outcomes in Schedule 5 and Table 1 of the LWRP.

4. The Council has not provided the stormwater design guidelines that will accompany the SMP. We consider that these guidelines should encourage (both for new developments and retrofitted systems) the use of 'natural' methods of treating stormwater including raingardens, wetlands and ponds. Planting of these facilities should emphasise indigenous species.
5. The SMP proposes to exclude development or redevelopment sites subject to a number of conditions. We are concerned that this will create uncertainty – with both consented and unconsented discharges coming from the same discharge point. Consequently, we would prefer that the assumption is that all sites remain "in" the SMP, unless they are actively excluded for a defined period of time to allow Council to undertake enforcement action on a particular issue. This approach provides certainty to ourselves as to which agency is dealing with a site or issue. We wish to avoid situations where a single discharge point contains contaminants from multiple sources, managed by different agencies, with all the associated uncertainty this would entail.

A number of these points can be resolved with changes to the SMP, or the approach the Timaru District Council takes in implementing the SMP. We think it would be worthwhile to discuss with Council how these will be included.

Adverse effects on mana whenua values

Te Rūnanga o Arowhenua also has an obligation to exercise kaitiakitanga over natural resources within their takiwa, and as the SMP sets the management direction for these waterbodies. The Cultural Impact Assessment remains relevant, but now that a consent application has been prepared we wish the Council to include the following summary in its primary assessment of effects:

"The discharge of stormwater to the Waihi and its tributaries is, as stated in the cultural impact assessment prepared by Tipa and Associates is of concern to Te Rūnanga o Arowhenua. The discharge:

1. *results in adverse impacts on taonga species (species which Ngai Tahu Whanui have a specific connection with). As taonga, these species have an intrinsic value that is not necessarily protected or provided for by the Table 1 and Schedule 5 limits.*
2. *cumulatively, results in a degradation of the mahinga kai values, as a result of pollution of the receiving waterbodies with sediment and heavy metals, and the management of these waterbodies for non-traditional values (e.g. flood mitigation).*
3. *degrades the mauri and other intrinsic values of the Waihi and its tributaries."*

Management actions that Timaru District Council should undertake to mitigate adverse effects on these values include:

1. avoiding and managing sedimentation of the receiving waterbodies by ensuring that the SMP:

    a. include clears, auditable responsibilities for Council to ensure that erosion and sediment control is implemented by developers and monitored by council.
    b. includes a risk assessment of sites that is used to priorities monitoring and enforcement
    c. includes specified consequences for non-compliance (on the part of a developer).
    d. Enables restoration actions, including sediment removal.
2. regular cultural monitoring, which we understand is already being considered. This is important to Te Rūnanga o Arowhenua – provided elements of the cultural monitoring are linked to performance standards in the consent. This could be achieved by:
    a. Providing an opportunity for Te Rūnanga o Arowhenua to visit and u
    b. ndertake a cultural assessment of the receiving rivers every 2-5 years (depending on how other council performance measures are tracking). Monitoring would be undertaken in accordance with the COMAR toolkit.
    c. Requiring that the diversity of taonga species present does not decrease (in the short term) and improves (in the medium to long term).
    d. Improving stream health measures, including the types of riparian and aquatic plants present, water clarity and flow. These can be linked to the stream enhancement that the Timaru District Council is planning under the SMP.
    e. Allowing for situations where the Timaru District Council is unable to meet these outcomes as a result of influences outside its control.

We are happy to provide draft condition wording and management actions to ensure that this mitigation is included. Alternatively, we can work with the Timaru District Council and Environment Canterbury through the consent process to ensure that this is reflected in the consent.

Receiving water body management objectives and processes

The SMP recognises that there are opportunities to improve various values through direct enhancement of the receiving waterbodies, e.g. by riparian planting. When undertaking stream enhancement, we request that:

1. The SMP should recognize the special relationship of Ngai Tahu Whanui with Taonga species, given that these are recorded within the area affected by the SMP discharge. Habitat improvements to waterways within the SMP area, particularly Serpentine Creek and Raukupuka Creek are important to protect these species and enhance mahinga kai.
2. Channel capacity management which adversely affects mahinga kai values (for example spraying, clearing) should be avoided, and the SMP should contain a clear protocol as to how this work is undertaken.

Review of the SMP

The SMP does not appear to contain a default timeline for review of the plan, and how this will occur. Given the SMP will set the direction for stormwater management, we believe that this plan should be subject to regular reviews – ideally a ‘soft’ review every 2 years addressing issues that

have arisen and a ‘hard’ review every 4 years which considers if the plan is ensuring that TDC is on track to meet its outcomes and targets and amending the SMP if needed.

Kā mihi

Alex Macdonald
Environmental Planner
Aoraki Environmental Consultancy Limited
On behalf of Te Rūnanga o Arowhenua

B2.2 Meeting Minutes – Geraldine SWMP (25 July 2018)

Bill Noell

From: Bill Noell
Sent: Wednesday, 25 July 2018 8:27 AM
To: 'grant.hall@timdc.govt.nz'; 'selwyn.chang@timdc.govt.nz'; 'alexmacdonald@aecltd.co.nz'
Cc: rufino.guinto@timdc.govt.nz
Subject: Geraldine/ RDC SWMP's

Gents

Confirming our discussion yesterday (Grant Hall TDC, Selwyn Chang TDC, Alex MacDonald (AECL), Bill Noell (PDP)

AMD comfortable with overall approach taken for Geraldine but looking to obtain more certainty of outcomes

AMD concern about softness of reporting (annual esp) not the intention - reporting needs to be acted on not just the 5 yearly review. Pdp to update to reflect.

Cultural monitoring - AMD comfortable if cultural monitoring is developed with Runanga in first year of plan (as baseline ecological and water quality completed also) BN noted that ECAN suggested to to change this for water quality to get better representation across seasons (risk of losing momentum vs monitoring representativeness affected by extreme seasons). Agreed easier to provide additional years of monitoring if season not considered representative that to regain momentum after three years.

PDP found CIA v genetic and not particularly focused on SW impacts (noting it was completed well in advance of final SW assessments), and keen to get thoughts on how to undertake for future consents/plans. Remaining catchments - not need for CIA but noted by BN as desirable to have a review / assessment of significant sites/areas so can understand issues better PDP to forward brief through TDC (AEL to engage Gail Tippa?). AON noted to make sure area a bit wider than SMA to ensure full picture captured eg Sth bank of Otipua)

Consent conditions - AMD to forward copies of acceptable consent conditions

Issues with waterway responsibilities discussed while one stop shop desired (by all parties) – Most of land in private ownership. Ecan some clearing works

AON wants to see the responsibilities spelt out in the plan eg private ECan TDC

AMD does consider further details / consultation required, but would like to have say on consent application

Alex - appreciate the short notice. Feel free to note any additional comments/corrections or call to discuss.

Regards

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Sent from my iPhone

B2.3 AECL Recommended Consent Conditions (8 August 2018)

Bill Noell

From: Alex MacDonald <alexmacdonald@aecltd.co.nz>
Sent: Wednesday, 8 August 2018 3:58 PM
To: Bill Noell
Subject: RE: Geraldine/ RDC SWMP's

Kia ora Bill

Here are the conditions that were appropriate in another case, that I think we could work with here. The other comments/issues are all good, and happy to sort out.

Ka mihi

Alex

(a)

a. The consent holder will provide the opportunity for Te Rūnanga o Arowhenua to undertake a COMAR assessment ("the initial assessment") of the relevant reach(s) of the XXXXX. Sites will be selected in consultation with Te Rūnanga o Arowhenua, with a minimum of x sites to be used.
b. The COMAR report prepared under (a) shall include a CHI scores, and recommendations as to how these scores can be improved within the scope of the SMP.
c. The recommendations provided under (b) shall be incorporated into the SMP with the agreement of both TDC and Te Rūnanga o Arowhenua.
d. Once the COMAR report required under (a) has been prepared, Te Rūnanga o Arowhenua shall be given the opportunity to undertake further cultural health monitoring in accordance with the CHI Toolkit, Te Rūnanga o Arowhenua shall be given the opportunity to undertake this monitoring if it has not been undertaken in the previous x years.

b. If monitoring undertaken (under clause (d)) after the initial assessment shows that CHI scores are not meeting the target scores set in (b), the TDC shall identify what amendments are needed either to the Stormwater Management Plan or the Design Guidelines to ensure that the targets are met
c. Clause (b) does not apply if:
    a. the decrease in scores is unrelated to the discharge of stormwater, or
    b. The decrease is unrelated to waterway enhancement actions identified under the SMP or the waterway management responsibilities that TDC undertakes under its SMP, or
    c. The decrease is related to a temporary event that TDC is rectifying using the methods identified in the SMP, and
    d. the reason for the exclusion is recorded and included in the annual report.
d. TDC shall pay for reasonable costs to undertake the cultural monitoring identified above. In the event that Te Rūnanga o Arowhenua and ADC do not agree on what is reasonable, ADCs hourly fee for persons of similar experience will be used.

Alex Macdonald
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From: Bill Noell <Bill.Noell@pdp.co.nz>
Sent: Wednesday, 25 July 2018 8:27 AM
To: 'grant.hall@timdc.govt.nz' <grant.hall@timdc.govt.nz>; 'selwyn.chang@timdc.govt.nz' <selwyn.chang@timdc.govt.nz>; Alex MacDonald <alexmacdonald@aecltd.co.nz>
Cc: rufino.guinto@timdc.govt.nz
Subject: Geraldine/ RDC SWMP's

Gents

Confirming our discussion yesterday (Grant Hall TDC, Selwyn Chang TDC, Alex MacDonald (AECL), Bill Noell (PDP)

AMD comfortable with overall approach taken for Geraldine but looking to obtain more certainty of outcomes

AMD concern about softness of reporting (annual esp) not the intention - reporting needs to be acted on not just the 5 yearly review. Pdp to update to reflect.

Cultural monitoring - AMD comfortable if cultural monitoring is developed with Runanga in first year of plan (as baseline ecological and water quality completed also) BN noted that ECAN suggested to to change this for water quality to get better representation across seasons (risk of losing momentum vs monitoring representativeness affected by extreme seasons). Agreed easier to provide additional years of monitoring if season not considered representative that to regain momentum after three years.

PDP found CIA v genetic and not particularly focused on SW impacts (noting it was completed well in advance of final SW assessments), and keen to get thoughts on how to undertake for future consents/plans. Remaining catchments - not need for CIA but noted by BN as desirable to have a review / assessment of significant sites/areas so can understand issues better PDP to forward brief through TDC (AEL to engage Gail Tippa?). AON noted to make sure area a bit wider than SMA to ensure full picture captured eg Sth bank of Otipua)

Consent conditions - AMD to forward copies of acceptable consent conditions

Issues with waterway responsibilities discussed while one stop shop desired (by all parties) – Most of land in private ownership. Ecan some clearing works

AON wants to see the responsibilities spelt out in the plan eg private ECan TDC

AMD does consider further details / consultation required, but would like to have say on consent application

Alex - appreciate the short notice. Feel free to note any additional comments/corrections or call to discuss.

Regards

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Sent from my iPhone

Appendix C

Proposed Consent Conditions

Proposed Consent Conditions

SCOPE

1. The discharge shall only be from stormwater generated by the area identified as the "Geraldine Township Stormwater Management Area" as shown on Plan CRCXXXXXX, which forms part of this consent, that enters the Timaru District Council (TDC) stormwater network and is subsequently discharged onto or into land or into surface water or groundwater.

2. The discharge shall not be from any:

   a) New industrial site listed in the attached XXX, which forms part of this consent, unless the stormwater design for the site and discharge into the TDC stormwater network is approved by TDC.

   b) Development area unless the mitigation measures and discharge into the TDC stormwater network is approved by TDC.

Advice Note:

1/ *Development area means any individual area within a site or sites that is undergoing development and construction activities.*

2/ *Acceptance for the discharge to stormwater does not relieve TDC or the site developer from requirements under the National Environmental Standards for Contaminated Land*

3. The discharge shall not be from any development or area or mitigation facility on a piece of land on the Canterbury Regional Council's Listed Land Use Register, unless the soil has been analysed for the appropriate contaminants as determined by Canterbury Regional Council and has been shown to be 'At or below background concentrations' or 'Below guideline values for residential' and accepted by Canterbury Regional Council as 'At or below background concentrations' or 'Below guideline values for residential'.

4. Stormwater from the TDC stormwater network shall be discharged either:

   a) To land adjacent to, or directly into Serpentine Creek; or

   b) To land adjacent to, or directly into the Waihi River; or

   c) To land adjacent to, or directly into Raukapuku Stream; or

   d) To land adjacent to, or directly into Downs Creek; or

   e) Onto or into land via soakage pits within the Stormwater Management Area where ground conditions permit.

   The Geraldine stormwater network is shown on Plan CRCXXXXXX which forms part of this consent.

OBJECTIVES AND TARGETS

5. The consent holder shall use reasonable endeavours to achieve the water quantity, water quality, ecosystem health, and cultural health objectives and targets set out in the attached SWMP to improve and maintain water quality in the receiving waterways, which forms part of this consent, with respect to effects arising from the exercise of this consent.

Advice Note: *It is anticipated that the consent holder will engage with the community and the Orari-Opihi-Pareora Water Zone Committee on objectives and targets for its Stormwater AMP during the life of the Stormwater Management Plan.*

EROSION AND SEDIMENT CONTROL AND DISCHARGES FROM CONSTRUCTION SITES

6. For the development area stormwater discharges authorised by this consent:

    a) All practicable measures shall be undertaken to minimise discharges of sediment-laden runoff.

    b) An ESCP shall be prepared, prior to land disturbance commencing, that is consistent with the principles for the type of site described in the E&SCG and shall be implemented on site.

    c) All erosion and sediment control measures shall be constructed and maintained in accordance with the E&SCG.

    d) The discharge shall only take place during the site construction period.

Advice Note:

E&SCP *means an Erosion and Sediment Control Plan*

E&SCG *means Erosion and Sediment Control Guidelines for the Canterbury region (Report no. CRCR06/23, February 2007) or subsequent revisions to this document and the Environment Canterbury Erosion and Sediment Control Tool Box published on the Environment Canterbury website*

7. The discharge of sediment laden stormwater from a development area shall not cause significant adverse effects on water clarity, water colour, and/or aquatic ecology in Downs Creek, Raukapuku Stream, Serpentine Creek or the Waihi River

PRINCIPLES OF DEVELOPED SITE STORMWATER MANAGEMENT

8. The consent holder shall, where practicable, give effect to the following general principles of stormwater management:

    a) Generally, to encourage and where appropriate, for new development or redevelopment, infilling, or street renewal and stormwater capacity upgrades, require the use of Low Impact Design Solutions as a preferred option to stormwater management where this is the best practicable option. The aim of

this is to mimic natural stormwater runoff characteristics, thereby helping to reduce the adverse off-site effects associated with stormwater from urban areas, particularly in sensitive receiving environments.

b) Examples of Low Impact Design solutions may include, but are not limited to the reduction in street carriageway width when scheduled for renewal, the use of grassed swales and rain gardens for treatment flow attenuation and/or infiltration.

c) The control of materials used in building construction to minimise leaching of toxic metals to the environment.

d) Ongoing responsibilities of upstream dischargers to control and maintain the quality and quantity of discharge to an acceptable standard.

e) Provision of policy and guidance to support enforcement of discharge requirements under Timaru District Councils "Consolidated By-law (2018)"

f) The storage, handing and use of hazardous substances from activities and industries specified in Schedule 3 of the LWRP shall only occur in a manner such that they are isolated from catchments that collect and discharge stormwater.

g) Allowances for increases in rainfall intensities from climate change consistent with national guidelines in stormwater design.

h) The use of ground soakage as a preferred option for the disposal of stormwater where site conditions allow and there is no risk to subsurface instability.

i) The mitigation and avoidance of scour and erosion of waterways from adverse changes in stormwater flows and new discharge outfalls.

j) The use of indigenous endemic and site appropriate riparian planting to achieve improved water quality and habitat outcomes. Riparian margin planting should provide for erosion control while not impeding capacity, flows or system maintenance.

k) The use of stormwater treatment and attenuation mitigation facilities where full low impact design solutions are not practicable.

l) Understand and maintain the condition and capacity of the stormwater network to avoid unacceptable flooding.

m) Identification and provision of secondary flow paths to cope with flows in excess of the primary stormwater network system storm shall be identified and protected from obstructions, and shall avoid dwellings.

n) Appropriate recognition of Ngai Tahu Cultural Values.

Advice Note: *The consent holder will actively provide and maintain stormwater design guidelines that will provide the methods that they will use to enact the above principles.*

MINIMUM STORMWATER DESIGN FOR SMALL SITES

9. Stormwater from hardstand areas associated with new small sites within all catchments shall as far as practicable be directed to:

    a) A submerged or flooded outlet sump; or

    b) Other device capable of removing at least 75 percent of total suspended sediment greater than 500 microns; and

    c) Each submerged or flooded outlet sump or device shall have capacity to trap at least 60 litres of floating hydrocarbons.

    d) Exclude all runoff from areas where activities specified in Schedule 3 of the LWRP has been identified. A spill management plan (SMP) for any hazardous substance stored to avoid the accidental discharge of contaminants is to be included with the SEMP.

    e) A Site Environmental Management Plan (SEMP) showing how the stormwater discharges from areas applicable to (d) above are to be managed during both construction and operational states of the site.

Advice Note: *new small site means a new site after the commencement of this consent where the maximum number of potential lots under the appropriate zoning of no more than 10 or the area is no greater than 3,000 square metres.*

MINIMUM STORMWATER DESIGN FOR LARGE SITES

10. a) stormwater discharged from new large site greenfield or brownfield urban developments within the Geraldine stormwater catchment shown in Plan CRCXXXXXX, shall direct stormwater runoff from the following areas to a volume or flow based mitigation facility sized to capture and treat runoff from contributing pervious and impervious areas of the site:

    i. roading;

    ii. hardstand areas; and

    iii. roofs if they are from galvanised building materials;

    iv. gardens and lawns; and

    v. Public greenspaces

Advice Notes:

New large site means a new site after the commencement of this consent where the number of potential lots under the appropriate zoning is more than 10 or the area is greater than

3,000 square metres. This area is selected based on a minimum outlet pipe size of 100 mm to limit blockage risks.

11. For large site greenfield and brownfield urban development occurring after commencement of this consent, mitigation facilities shall be constructed to provide to ensure no additional adverse hydraulic effect on the stormwater network, overland flow paths or ephemeral gullies, or Raukapuku Stream, Downs Creek, Serpentine Creek , Waihi River and their tributaries.

Advice Note:

Brownfield urban development *means the redevelopment of existing residential, business or industrial land.*

Greenfield urban development *means the construction of subdivisions, buildings, roads and associated network services on previously undeveloped land, such as land previously used for agricultural purposes.*

12. The large site greenfield and brownfields urban development mitigation facilities that primarily discharge:

a) Into land shall provide partial retention of all design storms up to and including the 0.5% AEP, critical duration storm event or provide satisfactory identification of an adequate secondary flow paths.

b) To surface water within the Raukapuka Stream/ Downs Creek/ Serpentine Creek / Waihi River stormwater catchment shall provide at least partial attenuation for the critical duration 50%, and 10% AEP storm events; and

Advice Note: *A mitigation facility may have a combined water quality and water quantity function to reduce the total capacity of the facility.*

Mitigation facility *means a stormwater management facility comprised of basins and/or proprietary devices to mitigate water quality and quantity effects associated with stormwater that may include, for example, an off-line first flush basin followed by an attenuation basin.*

Design storm *is the theoretical rainfall event that the analysis is based on for a particular probability. The design storm is based on certain assumptions, including rainfall depth, intensity, and storm rainfall profile shape for the time of concentration or critical duration.*

Partial attenuation or retention *means attenuating (to surface water) or retention (to land) the stormwater generated in excess of what would otherwise have run off under design storm conditions for a site or multiple sites land use that existed at the commencement of the consent. Commonly described as ensuring peak post-development flows do not exceed pre-development flows.*

Annual Exceedance Probability (AEP) *is the chance of a storm event of a given intensity / depth or flood occurring in any one year, usually expressed as a percentage. For example, if a 24 hour duration storm event with a depth of 102 millimetres or more has an AEP of five percent (5%), it means there is a 5% chance (i.e. one-in-twenty) of this magnitude storm*

event and resulting flood flows occurring in any one year. AEP is the inverse of return period expressed as a percentage.

***Critical duration** means the rainfall duration (time) which results in the largest flows to the stormwater network and/or receiving environment.*

13. The design of large site greenfield and brownfield urban development water quality and quantity mitigation facilities shall be in general accordance with a recognised design guideline, using local hydrology obtained from the latest available version of the Timaru District Council Stormwater Design Guidelines.

***Advice Note:** Recognised design guideline refers to the Stormwater Design Guidelines :Ashburton Timaru Districts, Auckland Regional Council, Stormwater Management Devices: Design Guidelines Manual, May 2003, Technical Publication No.10; Stormwater Management Devices in the Auckland Region, GD01 (December 2017), GD04 Water Sensitive Design for Stormwater March 2015 and/or Christchurch City Council, Waterways, Wetlands and Drainage Guide, Part B: Design, February 2003; and/or the New Zealand Water Environment Research Foundation, On-Site Stormwater Management Guideline, October 2004; and/or any subsequent revisions of these guidelines.*

Baseline Conditions

14. Environmental Monitoring

    The consent holder will complete additional baseline monitoring of the Waihi River and Serpentine Creek, and groundwater quality over a 12 month period as included in the SWMP no later than 31 July 2020

15. Cultural Impacts
    a. The consent holder will undertake a COMAR assessment with Te Rūnanga o Arowhenua ("the initial assessment") of the relevant reach(s) of the Waihi River and Serpentine Creek. Sites will be selected in consultation with Te Rūnanga o Arowhenua, with a minimum of 6 sites to be used. The sites shall be consistent with Environmental Monitoring Sites and relevant to stormwater discharges
    b. The COMAR report prepared under (a) shall include a Cultural Health Index (CHI) score, and recommendations as to how these scores can be improved within the scope of the SWMP.
    c. The recommendations provided under (b) shall be incorporated into the SWMP with the agreement of both TDC and Te Rūnanga o Arowhenua.
    d. The base line monitoring shall be repeated with the periodic Environmental Monitoring requirements specified in the SWMP and may also be required with any exceedance of the "bottom line" conditions included in the SWMP
    e. Once the COMAR report required under (a) has been prepared, Te Rūnanga o Arowhenua shall be given the opportunity to undertake further cultural health monitoring in accordance with the CHI Toolkit, Te Rūnanga o Arowhenua shall be

given the opportunity to undertake this monitoring if it has not been undertaken in the previous 6 years.

16. Responsibilities of dischargers to the stormwater network

    Within 12 months of completion of requirements of clauses 14 and 15, the consent holder shall implement supporting policy and guidance to support the Timaru District Council "Consolidated By-law 2018" to specify the obligations of dischargers to the stormwater network .

17. Large Developments – Cultural Requirements

    The consent holder, or developer acting under this resource consent with permission, shall consult with Te Runanga o Arowhenua at the concept design stage of each large site greenfield urban development regarding:

    a) Siting and design of stormwater infrastructure with respect to wāhi tapu and wāhi taonga; and

    b) Landscaping and choice of plant species for stormwater management areas, and riparian margins.

Advice Note:

COMAR *means Cultural Opportunity Mapping and Assessments. The COMAR method is dependent upon active engagement with Ngāi Tahu. The design and application of the process explicitly recognises Ngāi Tahu as kaitiaki.*

STORMWATER MANAGEMENT PLAN AND REVIEW

Advice Note: *The SWMP provides for an adaptive management process to respond to changes in activities, environmental conditions and improvements in understanding of the environment during the life of the consent.*

17. The consent holder shall manage the area covered by this consent in accordance with the Stormwater Management Plan (SMWP).

Advice Note: *SWMP means Stormwater Management Plan for the Geraldine Township*

18. The SWMP shall include, but not be limited to, the following content in addition to that required to meet Local Government Act requirements:

    a) Description of Area / Catchments:

        i. Built Environment and Land use

        ii. Geology, Soils and Topography

        iii. Flooding Risks – Network and Floodplain

        iv. Groundwater / Surface water Interaction

        v. Serpentine Creek / Waihi River Stream Habitat and Surface Water Quality

vi. Serpentine Creek / Waihi River Aquatic Ecology

vii. Cultural, Amenity and Recreational Values

b) Approval Process for New Development / Connections; and

c) Monitoring:

i. Receiving Environment Monitoring

ii. Cultural Monitoring

iii. Reporting

iv. Further Investigations

19. The consent holder shall review the SWMP and revise (if required) at least every six years and any exceedance of any bottom line levels specified in the SWMP after the commencement of this consent. All revisions shall:

a) Take into account:

i. Changes in the catchment land use development.

ii. Changes or modification to the stormwater network.

iii. Implications of catchment water quality and hydrological monitoring results and analyses.

iv. Changes in recreational access or use.

v. the release of any amendment to the Resource Management Act 1991, or any document accepted as a New Zealand Guideline or Standard, which addresses stormwater management or water quality.

vi. the Orari-Opihi-Pareora sub-regional section of the Land and Water Regional Plan.

vii. the Opihi River Regional Plan.

viii. the response to any Receiving Environment Bottom Line Limit exceedances as reported under Conditions (24) - (26).

ix. the response to any additional adverse trends in the receiving environment identified from monitoring undertaken by the Canterbury Regional Council or reported by the Consent Holder.

b) Be clearly identifiable with a revision number and date on the front cover and header or footer.

c) Involve consultation with iwi and the Orari-Temuka-Opihi-Pareora Water Zone Committee.

d) Be submitted to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager within one month of the revision being adopted with an explanation of the changes that have occurred.

MAINTENANCE AND OPERATION

20. The consent holder shall undertake inspection, maintenance and operation of the Timaru District Council (TDC) stormwater network in accordance with the SMP.

Advice Note: *TDC stormwater network means drains, the reticulated piped network, kerb and channel, sumps, pipes, manholes, soakage chambers and any stormwater conveyance and mitigation facilities, for which Timaru District Council are responsible for operation, maintenance and upgrade.*

RECEIVING ENVIRONMENT BOTTOM LINE AND TARGET LEVEL TRIGGER RESPONSE

21. An exceedance of the bottom line receiving environment limits referred to in the SWMP with the Canterbury Regional Council on completion of the 12 month baseline sampling as outlined in Condition 14 of this consent.

22. The limits and monitoring included in the SWMP may from time to time be varied in response to activities, improvement in the understanding of the environment and changes in the environmental conditions. Details of proposed changes shall be submitted in accordance with Condition 25.

23. In the event that the monitoring shows stormwater contamination above Bottom Line level, or shows a reduction on the condition of the receiving environment is deemed to have occurred as described in the SWMP then the consent holder shall take the following actions that:

    a) Investigates the possible changes in the catchment conditions that has led to the reduction in water quality or ecological condition; and

    b) Establishes what options are appropriate to reduce the contaminant loads being discharged to the receiving environment via the TDC stormwater network; and

    c) Confirms the ability to implement potential load reduction options as outlined in (a) above; and

    d) Selects the specific contaminant load reduction option(s) to address the reduction in the receiving environment receiving water condition; and

    e) Provides a reasonable timeline for implementation of the selected contaminant load reduction options.

    f) Submit the report prepared in accordance with Condition (25) to the Canterbury Regional Council, Attention: Regional Leader- Monitoring and Compliance, within three months of a breach of a receiving environment bottom line trigger level, for certification that it complies with the requirements of Condition (25); and

    g) After the report has been approved in accordance with (a) above, implement the selected options in accordance with the timeline identified in the certified report (should the solution have not been implemented).

h) Clause (a) does not apply if:

i. the decrease in condition of the receiving environment is unrelated to the discharge of stormwater, or
ii. The decrease is unrelated to waterway enhancement actions identified under the SWMP or the waterway management responsibilities that TDC undertakes under its SWMP, or
iii. It is agreed that the decrease is related to a temporary event that TDC is rectifying using the methods identified in the SWMP, and
iv. the reason for the exclusion is recorded and included in the annual report.

24. The consent holder shall:

i) Submit the report prepared in accordance with Condition (26) to the Canterbury Regional Council, Attention: Regional Leader- Monitoring and Compliance, within three months of a breach of a receiving environment bottom line trigger level, for certification that it complies with the requirements of Condition (26); and

j) After the report has been approved in accordance with (a) above, implement the selected options in accordance with the timeline identified in the certified report.

IMPLEMENTATION RECORDS AND REPORTING

25. The consent holder shall keep and maintain records including, but not limited to:

a) A schedule of ESCPs and SEMP's prepared for or by the consent holder under Condition (6)(b). Copies shall be furnished to Environment Canterbury on request;

b) Spill Management and Containment Management Plans for any sites with activities included in Schedule 3 of the LWRP

c) For large site greenfield and brownfield urban development greater than 3,000 m^2:

i. Detailed design drawings of any water quality or quantity mitigation facilities;

ii. Details of site specific assessments undertaken;

iii. Maps and any engineering design; and

iv. Construction certificates issued by a suitably qualified engineer with stormwater design experience for any water quality or quantity mitigation facilities constructed that confirms compliance with the relevant design requirements described in Conditions (10) to (13).

d) Details of all inspections, maintenance, and materials disposal associated with the management of the stormwater network.

e) The environmental monitoring undertaken in accordance with the SWMP.

These records shall be made available to Canterbury Regional Council on request.

26. The consent holder shall submit a stormwater management report each year to the Canterbury Regional Council, Attention: Regional Leader- Monitoring and Compliance prior to the 30 November. The report shall detail:

    a) A summary of any new capital and renewal capital works carried out to improve the collection, conveyance and quality of the discharges from 1 July to 31 June each year.

    b) A summary of Low impact design devices installed in the network.

    c) Results of monitoring carried out from 1 July to 31 June each year including:

        i. the name of the person who collected the samples, the date and time the samples collected;

        ii. rainfall records for the corresponding rainfall events sampled;

        iii. an interpretation of the impacts of the discharges on receiving environment water quality; and

        iv. details of where a management or monitoring response should be adapted to reduce the adverse effects on the environment.

    d) Details of site audits completed

    e) Flooding complaints received and responses undertaken.

    f) Details of any water quality complaints/ no compliances associated with actual or potential discharges from the stormwater network

    g) Details of public education and land use control activities to limit contaminants discharged to the stormwater network and receiving environment.

    h) New connections and discharges approved for connection to the network

    i) Details of any unauthorised discharges to the network and remedial measures taken by the discharger;

    j) Proposed changes to the SWMP in response to monitoring details or changes in national policy requirements

    k) A description of the programme of works and any new large sites for the next financial year, and beyond, including:

        i. setting priorities to achieve the receiving environment objectives; and

        ii. Maintenance of the network, source control measures and structures.

Any programme beyond three years will be indicative.

    l) A summary of changes in land use by type and area in the reporting period; and

    m) All ‘new sites’ developed within the reporting period.

26. Copies of the annual report shall be forwarded to Environment Canterbury Zone Committee and Te Rūnanga o Arowhenua prior to 15 September each year.

CONSENT REVIEW

27. The Canterbury Regional Council may, on any of the last five days of March or September each year, serve notice of its intention to review the conditions of this consent for the purposes of:

    a) Dealing with any adverse effect on the environment which may arise from the exercise of this consent and which it is appropriate to deal with at a later stage; or

    b) Achieving reasonable endeavours to make improvements to receiving environment surface water quality; or

    c) Complying with the requirements of a relevant rule in an operative regional plan; or

    d) Achieving consistency with the Orari-Opihi-Pareora sub-regional section of the Land and Water Regional Plan and the Opihi River Regional Plan.

Advice Note: *It is the intention that these reviews would mainly occur where the SWMP is unable to or not achieving the objectives and targets specified in the SWMP this consent, and/or is not being updated adequately to take into account changes to Resource Management Act 1991 related documents.*