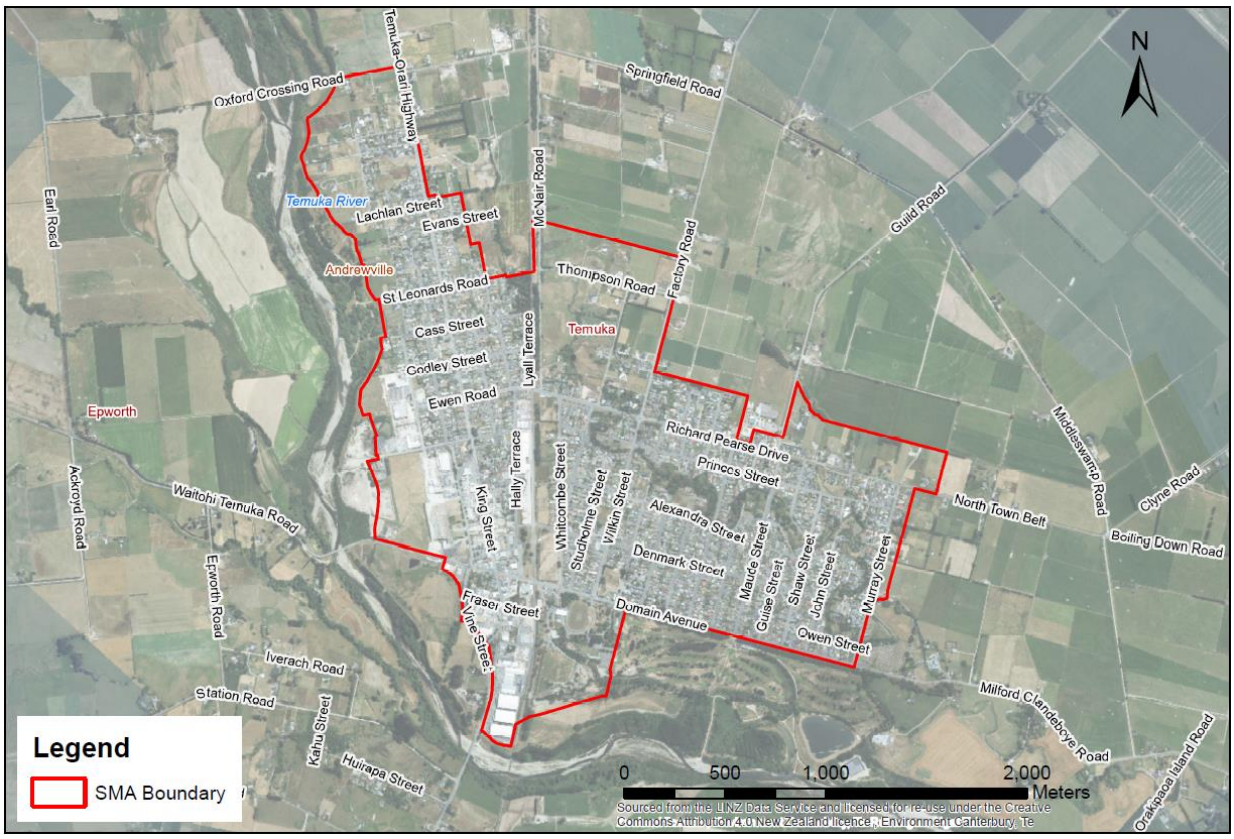
Timaru District Council – Contract 2442

Project Number: 6-TTDA7.00

Temuka - Stormwater Management Area

30 June 2022

FOR LODGEMENT



Discharge Permit Application and Assessment of Effects on the Environment

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Document Details:

Date: 30 June 2022
Reference: 6-TTDA7.00 / 600
Status: Final - For lodgement
Revision: 2.0

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Document History and Status

Revision	Date	Author	Reviewed by	Approved by	Status
2.0	30 June 2022	Brent Hamilton	Kylie Galbraith	Fraser O'Malley	Final

Revision Details

Revision	Details
2.0	For lodgement

Disclaimers and Limitations

This report ('**Report**') has been prepared by WSP exclusively for the Timaru District Council ('**Client**') in relation to a resource consent application to Environment Canterbury Regional Council ('**Purpose**') and in accordance with the scope of services dated 17 December 2021 and the Form of Agreement for Engagement of Consultant 2021-22 made between TDC and WSP on 12 August 2021 (**Agreement**). WSP accepts no liability whatsoever for any reliance on or use of this Report, in whole or in part, for any use or purpose other than the Purpose or any use or reliance on the Report by any third party.

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APPLICATION FOR RESOURCE CONSENT

PRESCRIBED FORM 9 FOR SECTION 88 OF THE RESOURCE MANAGEMENT ACT 1991

To: Environment Canterbury Regional Council

PO Box 345
Christchurch 8140

From: Timaru District Council - Water and Drainage

2 King George Place
PO Box 522
Timaru 7940
(please note different address for service)

1. The Applicant applies for the following type(s) of resource consent:

   Discharge Permit – Duration 35 years

2. The activity to which the application relates (the proposed activity) is as follows:

   Discharge of stormwater and construction-phase stormwater to land and water from existing and future urban areas within the Stormwater Management Area of Temuka. Noting that there are some land uses and larger scale activities that are excluded from the application

   For further details refer to the Description of the Proposal Section 5 of the Assessment of Effects on the Environment (AEE) Report.

3. The area at which the proposed activity is to occur is as follows:

   Temuka, Timaru District.

   The site is within the Stormwater Management Area as shown in Figure 1-1 of the AEE Report.

4. The Applicant is the owner of the reticulated stormwater system and parts of the site including but not limited to the road reserves. There are various landowners and occupiers (other than the Applicant) within the Stormwater Management Area that utilise the reticulated network or have private stormwater systems to which the application relates.

5. No additional resource consents are needed for the proposal to which this application relates.

6. Attached is an assessment of the proposed activity's effect on the environment that—

   a. Includes the information required by clause 6 of Schedule 4 of the Resource Management Act 1991; and

   b. Addresses the matters specified in clause 7 of Schedule 4 of the Resource Management Act 1991; and

c. Includes such detail as corresponds with the scale and significance of the effects that the activity may have on the environment.

Refer Section 6, 7, 8 of the AEE Report.

7. Attached is an assessment of the proposed activity against the matters set out in Part 2 of the Resource Management Act 1991.

Refer Section 10.8 of the AEE Report.

8. Attached is an assessment of the proposed activity against any relevant provisions of a document referred to in section 104(1)(b) of the Resource Management Act 1991, including the information required by clause 2(2) of Schedule 4 of that Act.

Refer Section 10 of the AEE Report.

Applicant/person authorised to sign on behalf of applicant

Dated: 30 June 2022

Grant Hall | Drainage & Water Manager
Timaru District Council
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ASSESSMENT OF EFFECTS ON THE ENVIRONMENT

List of AEE Appendices

List of AEE Figures

List of AEE Tables

1 Introduction

1.1 Overview

The Timaru District Council (TDC) provides urban stormwater collection and disposal for Temuka, and is responsible for ensuring the urban stormwater system provides an adequate level of service for this community.

The TDC has prepared a Stormwater Management Plan (SMP) for these existing urban area and a future urban growth scenario which is primarily based on the current and draft District Plan urban zoning (the Stormwater Management Area). The SMP provides for Temuka an integrated and adaptive management approach for the management of stormwater discharges from a urban catchment perspective. The TDC SMP is attached as Appendix 1.

In association with the SMP, the TDC is applying for a discharge permit (or resource consent) for the stormwater discharges from their managed stormwater network for the urban area, and other existing and future individual residential and commercial properties discharges (not via the network), subject to risk and design criteria.

This resource consent application is pursuant to the section 15 restriction of the Resource Management Act 1991 (RMA) and is classified following bundling under the national regulations and regional plan rules as a non-complying activity. The duration sought is a period of 35 years.

1.2 Purpose of this Document

This report provides an Assessment of Effects on the Environment (AEE) in accordance with Section 88 and Schedule 4 of the Resource Management Act 1991 (RMA) to accompany the application for a discharge permit.

This report describes the proposal and provides an assessment of the requirements under the RMA, and the relevant statutory documents, including the Opihi River Regional Plan (ORRP) and Canterbury Land and Water Regional Plan (LWRP). It also provides information on the nature of the existing environment and an assessment of actual or potential effects that could occur because of the proposed activities.

1.3 Stormwater Management Area

The township of Temuka is approximately 15 km north of Timaru.

The Stormwater Management Area (SMA) covered by the resource consent application includes the existing and future urban catchments of Temuka as shown in Figure 1:1.

The area of the Temuka SMA is approximately 467 ha and consists a mixture of residential, reserve, industrial, and commercial land uses with some lifestyle blocks and pasture to the north. The Main South Railway Line and SH1 run through the centre of the town from north to south.

Stormwater in Temuka discharges to three waterways, as well as to land as the stormwater system of Temuka includes soak pits at various locations. The three waterways are the Te Uma kaha (Temuka River), the Taumatakahu Stream and it's tributary North Taumatakahu Stream or 'its tributary' for the purposes of this report.

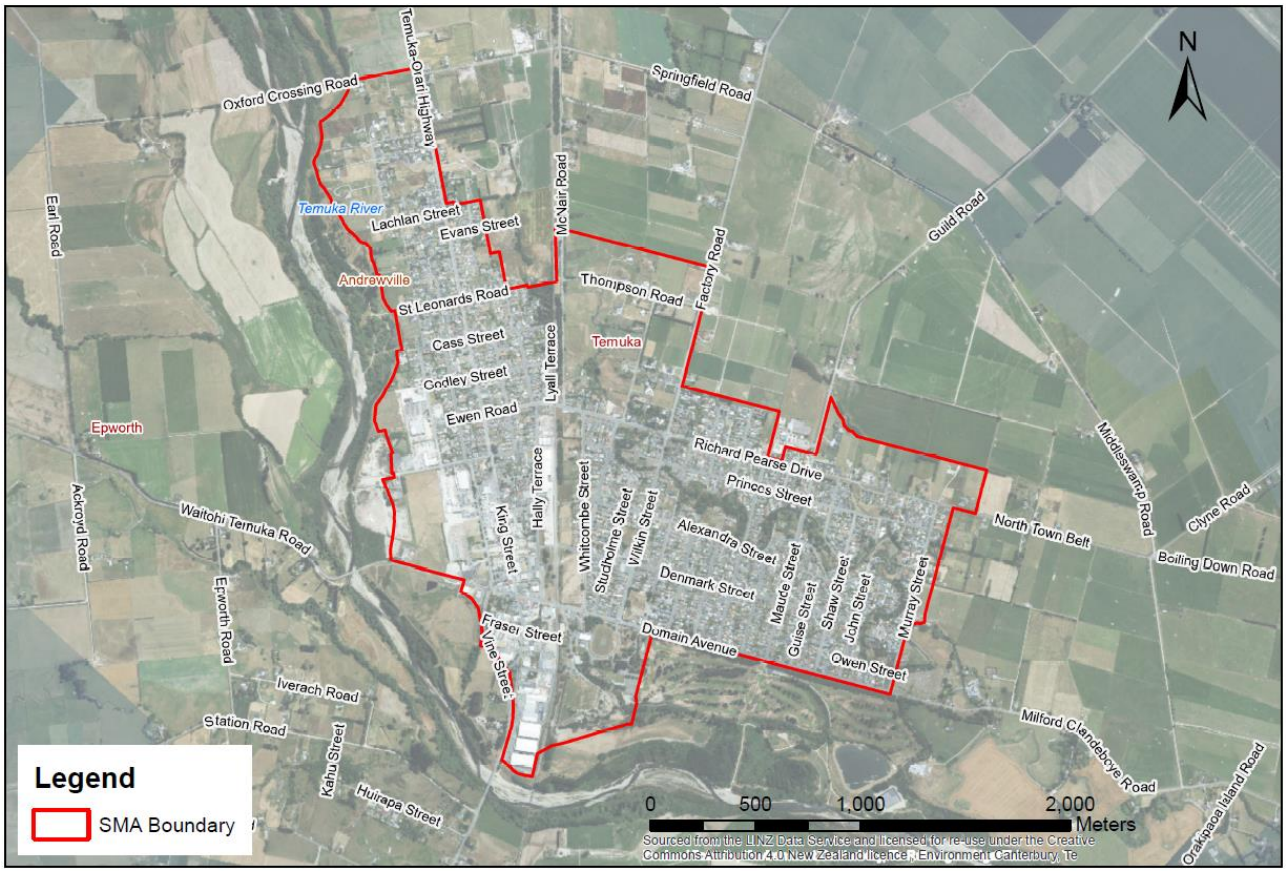

Figure 1:1 – Temuka SMA

2 Background

2.1 Reasons for Application

The majority of the existing stormwater network and minor discharges sought (otherwise not permitted or separately consented) were previously lawfully established (permitted) under the Transitional Regional Plan (TRP) and the Natural Resources Regional Plan (NRRP) for Canterbury that predated the LWRP.

With the LWRP becoming operative in 2015, under the regional rules all reticulated stormwater network discharges were required to be authorised by a resource consent (discharge permit) as there was no associated permitted activity rule. At a minimum the reticulated network discharges can be classified as a restricted discretionary activity.

Under the LWRP for a reticulated stormwater network discharge that existed at 11 August 2012, an application for a discharge permit is to be lodged prior to 30 June 2018, or at a later date as agreed between the reticulated stormwater system operator and Environment Canterbury (ECan). Agreement on an extension for Temuka has occurred and the application is now required to be lodged prior to 31 July 2022.

During development of the scope of the application it has been decided to also include discharges from residential (not rural residential) and commercial urban development within the SMA that is not connected to the TDC reticulated stormwater system. This is anticipated to provide benefits to ratepayers (who may have had to apply for a separate discharge permit) and no significant risk to TDC. Industrial sites not connected to the network are to be excluded. Refer to Section 5.1 for the detailed description of the activities sought.

2.2 Existing Stormwater Consents in the Temuka SMA

Currently individual stormwater discharge permits are typically obtained by residential developers for new urban developments or for some major development areas TDC has sought the discharge permit. This is when the stormwater discharge activities do not comply with the relevant regional permitted activity rules. Following the developments completion and infrastructure being vested with TDC the associated stormwater discharge permits are transferred to the TDC, providing a set defects period is completed and full resource consent compliance is achieved.

However, generally there has not been any significant scale greenfield development in Temuka over the last 30 years, or when smaller development has occurred the associated discharges (from <28 lots) were permitted activities under the TRP.

An analysis of data obtained on the 18 May 2022 from Environment Canterbury's (ECan) Canterbury Maps open data service was undertaken to determine the number of active stormwater discharge permits in the Temuka SMA.

At the time of obtaining the data on 'active resource consents', there were:

- 4 privately held consents to discharge stormwater from residential roofs and hardstand areas to land within their allotments at Factory Road (CRC103871, CRC131098 CRC131634, CRC176444).
- 1 privately held consent CRC136500 to discharge residential roof and hardstand areas to land within their allotment at Grant Street.
- 2 consents to discharge stormwater from industrial sites:
    - CRC063704 Timaru District Council (Solid Waste Unit) for the Temuka Refuse Transfer Station at Wilmhurst Street. The discharge is to land. This expires on the 11 December 2041.
    - CRC133242 KiwiRail's Temuka Railyard site located on Pt Railway Reserve, main South Railway, Hally Terrace. The discharge to land up to a 10%AEP with overflows to the TDC Reticulated stormwater network.

Potentially the above private held residential consents could be surrendered by the consent holders. However it is also worth noting that the discharges may actually be permitted activities under the current LWRP regional rules.

As the Temuka Refuse Station stormwater system is owned by TDC this consent could be surrendered as it is within the scope of the Temuka SMA consent, however it has been decided that this site would be best to be a standalone consent.

The KiwiRail railway yards site's private industrial discharge to land is not within the proposed scope of the TDC's Temuka SMA application.

3 Description of the Existing Stormwater System

3.1 The Assets Overview

Stormwater within the Temuka SMA relies heavily on the kerb and channel flow to convey stormwater to a piped network, which discharges to the ground via soakpits or to one of the surface waterbodies within or adjacent to the SMA. Moderate to well-drained soils and flat topography are the key drivers for this network layout, as these conditions when groundwater levels allow, are well-suited for discharges to ground and overland flow. There is limited information on the physical condition of the pipe network. However, the network is believed to be aged.

3.2 Infrastructure Summary

There is a total of 15.6 km of pipeline with their sizing detailed in Table 3:1.

There are 37 TDC-owned soak pits within the Temuka SMA, as well as numerous private soak pits for discharging roof runoff to the ground.

In addition to the soak pits, there are a total of 32 (including private) stormwater outfalls within the SMA, including 7 outfalls into the Te Uma kaha (Temuka River) and 25 outfalls into the Taumatakahu Stream and its northern tributary. The TDC pipelines, soakpits and outfalls are shown in Figure 3:1.

There is no existing proprietary treatment systems in the reticulated network. There are several grassed conveyance channels that are referred to as 'swales' in the existing urban area these will provide varying degrees of stormwater treatment. Also there are two stormwater treatment basins (treatment is mainly via attenuation) located at Fraser Street (corner King street) and Domain Avenue (corner Whitcombe St).

Table 3:1 – TDC Stormwater Infrastructure Summary

Stormwater Infrastructure	Quantity
Stormwater pipe size	15,676 m total
<300 mm diameter	5,425 m
300 – 500 mm diameter	9,052 m
500 – 1,000 mm diameter	1,101 m
>1,000 mm diameter	98 m
Stormwater soakpits	37
Stormwater Basins	2
Stormwater outfalls total	32 (including private)

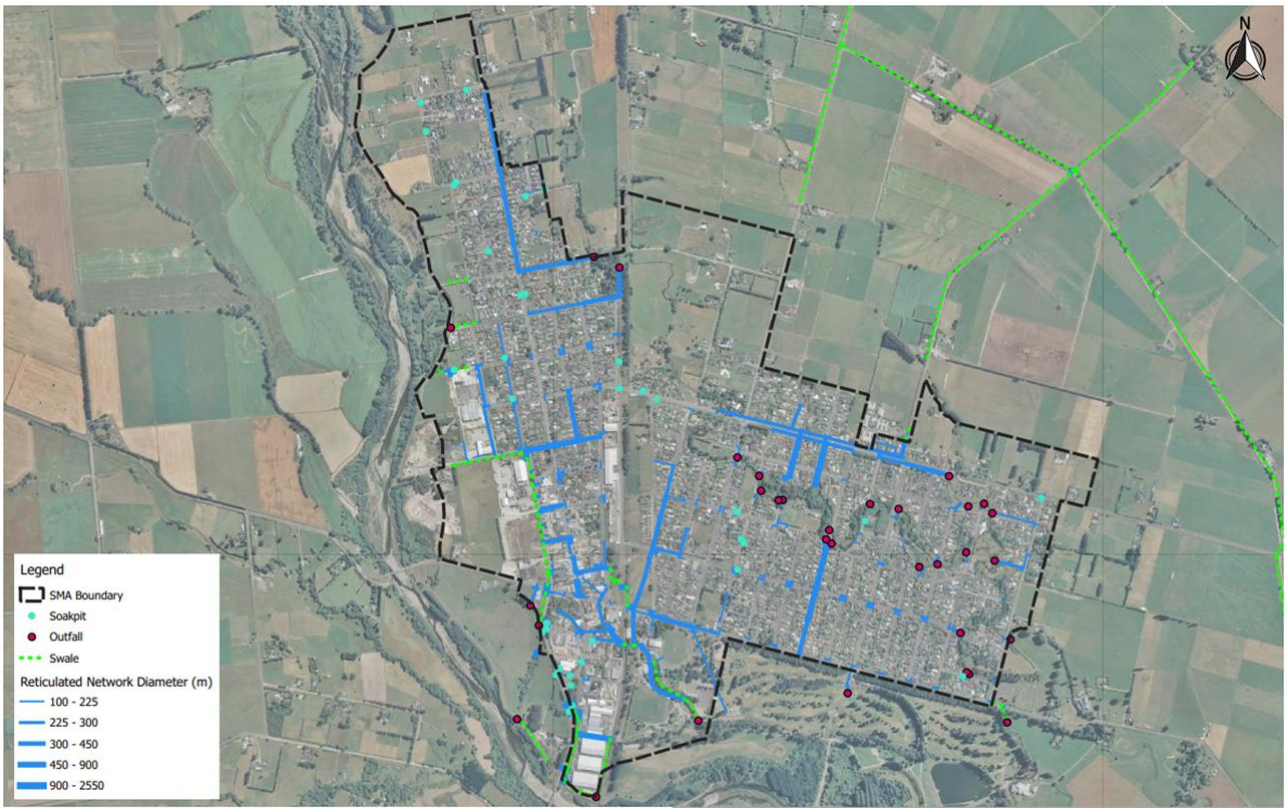

Figure 3:1 – Temuka Stormwater Infrastructure

3.3 Network Capacity

The level of service currently adopted by TDC is that water will not inundate habitable floor spaces in the:

- 5-year Average Recurrence Interval (ARI) (or 20% Annual Exceedance Probability (AEP)) for urban residential areas
- 10-year ARI (or 10%AEP) for industrial and commercial areas

This means that ponding can be expected to occur in parks, roads, and private properties during the above rainfall events.

An assessment of the capacity of the piped stormwater network has been completed by WSP (2021) and is attached as Appendix 2. The assessment results are summarised in Table 3:2. The assessment did not report the associated land use for the pipes so a direct comparison of land use Level of Service (LoS) is not able to be undertaken.

The capacity assessment found that 35% of the pipe network is unable to convey 2-year ARI (50% AEP) peak flows. 53% of the network is able to convey up to 5-year ARI (20%AEP) peak flows and 50% can convey 10-year ARI (10%AEP) peak flows. However, where pipe capacity is exceeded, this is does not immediately result in habitable floors being inundated. This assessment highlights the need for increased capacity in the Temuka stormwater network to reduce the frequency of predominantly nuisance flooding in parks, roads, and private properties. However, any network capacity improvements would need to be considered alongside the potential impact on stream flows.

Table 3:2 – Level of service results by pipe length and percentage for Temuka (WSP 2021 existing modelling assessment and GIS assessment combined).

Pipe length unable to convey 50% AEP peak flows (m)	Pipe Length able to convey 50% AEP peak flows (m)	Pipe Length able to convey 20% peak flows (m)	Pipe Length able to convey 10% AEP peak flows (m)	Total length of pipes assessed (m)
3,230 (35%)	6,081 (65%)	4,927 (53%)	4,620 (50%)	**9,319**

3.4 Flood Hazards

WSP also undertook a flood mapping assessment (refer Appendix 2). This found that the generally flat topography of Temuka combined with the undersized pipe network results in extensive nuisance flooding across the SMA in the level of service rainfall events. However, even in extreme rainfall events such as the 200-year ARI, the modelled flooding is generally shallow other than within or adjacent to stream channels or in historic overland flow paths and depressions in the topography. The modelling indicates that extensive shallow sheet flooding can be expected in the rural land north of Richard Pearse Drive.

Temuka is also protected by stopbanks on the adjoining Waihi, Temuka and Opihi rivers to the township. These assets are operated and maintained by Environment Canterbury Regional River Engineers (refer Section 4.11.1).

3.5 Summary of Key Issues and Observations

The following are the key known issues with Temuka's stormwater management and the wider environment as identified to date. These issues are elaborated in more detail in other sections of this AEE and the attached Appendices containing the technical supporting documents.

In summary , the key known issues with stormwater management, include:

- A portion of the Temuka Township stormwater is untreated and discharges to the spring-fed Taumatakahu Stream (and its northern tributary);
- Metals and metalloids commonly found in stormwater have been observed to accumulate in sediments in the lower Taumatakahu Stream and mid-reach of the Te Umu Kaha / Temuka River. These metals and metalloids lead to the poor condition of mahinga kai in these waterways;
- In the upper stretch of the Taumatakahu Stream hydrocarbons have been observed in the stream sediments;
- Use of some existing soak pits and possible future discharge to land in the vicinity of the Taumatakahu Stream could lead to some indirect discharges of dissolved stormwater contaminants into the stream;
- Lack of biodiversity, riparian habitat, and cultural materials;
- Taumatakahu Stream is impacted by sedimentation. Attributed to a combination of bank instability, sediment in stormwater and/or agricultural runoff. This can impact the condition of mahinga kai and the appearance of the waterway;
- There are currently 37 soak pits for stormwater management that service the SMA, and may affect existing active drinking supply wells within the SMA and a conservative 500 m buffer downgradient of the SMA;
- Stormwater inflows (in addition to groundwater infiltration) into the Temuka wastewater system have contributed to increased wastewater flows and have led to wastewater overflows. Recent wastewater pipelines and pump station upgrades should have addressed this issue;

- Loss of the extent and condition of wetlands and springs;
- The ability to provide an efficient and sustainable stormwater drainage system is challenging due to the characteristically flat terrain of the town together with a typically high groundwater table;
- Limited and undersized pipe networks and road drains (or swales) result in high-frequency nuisance flooding across the urban catchment as well as some areas subject to high hazard flooding that may be a risk to public safety;
- Absence of any interpretation or recognition of cultural significant sites; and
- Agricultural and grazing practise in the upper catchments present a risk to the water quality in the Taumatakahu Stream.

4 Description of the Environment

4.1 Temuka

Temuka is a town on the Canterbury Plains, 15 kilometres north of Timaru and 142 km south of Christchurch. It is located at the centre of a rich sheep and dairy farming region, for which it is a service town. Temuka has a population of around 4,500.

Temuka is believed to have come into existence because of its proximity to convenient fords on the Temuka and Opihi Rivers, crossing places on the main north-south route in early times. The site of the township is identical with the original Māori settlement called Arowhenua. Other villages, now deserted by Arowhenua, were located between this place and the mouth of the Opihi River. At Orakipaoa (4 km south-east) evidence of former occupation is still to be seen in the vestiges of an old Māori fortification (AECL 2020).

The current developed urban area of Temuka within the SMA boundary, is approximately 325 ha.

4.2 Cultural Landscape Summary

Cultural landscapes represent the "*combined works of nature and man*" and the term embraces a diversity of manifestations of the interaction between humankind and the natural environment. Cultural landscapes often reflect specific techniques of sustainable land-use, considering the characteristics and limits of the natural environment they are established in, and a specific spiritual relation to nature.[1]

A Mana Whenua Impact Assessment (MWIA) was undertaken by Aoraki Environmental Consultancy Limited (AECL) for Temuka stormwater management in November 2020, early on in the SMP project. This is attached as Appendix 3.

Subsequent to the MWIA, an "*Assessment of effects on Te Rūnanga o Arowhenua values and interests by TDC Stormwater Management*" February 2022 was undertaken by Kitson Consulting Ltd (herein referred to as Cultural Values AEE) and this is attached as Appendix 4.

A full description of the cultural landscape for Temuka and the connected environment can be found in these Appendices prepared for on behalf of Arowheuna. This cultural landscape summary subsection uses content from these two reports.

The MWIA and Cultural AEE illustrates a rich cultural landscape that includes mahinga kai/taonga species, culturally significant waterways, settlements (kāinga, pā, nohoanga), Arowhenua marae (Te Hapa o Niu Tireni), wāhi tapu, wāhi taonga, Ōpihi Mātaitai Reserve, Māori Land, and traditional trails. Figure 4:1 gives an example of how extensive occupation was in the lower Ōpihi catchment.

[1] World Heritage Centre. 2013. Operational Guidelines for the Implementation of the World Heritage Convention

Of particular significance in the Arowhenua Rūnanga rohe are the Mātaitai reserves for the Ōpihi and the Coast. Customary fisheries are a central element to Ngai Tahu identity and well-being. Arowhenua has been a stronghold for customary harvesting of tuna/eels, kanakana, whitebait, patiki and other species.

A mātaitai identifies an area that is a place of importance for customary food gathering and allows for the area to be managed by tāngata tiaki/kaitiaki nominated by the tangata whenua. These are areas that Mana whenua have spent considerable effort to have recognised through Fisheries (South Island Customary Fishing) Regulations 1999.

Established in 2016 the Ōpihi Mātaitai Reserve extends from the Ōpihi Lagoon up the Ōpihi River to a point to the south of Pearse Road, and includes the adjoining creeks, streams, and tributaries of the Ōpihi River. The Opihi Mātaitai extent and recent extension to the reserve is shown in a map in Figure 4:1.

Pleasant Point is also another township in the Timaru district that has discharges of stormwater that eventually flow to the Opihi River / Mātaitai. Pleasant Point township is subject to a separate SMA application, that is expected to be lodged later this year.

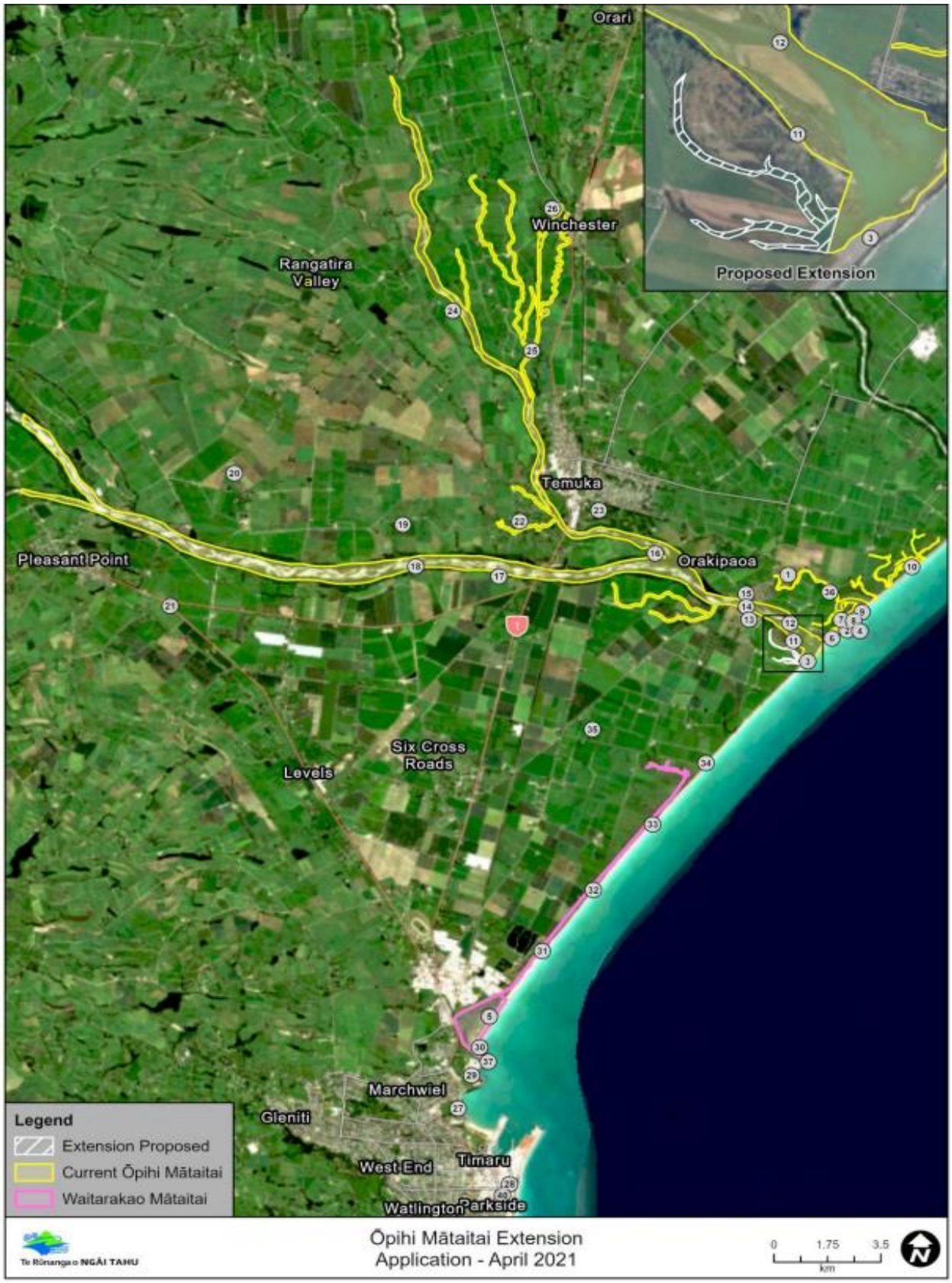

Figure 4:1 – Opihi Mātaitai and recent extension area. Also illustrated are sites of settlement, pā, kāinga, nohoanga and Māori reserves, near the Ōpihi and Waitarakao Mātaitai Reserves. Reproduced by Kitson Consulting Ltd from the Ōpihi Mātaitai Extension Application – April 2021

4.3 Land Use in the SMA

The land use zoning in the operative Timaru District Plan (TDP) includes Rural, Recreational, Residential, Commercial, and Industrial Light and Industrial Heavy zone types. The land use zones from the District Plan do not separate roads from land.

The draft District Plan Review (DPR) has introduced new zones 'Neighbourhood Centre' and 'Retail Zone' which for the purposes of the AEE and assessments on land use changes in the SMA have been described and modelled as commercial.

Roads are typically classified based on their Annual Average Daily Traffic (AADT) this can also be used to assess their contaminant generation potential.

Figure 4:2 provides a map of the current zoning within the SMA based on the TDP. Pasture areas will be zoned rural. Table 4:1 provides a summary of the areas of current and possible future zoning within the SMA of approximately 467 ha.

A full assessment of the assumptions and breakdown of the existing and future zoning areas can be found in The PDP Contaminant Load Model Report Appendix 5 as well as a map of the proposed zoning (refer Figure 12 of Appendix 5). Note the future land use zones may be subject to change prior to the notification of the DPR and the hearing on submissions process.

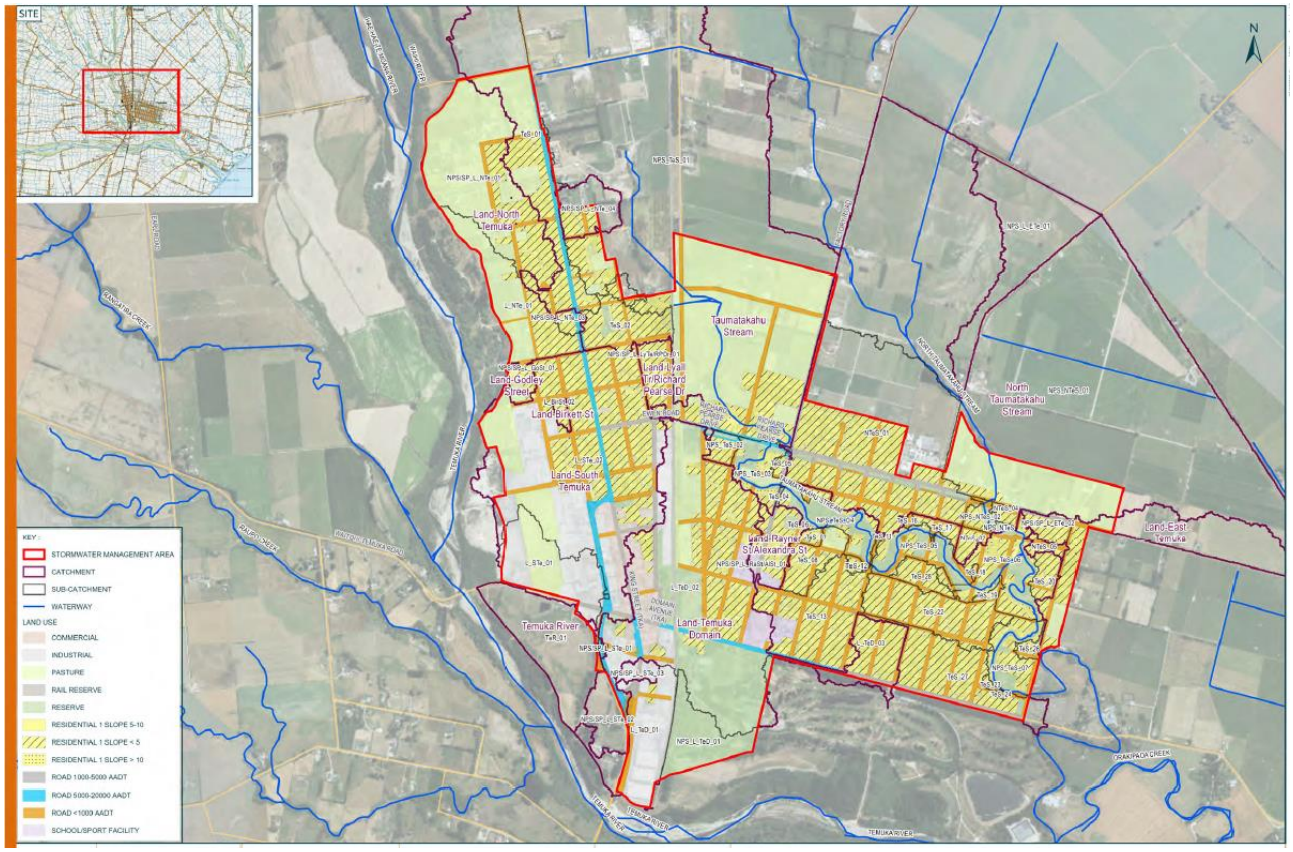

Figure 4:2 – Temuka current land use based on TDP (source PDP CLM)

Table 4:1 – Comparison of land use zoned in Temuka SMA currently and proposed under the DPR (Source Appendix 5)

Land-Use Zone	Current Area (ha)	Future Area (ha)	Δ (ha)
Commercial	**7.9**	**9.7**	**1.8**
Industrial	**38.0**	**51.2**	**13.2**
Pasture	**109.3**	**59.1**	**-50.2**
Reserve	**46.0**	**38.2**	**-7.8**
School	**5.0**	**5.5**	**0.0**
Residential Total	**179.9**	**223**	**43.1**
Slope < 5	166.5	202.9	36.4
Slope 5-10	11.7	16.6	4.9
Slope > 10	1.7	3.5	1.8
Roads Total	**78.4**	**78.4**	**0.0**
<1000 AADT	55.7	55.7	0.0
1000-5000 AADT	12.6	12.6	0.0
5000-20000 AADT	10.1	10.1	0.0
Rail Reserve	**3.0**	**3.0**	**0.0**

4.4 Climate

In general, Temuka has a dry moderate climate. As it lies approximately 8 km inland from the coast, and the township is on average 20 m above sea level.

Table 4:2 provides monthly statistical climate data for the last 20 years for Temuka based on the Timaru Airport weather station (NIWA Network# H414325). This station is located only 7.5 km from Temuka. This weather station is located at a similar distance inland from the coast and elevation to Temuka. Temuka experiences a moderate range of mean monthly temperatures and a lesser range or mean monthly precipitation depth.

Table 4:2 – Mean Climate data for Timaru Airport 2000 to 2021

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average ˚C	15.9	15.6	14.1	11.1	8.3	5.8	5.2	6.6	8.8	10.4	12.4	14.7	**10.7**
Rainfall mm	52	47	36	53	44	31	35	51	31	46	50	51	**548**
Wet Days *	7.6	5.9	5.9	6.2	5.5	5.0	4.5	5.9	5.5	7.4	7.1	7.7	**75.1**
* number of days with 1 mm or more of rain													

MfE (2018) climate change projections for Canterbury forecast an increase in temperature, an increase in the number of hot days, a decrease in the number of frost days and snow days and an increase in annual rainfall. Specifically, MfE (2018) predicted temperatures will likely be 0.7°C to 1.0°C warmer by 2040 and 0.7°C to 3.0°C warmer by 2090.

A recent update of climate change predictions by NIWA (2020) is forecasting rainfall to change by between +/-5 percent for most of the Canterbury region by 2040 and 2090. Winter rainfall is

projected to increase considerably by 2090 in many eastern, western and southern parts of Canterbury, a 15 to 40 percent more rainfall is projected. Of most relevance, it is predicted that annual rainfall is projected to increase by 20 to 25 percent in eastern parts of South Canterbury near Timaru by 2090. [2]

As climate change predictions will increase the incidence and intensity of extreme and very extreme rainfall events, particularly for shorter duration events with associated larger floods.

4.5 Topography

Temuka is situated on the southern part of the Canterbury Plain near the junction of the Temuka and Opihi Rivers. The surrounding country consists of a flat alluvial plain, except in the northwest, where rolling to hilly land rises gradually to the Four Peaks Range.

Elevations of the plains range from 500 metres above mean sea level (m amsl) at the base of the foothills to sea level at the coast. The Temuka SMA is at an elevation of approximately 26 m amsl at the north west corner (at Oxford Crossin Road falling to 13.5 m at the south east corner (at Milford Clandeyboy Road).

The Temuka SMA is generally described as very flat with a slope gradient ratio (V:H) of 1:320 from west to east.

4.6 Geology and Soils Drainage

The 1:250,000 scale geological map of the area presented in indicates that the surficial geology consists mostly of Late Pleistocene river deposits, including mixtures of gravel, sand, silt and clay. Holocene river deposits (unweathered loose gravel, sand and silt) also occur towards the boundaries of the western and southern catchment and are primarily associated with the recently active Te Uma kaha (Temuka River) flood plain.

Holocene deposits are also associated with Taumatakahu Stream in the southeast of the SMA area.

Based on S-Map Online with the soil drainage capacities mapped in Figure 4:4, the permeability of the soils in the Temuka SMA is variable. Most of the soils in the west and south-west are well-draining with moderate permeability, typically with a clay content ranging from 8-18%.

In the east, the soils are moderately well-drained, whereas small areas in the north-east are quite variable ranging from well-drained to poorly drained.

[2] NIWA. 2020. Climate Change predictions for the Canterbury Region. Prepared for Environment Canterbury

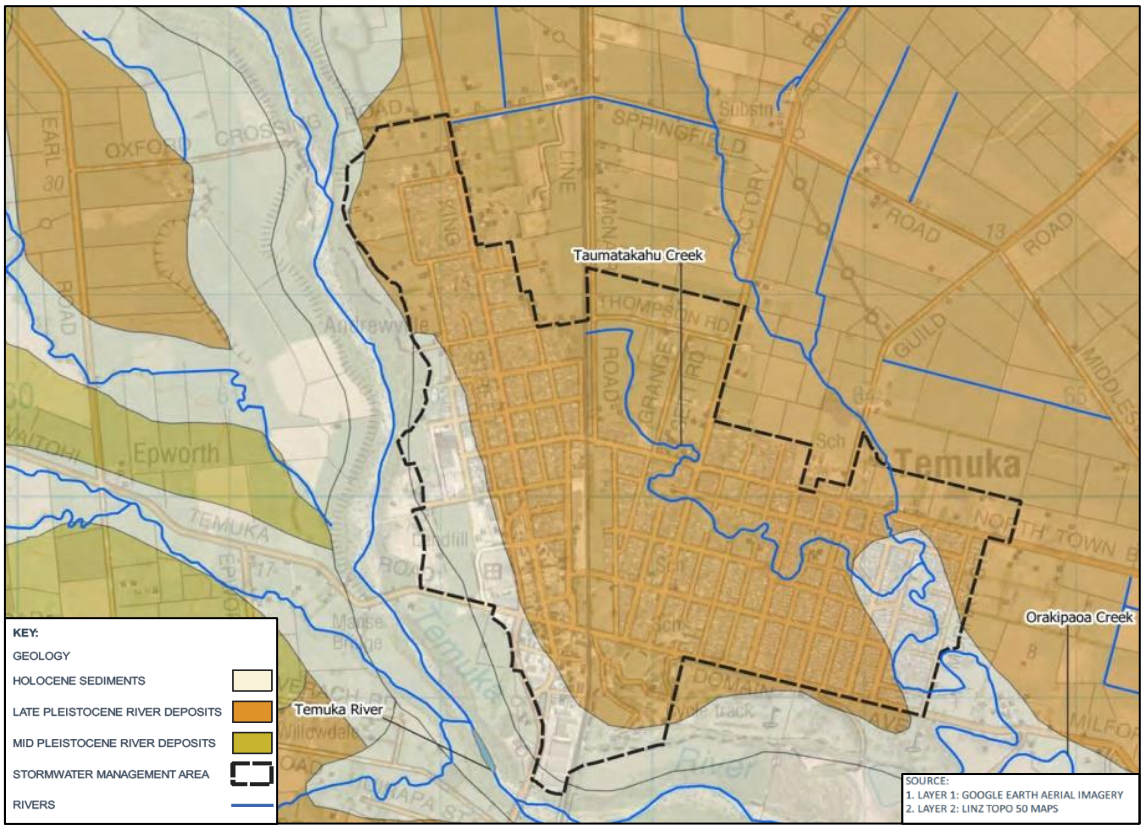

Figure 4:3 – Geology of Temuka (source GNS Geology[3])

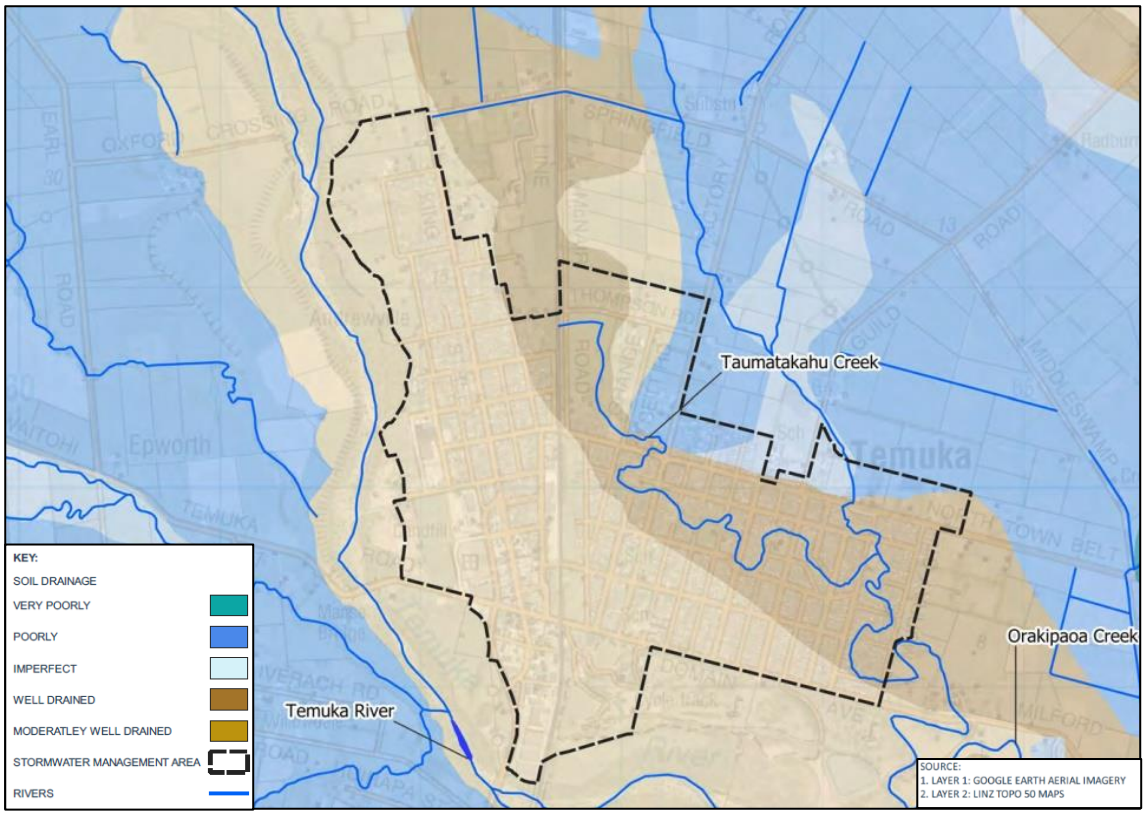

Figure 4:4 – Soil of Temuka (source S-Maps[4])

[3] Cox, S. , & Barrell, D. (2007). *Geology of the Aaroki area*. Institute of Geological Nuclear Sciences 1:250 000 geological map 15. 1 Sheet + 71p. Lower Hutt New Zealand: GNS Science

[4] S-maps Online https://smap.landcareresearch.co.nz/

4.7 Groundwater

4.7.1 Hydrogeology

Borelogs listed on the ECan database[5] within and around the management area are consistent with the geological map, indicating a shallow gravel aquifer beneath the stormwater management area. The borelogs also indicate that there is some stratification within the gravels, with some layers described as claybound gravels and others as gravels and/or loose gravels. The thickness of these layers varies and it is difficult to correlate these layers between boreholes, which implies that the variations may represent more permeable gravelly lenses within the overall sequence of claybound or less permeable gravelly strata.

Piezometric contours provided on the ECan Canterbury Maps GIS database for several surveys indicate that the overall groundwater flow direction is southeast, although minor, local scale variations are likely. The Orari-Waitaki water table August 2013 survey suggests that, within the downgradient area of the SMA, the lateral hydraulic gradient is about 0.003.

Depth to groundwater below the ground surface is provided by the ECan Canterbury Maps GIS database, which indicates that groundwater depth varies from approximately 1 to 2.4 m below ground level (bgl).

There are several bores available with hydraulic properties for the shallow aquifer in the wider area, from which to calculate groundwater flow velocities. There are several shallow bores with aquifer pumping test results outside of the SMA but in surrounding areas around Temuka. These bores range in transmissivity values. The lowest value is for bore K38/2337 (10 m deep about 1700 m east of the SMA) within an area of Late Pleistocene river deposits, which has an estimated aquifer transmissivity of 135 m^2/d. The highest value is for bore K38/2424 (6 m deep about 300 m north of SMA) within Holocene river deposits, which has an estimated aquifer transmissivity of 10,000m^2/d, an initial water level of 1.77 m bgl, and a geological log showing loose gravels and loose claybound gravels followed by claybound gravels.

Groundwater levels are anticipated to be well connected hydraulically to the adjacent surface water bodies.

NIWA (2020)[6] predictions formed the basis of a PDP (2021)[7] assessment that a future increase in groundwater levels underlying Temuka is anticipated, although this could also lead to an increase in groundwater losses to streams which may provide a buffering effect.

4.7.2 Groundwater Quality

Very limited groundwater quality is available for the Temuka SMA area in terms of parameters monitored, frequency and of a current nature. No ECan monitoring has occurred in the area since 1999. Last results indicated that between 1991 and 1999 nitrate nitrogen at well K38/0298 had a median of 2.1 mg/L and a maximum of 4.6 mg/L. No metals analysis has been undertaken by ECan.

ECan 2020[8] reports that the risk of nitrates in shallow groundwater in the Temuka SMA area "*may be above or below*" the Maximum Acceptable Value (MAV) 11.3 mg/L[9] so this is referred to as a 'moderate risk' area in the report. This lack of definitive assessment reflects the lack of information available.

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[5] https://www.ecan.govt.nz/data/well-search/ or https://mapviewer.canterburymaps.govt.nz/

[6] NIWA. 2020. *Climate Change predictions for the Canterbury Region*. Prepared for Environment Canterbury

[7] PDP 2021 *Groundwater assessment to support stormwater management plans – effects of climate change*. Letter August 2021

[8] ECan 2020 *Risk maps of nitrate in Canterbury groundwater*, R20/18

[9] is the highest concentration of a parameter in water that, based on present knowledge, is considered not to cause a significant risk to human health. Ministry of Health has set a short-term exposure MAV for nitrate to protect against methaemoglobinaemia in bottle-fed infants (MoH, 2018 -NZDWS).

It is assumed that with a general increasing trends in nitrate nitrogen concentrations in Canterbury Plains that nitrate-nitrogen concentrations in groundwater within the SMA away from the influence of the rivers and streams would likely be above ½ the MAV.

On-site wastewater discharges and agricultural land use typically have higher source *E. coli* concentrations and, depending on their number within the SMA and level of leaching, would also be expected to present a principal contaminant source of nutrients and pathogens and micro-organisms (e.g. *E.coli*).

Owing to the volume of water potentially lost from rivers to groundwater in the area, the Te Uma kaha (Temuka River) is considered a significant source of *E. coli* to groundwater in the Temuka SMA and is considered to present a similar or greater risk as potentially from stormwater, although it is acknowledged that parts of the SMA located further from the river is less likely to be impacted. The LAWA water quality data base[10] records maximum *E. coli* levels of > 2,420 cfu/100 mL (above detection limit) at the Te Uma kaha (Temuka River) at SH1.

Flow losses from Taumatakahu Stream may also impact groundwater quality, particularly flood flows.

4.7.3 Groundwater Users

A review of the ECan well database, and consideration of those wells on properties also having a rated reticulated water supply, and those properties without registered wells but also not having access to a reticulated water supply was undertaken by PDP in March 2022 as part of a contaminant transport assessment for Temuka (and Pleasant Point). This PDP Letter Report is attached as Appendix 6.

There is one community supply bore within the SMA, K38/0445 (5 m deep), which is owned by TDC and appears to be the Temuka Domain supply. There is a comment on ECan's bore database that it is probably not used now, even though its status is active.

TDC have confirmed that the domain well is not used as a community drinking water supply bore.

There is also a very small section of community drinking water protection zones for bores BZ19/0172, BZ19/0181 and BZ19/0171 that overlaps with the 500 m buffer south of the SMA (Figure 2A in Appendix 6). The bores however are across the Te Uma kaha (Temuka River), cross-gradient in terms of the groundwater flow direction, and not within the 500 m buffer, therefore not considered to be at risk of contamination from the TDC stormwater discharges.

The other uses of groundwater for domestic supply, commercial and industrial and irrigation and stock water supply within the SMA and within a 500 m buffer of the SMA were assessed by PDP in March 2022.

Table 2 and Table 4 within Appendix 6 identifies 13 registered wells within or downgradient of the SMA and 13 properties within the SMA that may have wells used for drinking water supply but are not registered on the ECan wells database. Subsequently TDC has identified 3 other properties that may have non-registered bores within or downgradient of the SMA. The full list of the wells used for drinking water supply following TDCs further investigations and contact with property owners is discussed in Section 7.5.

[10] https://www.lawa.org.nz/explore-data/canterburyregion/swimming/temuka-river-at-sh1-bridge/swimsite).

4.8 Surface Water

4.8.1 Overview

Temuka is part of the wider Ōpihi River catchment which has a size of approximately 245,000 ha.

The entire catchment of the Ōpihi River is made of three additional rivers or tributaries. These main addition rivers are the:

- Te Ana-a-Wai River
- Ōpuaha (Ōpuha River)
- Te Umu Kaha (Temuka River)

The Te Uma kaha (Temuka River) catchment measures around 61,101 ha (approx. 25% of the Opihi Catchment). The dominant land cover in the Te Uma kaha (Temuka River) catchment is high production exotic grassland, owing to widespread pastoral agricultural land use.

Historically, wetlands and swampland were far more prevalent in the Ōpihi River catchment (Scarf, 1984) but have been significantly reduced through drainage and the ongoing pressure for such land to be made agriculturally productive. These wetlands and swampland once provided a natural storage of water to the catchment and represented a significant mahinga kai resources for Ngāi Tahu.

The Opihi riverbed (downstream of Temuka) is characterised as a Land of National Significance and a Site of Special Wildlife Significance by the Department of Conservation (DoC). Approximately 3 km downstream of the confluence with the Te Uma kaha (Temuka River), the Opihi River forms the Opihi River Mouth Lagoon. This lagoon has been characterised as a highly significant and moderately threatened wetland, land of national significance (DoC), a site of special wildlife significance (DoC), and contains significant habitat for inanga spawning.

The Opihi River catchment (particularly at the coast) is also of very high value to Arowhenua, being the locale of several historic settlements. As such, this area was gazetted a Mātaitai reserve in 2014.

4.8.2 Te Umu Kaha (Temuka) River

Overview

The Te Uma kaha (Temuka River) catchment includes the town of Temuka (and the Taumatakahu and its tributary). The catchment includes residential, recreational, and rural land use classes, with the dominant land cover being high production exotic grassland. The primary source of urban runoff within this catchment is the Temuka township.

The Te Uma kaha (Temuka River) borders the town of Temuka to the south and west and receives stormwater via indirect discharge from outfalls as well as from its tributaries such as the Taumatakahu Stream. Before its confluence with the Opihi River downstream of Temuka township, the Te Uma kaha (Temuka River) is a sixth-order braided watercourse with an estimated mean annual flow rate of 6.28 m^3/s.

The Te Uma kaha (Temuka River) LWRP Water Quality Management Unit Class is: Hill-fed Lower.

A baseline assessment was undertaken by PDP 2021 (herein referred to as PDP Baseline EA) which included sampling and reporting on surface water quality, sediment quality and invertebrates for the Temuka SMA waterways. Other sources of information were also reviewed. This report is attached as Appendix 7 and conclusions are summarised below. Sampling locations are shown in Figure 4:5.

Water Quality

In general, dry weather water quality in the Te Uma kaha (Temuka River) was found to be good, with all metals, metalloids, and total petroleum hydrocarbons (TPH) being below the guideline

values. Nutrient concentrations in water were found to be elevated, with little variation between sites. Total nitrogen and nitrate-nitrogen both exceeded the ANZG [11] trigger values at all three sites, whilst dissolved reactive phosphorus exceeded the ANZG triggers at two sites and all three sites exceeded the Opihi Regional Plan water quality limits.

Sediment Quantity and Quality

Fine sediment cover was within the trigger value limits at all three sites. One site (TE_S2) had elevated levels of lead above the ANZG Default Guideline Value (DGV) (but not above the Guideline Value -High) in sediment in the dry weather monitoring; however, all other sites had concentrations of metals and metalloids in sediment that were below the ANZG DGV. Polycyclic aromatic hydrocarbon (PAH), TPH and nutrient concentrations were also found to be low in sediment samples from all three sites.

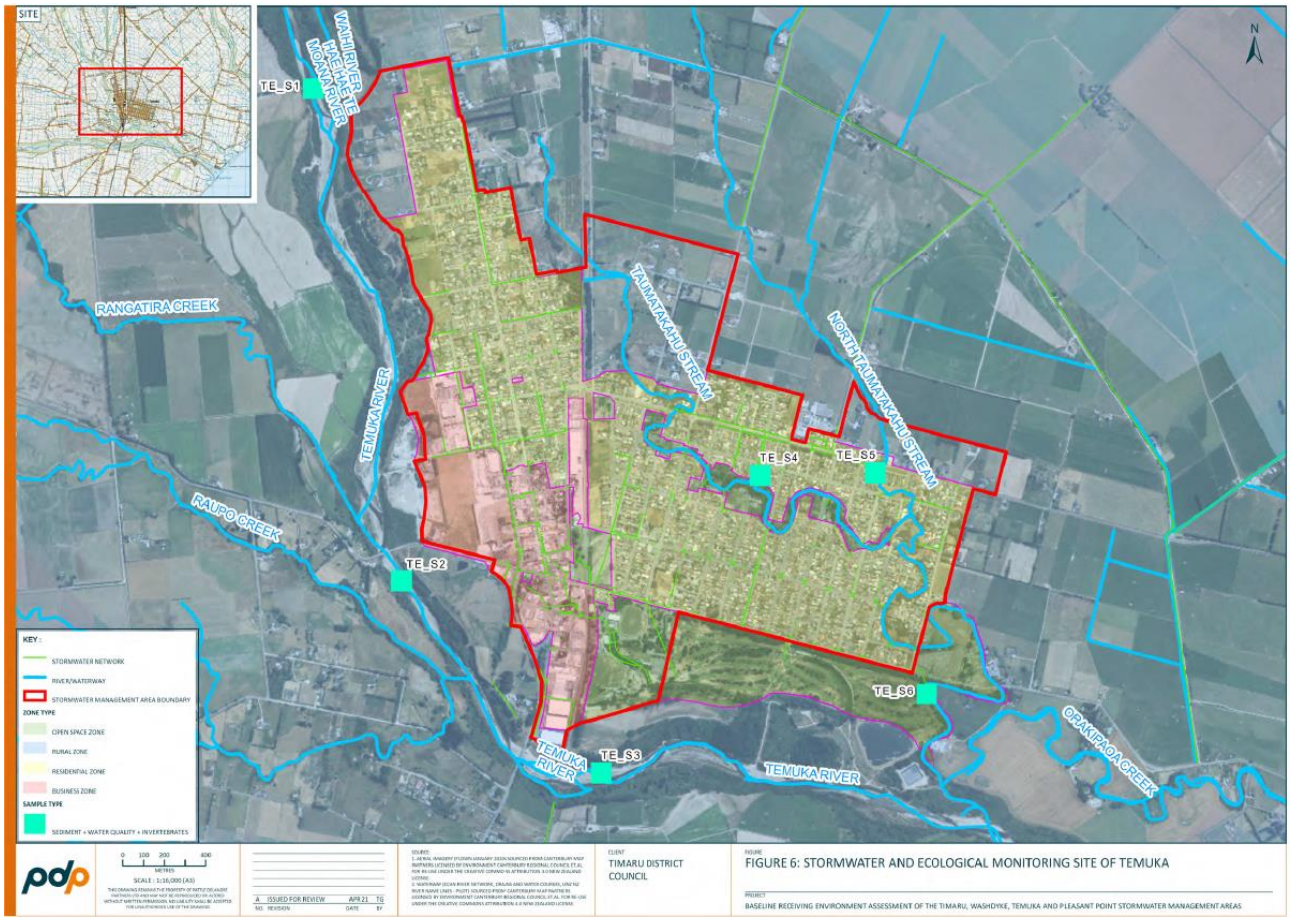

Figure 4:5 – Temuka SMA baseline assessment monitoring sites (source Appendix 7)

Aquatic Ecology

The review of the NZFFD found a total of 12 freshwater fish and large macroinvertebrate species in the wider Te Uma kaha (Temuka River) catchment, 11 of which are native to New Zealand. This indicates that historically the catchment contained a diverse and high-value aquatic community.

The NIWA Fish Passage Assessment Tool did not show any fish passage barriers within the main channel of the Te Uma kaha (Temuka River).

[11] ANZG 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at www.waterquality.gov.au/anz-guidelines

The sampling sites in the Te Uma kaha (Temuka River) were 'hard-bottomed' (which is characteristic of braided rivers) and had very low fine sediment cover. A high abundance of organisms with low diversity was found during the ecological sampling, with a high proportion of sensitive organisms present.

The Te Uma kaha (Temuka River) sites had higher Macroinvertebrate Community Index (MCI) and Quantitative MCI (QMCI) scores, consistently indicating moderate ecological health, albeit with probable mild organic pollution. All sites met the NPSFM national bottom line; however, all sites were slightly below the LWRP Plan Change 7 (decision version) freshwater outcome value for QMCI of 6.

4.8.3 Taumatakahu Stream

Overview

Two spring-fed tributary streams pass through and confluence within the residential area on the eastern side of the Temuka township. The combined streams confluence with the Te Uma kaha (Temuka River) downstream of the Temuka wastewater treatment plant. The southern-most stream (Taumatakahu Stream) is a second-order stream with an estimated mean flow of 0.04 m^3/s (40 L/s), while the northern waterway that confluences with the Taumatakahu Stream is a first-order stream with an estimated mean flow of 0.01 m^3/s (10 L/s)

The Taumatakahu Stream has been undergoing ecological enhancement since 2006 through Environment Canterbury's Living Streams Programme. Rural reaches of the stream have also been planted where the stream has been fenced from livestock.

The Taumatakahu Stream and its northern tributaries LWRP Water Quality Management Unit Class is: Spring-fed Plains-Urban

Water Quality

As reported in the PDP Baseline EA Total nitrogen and nitrate-nitrogen exceeded the ANZG trigger values at all three sites on the Taumatakahu Stream and its tributary (refer Figure 4:5 for locations). Dissolved reactive phosphorus also exceeded the ANZG and Opihi Regional Plan trigger values, with the TE_S6 site also exceeding the NPSFM national bottom line. Total phosphorus exceeded the ANZG trigger values in two of the three sites. Metals, metalloids, and hydrocarbons during dry weather were all below the trigger values and were mostly below laboratory detection limits.

Sediment Quantity and Quality

Fine sediment cover was high at all three sites and exceeded the ECan Plan Change 7 (decision version) and NPSFM national bottom line at TE_S5 and TE_S6 (refer Figure 4:5 for locations). Lead (Pb) and zinc (Zn) in sediment exceeded the ANZG DGV at TE_S6, but were below the ANZG GV - High. Elevated concentrations of some PAH compounds were found at TE_S4, with lower levels of several PAH compounds found in TE_S6 no PAH compounds were above the ANZG 2018 DGV. TPH concentrations were consistently low across the three sites.

Aquatic Ecology and Ecological Value

The NIWA Fish Passage Assessment Tool shows seven 'Very High Risk' instream structures in the Taumatakahu Stream. Four of these barriers are located a short distance upstream of the stream's confluence with the Te Uma kaha (Temuka River).

The Taumatakahu Stream had 'soft-bottomed' features with a high cover of fine sediment. The high sediment cover is likely due to several human-influenced sources including bank instability due to riparian clearing, channelisation of the stream, and sediment-laden stormwater discharges. Sedimentation was highest (100%) at the TE_S6 site, whilst the other two sites were more characteristically 'hard-bottomed' streams; however, both had been impacted by high sediment

inputs. These softer bottomed sites had fewer sensitive species and a higher diversity of organisms.

The MCI and QMCI scores for Taumatakahu were lower than for the Te Uma kaha (Temuka River), indicating fair ecological health and probable moderate organic pollution, although all sites met the NPSFM national bottom line. Site TE_S6 does not meet the LWRP Plan Change 7 (decision version) freshwater outcome values for QMCI of 5.

4.8.4 Current Cultural State Summary

An assessment of the thresholds expressed by Arowhenua for cultural use, with a particular focus on mahinga kai was undertaken by Kitson Consulting Ltd in February 20212 (Cultural Values AEE refer Appendix 4) using resources available including assessments undertaken by TDC for the townships stormwater. A high level summary of the assessment of the state of the values, uses and associations for Temuka is presented in Table 4:3 from the Cultural Values AEE. With the data available (that also included the PDP Baseline EA) it was considered that the current state fails to meet the cultural thresholds and restoration is required.

Table 4:3 – Assessment of thresholds for cultural use - Ratings are: Pass, Poor or Fail

Threshold						
Mahinga kai resources present	Mahinga kai species in sufficient numbers and good condition	The ecosystem supports mahinga kai species and resources	Human health safety for gathering and consuming kai	Access to mahinga kai is available	Nitrate and Ammonia toxicity in A band	*E. coli* in A band
Poor	Poor	Poor	Poor	N/A	Fail	Fail

4.8.5 Surface Water Users

A review by WSP of the Canterbury Maps 'Surface Water Take (Active) Consented' take layer on the 24th of May 2022 showed that no active surface water consented takes are occurring from the Taumatakahu Stream or its tributary within the SMA or downstream of the SMA to its confluence with the Te Uma kaha (Temuka River). No surface water takes were occurring adjacent to the SMA to the Te Uma kaha (Temuka River).

There are two surface water takes CRC176502 (expires 30 Jul 2032) and CRC161299 (expires 25 Nov 2033) immediately upstream of the SMA from the headwaters of the Taumatakahu Stream (near McNair Road) and its northern tributary (at Guild Road) respectively . These were granted for 35 years and authorise the use of water for irrigation of land with take rates up to 14 L/s and 38 L/s respectively, which is a combined peak rate of 52 L/s. The combined mean flow of the streams downstream from these takes is only 50 L/s.

Arowhenua has identified the lack of water and flow in springs in the Taumatakahu.

4.9 Wetlands

The Temuka SMA in its pre-European state, was largely dominated by herbaceous (fern/grass/herbs). There was a large wetland to the east of the SMA as digitised from the original 19th Century 'Black Maps', as shown in Figure 4:6. No large historic wetlands were mapped along the Te Uma kaha (Temuka River).

[12] Kitson Consulting. (2022). *Assessment of effects on Te Rūnanga o Arowhenua values and interests by TDC Stormwater Management*. Kitson Consulting Ltd.

A extract from the Canterbury Wetlands GIS layer (CWGIS) was obtained from Environment Canterbury (in May 2022), using a 100 m buffer of the SMA and its existing stormwater outlets outside the SMA. There were two potential wetlands within the extraction area within the GIS layer as shown in Figure 4:7, one potential natural wetland immediately adjacent to the SMA ('Wetland A'), and another within the SMA ('Wetland B').

From a review of historic aerials the two identified potential natural wetlands shown may (Wetland A) and probably include (Wetland B) a defined steam supported by upstream spring flow input. Refer to Figure 4:8 and Figure 4:9 that shows a close up of the potential natural wetlands using the latest aerial imagery and a possible indicative delineation. Figure 4:10 provides a photograph of Wetland B clearly showing a stream including defined banks along its northern and western boundary.

If these are confirmed as natural wetlands, Table 4:4 summarises a wetland classification that would likely apply. No existing stormwater discharges from TDC reticulated stormwater network occur to these potential natural wetland areas or within 100 m of them.

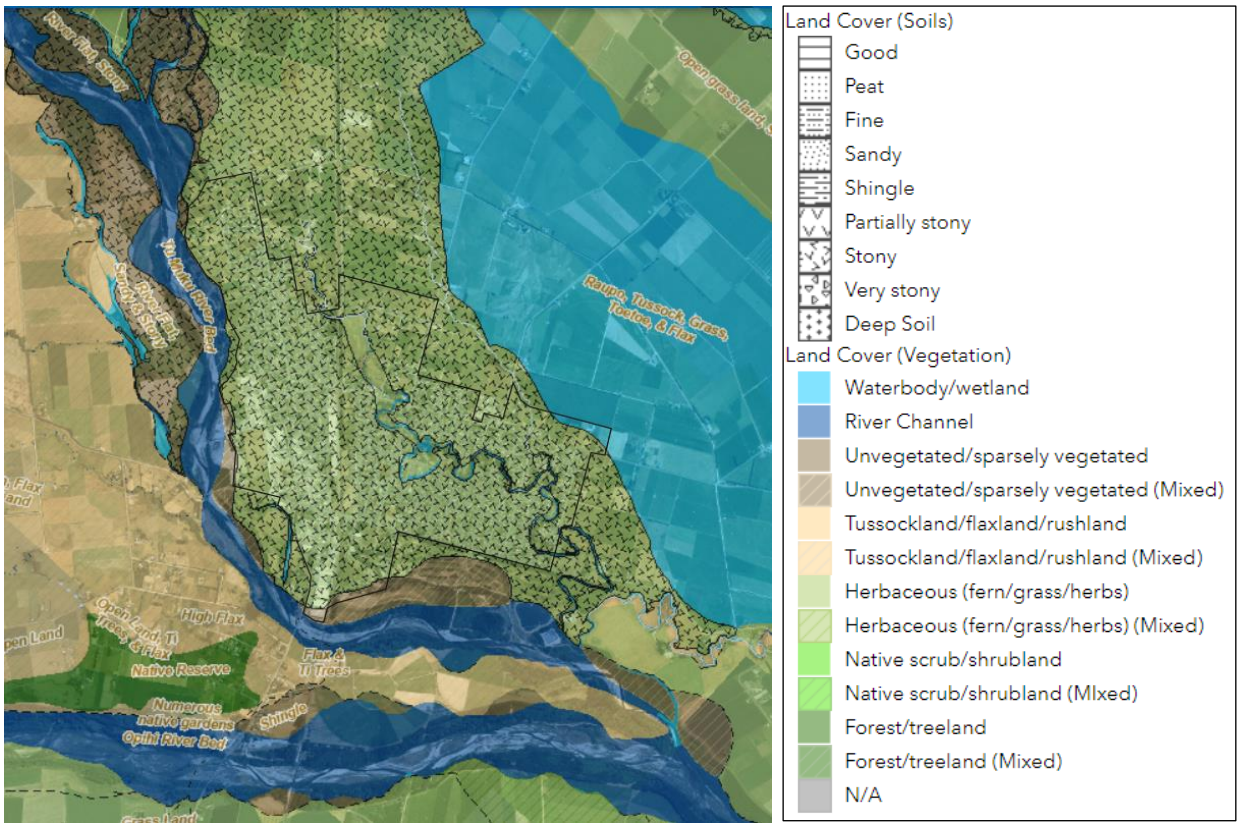

Figure 4:6 – Black Map of pre-European vegetation and waterbodies (source Canterbury Maps)

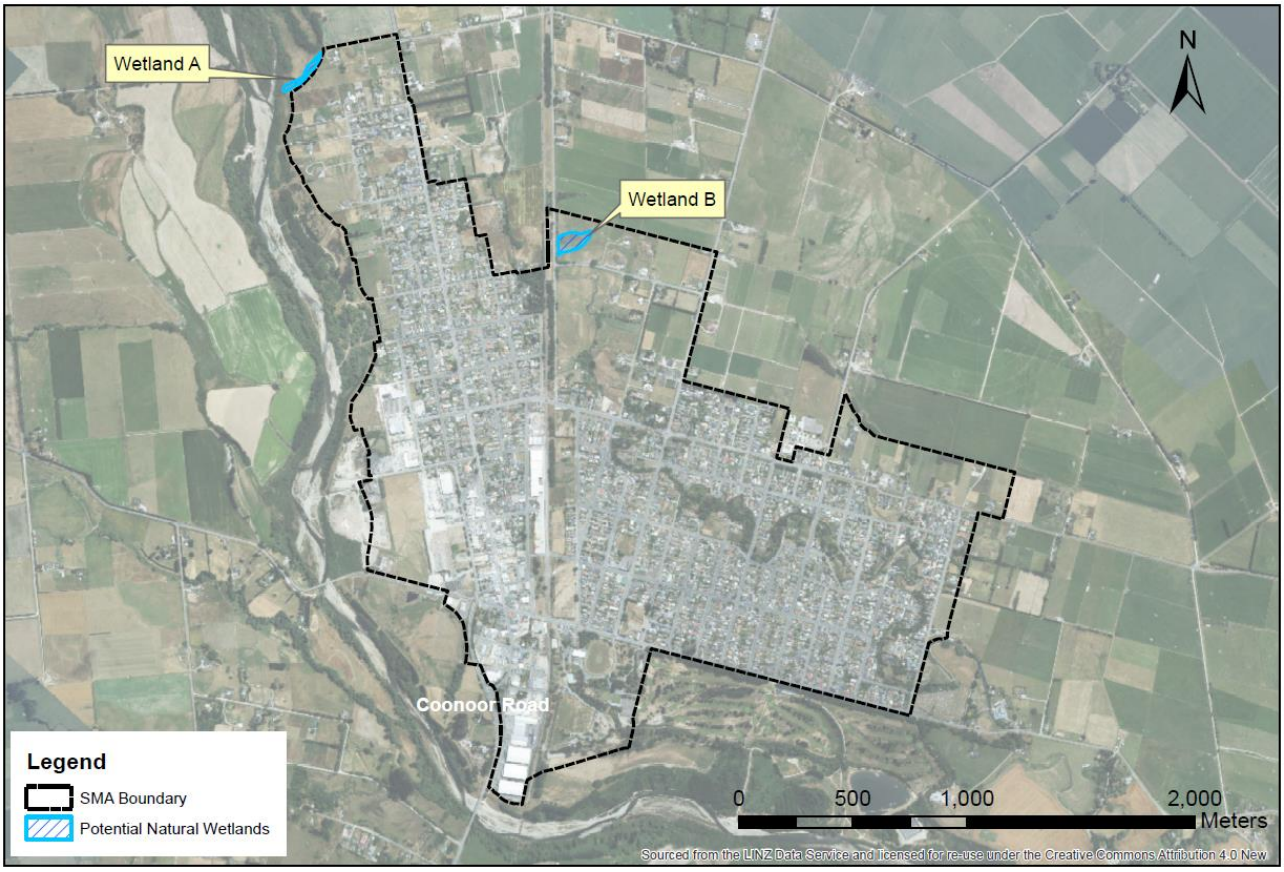

Figure 4:7 – Potential Natural Wetlands within 100 m of SMA and outfalls outside SMA (source Canterbury Wetlands GIS - May 2022)

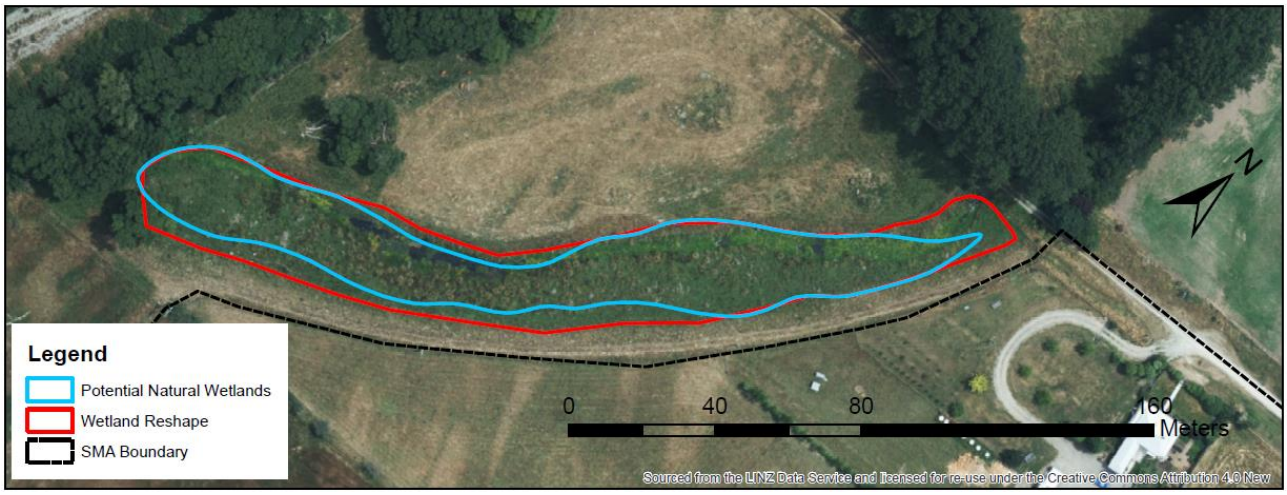

Figure 4:8 – Wetland A CWGIS in blue outline and a reshape based on latest imagery in red outline

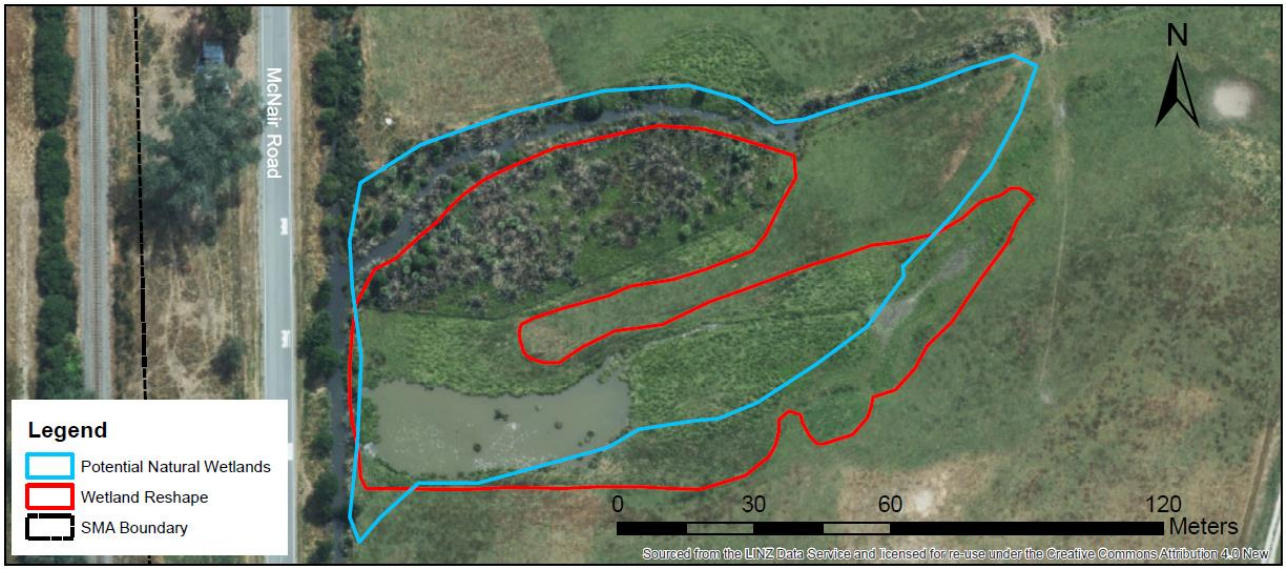

Figure 4:9 – Wetland B CWGIS in blue outline and a reshape based on latest imagery in red outline

Figure 4:10 – Wetland B: Photo from McNair Road looking east showing that the associated waterway is a stream with banks.

Table 4:4 – Natural wetland areas, hydrosystem and class, dominant vegetation present and ground level (GL) relative level (RL) in terms of the Christchurch City Datum (CDD)

Name - ID#	Feature	Area (ha)	Wetland Hydrosystem and Class [13]	Dominant Vegetation
Wetland A - 15558	Channel (spring-fed	0.4	palustrine – shallow water / marsh	Native exotic grasses
Wetland B - 14225	Channel (spring fed) / pond + bog	0.92	palustrine – marsh / shallow water	Native plantings / exotic grasses

[13] Johnson, P. & Gerbeaux P, 2004, *Wetland Types in New Zealand.* Department of Conservation, Wellington.

4.10 Riparian Ecology, Recreational and Amenity Values

Since 2008 ecological enhancement has occurred along rural and urban stretches of the Taumatakahu through the Environment Canterbury Living Streams Programme, Community Groups, and Fish and Game. Various town-based care groups has been assisting farmers to plant its margins and fence the stream from livestock. Riparian enhancement planting have also occurred along the urban stretches of the Taumatakahu Stream which are now well established..

The Te Uma kaha (Temuka River) confluences with the Opihi River immediately downstream of its confluence with the Northern Tributary and Southern Tributary. The Opihi riverbed is characterised by DoC as Land of National Significance and a Site of Special Wildlife Significance, being the only recorded breeding area for the black-fronted dotterel (*Elseyornis melanops*) and known habitat for the long-tailed bat (*Chalinolobus tuberculatus*). At the coast, the Opihi River forms the Opihi River Mouth Lagoon, which has been characterised as a highly significant and moderately threatened wetland, land of national significance (DOC), a site of special wildlife significance (DoC), and contains significant habitat for inanga spawning[14].

The Te Uma kaha (Temuka River) likely provides a significant conduit between the upper catchment and coast for sports fish. A salmon spawning site / reach is documented in Schedule 17 of the LWRP along the Te Uma kaha (Temuka River) adjacent to the SMA. This is between the ford crossing at Oxford Crossing Road at the confluence of the Waihi River and Hae Te Moana to the confluence of Te Uma kaha (Temuka River) with Opihi River (approx.. 3.5 km downstream of SH1 Bridge over Opihi River). The Taumatakahu and its tributary also has spawning sites.

The Te Uma kaha (Temuka River) is monitoring for swimming water quality at the SH1 Bridge. According to the LAWA website the long term grade (5 year sampling) grade is 'Poor'. [15]

Below Temuka and the confluence with the Te Uma kaha (Temuka River) the Opihi River swimming water quality is monitored at the Waipopo huts the LAWA website reports this site as a 'Fair' long term grade.[16]

The suitability for recreational use outcome set in the LWRP (PC7 decision version: Table 14(a)) are:

- Taumatakahu Streams (spring-fed Plains -urban) - No value set
- Te Uma kaha (Temuka River) (Hill-fed Lower) - Good
- Opihi River (Hill fed lower) - Good

4.11 Critical Infrastructure

4.11.1 River Flood Protection Assets

The largest flood recorded in South Canterbury occurred during a 13-14 March 1986 storm event that impacted Temuka as shown in Figure 4:11. This even was estimated at the time to be a ARI of 1% (100 years).

As shown in Figure 4:12. Temuka is protected by stopbanks on the true right banks of the Waihi River and Te Uma kaha (Temuka River) above and down the western boundary of Temuka to the SH1 Bridge. There is also Opihi River related stop banks within the golf course and farmland further downstream. These assets are operated and maintained by Environment Canterbury Regional River Engineers, as well as managing and maintaining the flood drainage capacity of the Taumatakahu Stream and its northern tributary under the Bylaw.

[14] https://mapviewer.canterburymaps.govt.nz/
[15] https://www.lawa.org.nz/explore-data/canterbury-region/swimming/temuka-river-at-sh1-bridge/swimsite
[16] https://www.lawa.org.nz/explore-data/canterbury-region/swimming/opihi-r-at-waipopo-huts/swimsite

The estimated peak flood flows for the Te Uma kaha (Temuka River) at the Manse Bridge in a 100 year event is 1,091 m^3 / s.[17]

Arohwenua has recorded and communicated in NIWA (2012) their issues with the lack of flood protection for Te Hapa o Niu Tireni marae and the Arowhenua Native Reserve 881 as the stopbanks configuration will cause floodwaters to flow towards the marae and reserve.[18]

The impact of flooding on Arowhenua flood plain and a summary on the state of flood plain structures and management within and around Arowhenua flood plain region was conducted by Hall (1997)[19]. This indicated that the potential of Te Hapa o Niu Tireni marae and Arowhenua reserve land to be inundated by the Te Uma kaha (Temuka River) is far greater than the flood hazard risk associated with the Opihi River. Hall (1997) concluded that the stop-bank between Opihi River and the Arowhenua flood plain offers protection against floods form the river, but the absence of such a structure on the Southern side of the Te Uma kaha (Temuka River), significantly increases the risk of flooding of the Arowhenua flood plain areas.

Figure 4:11 – Aerial view of flooding looking north-east over Arowheuna reserve land and Te Uma kaha (Temuka River) and State Highway 1 – March 13th 1986 (1430-1630 hrs) Temuka Township is in the background. (Source RNZAF – K38 723 600)

[17] Griffiths, G.A., McKerchar, A.I., Pearson, C.P. 2011. *Review of flood frequency in the Orari and Temuka Rivers*. NIWA Report prepared for Environment Canterbury: CHC20111-012. 17 pp
[18] NIWA 2012. *Maori Community Adaption to Climate Variability and Change. prepared for Te Runanga o Arowhenua and the New Zealand*. Climate Change Research Institute – Victoria University
[19] Hall, R.J. 1997. Report: *Arowhenua flood plain study. Report to the Canterbury Regional Council*, 8 June 1991. 12pp

Figure 4:12 – Environment Canterbury Stop bank Infrastructure (yellow lines) at Temuka as part of the Temuka and Opihi Flood Protection Schemes and watercourses (blue lines) managed under the Flood Protection Bylaw . Te Hapa o Niu Tireni marae is indicated by red circle.

4.11.2 SH1 and its Te Uma kaha (Temuka River) Bridge

SH1 through the township and its bridge over the Te Uma kaha (Temuka River) at the southern end of Temuka is a critical transport asset . The stormwater runoff associated with the bridge and the SH1 through the township is authorised by a separate discharge permit CRC111005.

4.11.3 Temuka Wastewater System

Temuka has a reticulated wastewater network that services all of the existing urban area. The Temuka Wastewater Treatment Plant (WTP) is located off Domain Avenue within the stopbanks on the Te Uma kaha (Temuka River) adjacent to the eastern end of the Temuka Golf course.

The primary treated wastewater is pumped to the Timaru Wastewater Treatment Plant at Aroangi Road, Washdyke and ultimately discharges via a coastal outfall out into the Pacific Ocean under discharge permit CRC101831.

In addition to the direct impacts of flooding such as ponding and sheet flow, the existing stormwater system also has an impact on the wastewater system in Temuka. Shallow groundwater combined with surface ponding results in inflow and infiltration (I&I) into the wastewater system.

There are widespread reports of wastewater blockage/overflow across the urban catchment since 2013. However, there were only six instances of wet-weather-associated overflows from the network recorded by the maintenance contractor and only one specific reported instance of a wastewater overflow to a waterway (Taumatakahu Stream), which occurred during dry weather (reporting period 2013 to 2021).

Historically, high volumes of I&I could result in the wastewater treatment ponds overflowing and entering the Te Uma kaha (Temuka River); however, recent wastewater pipeline and pump station upgrades have addressed this particular issue.

4.12 Summary of Sensitivity of the Environment

The following summarises the sensitivity of the environment based on the information presented in this section of the AEE:

- The shallow groundwater resource used for drinking water supply in Temuka when abstracted water is not treated adequately will be moderately sensitive to the discharge of microbiological contaminants (*E.coli* and pathogens).
- The Taumatakahu and its tributary surface water quality and aquatic ecology will have moderate to high sensitivity to stormwater contaminants given the small baseflows and surface water abstraction that will occur in summer upstream.
- The Te Uma kaha (Temuka River) surface water quality and aquatic ecology will have a low sensitivity to stormwater contaminants given its larger baseflows
- The Taumatakahu and Te Uma kaha (Temuka River) and the upstream and downstream Opihi River catchment has high cultural sensitivity.
- The Taumatakahu and the Te Uma kaha (Temuka River) have a high recreational (fishery) and moderate amenity value.
- Critical infrastructure will have a moderate (wastewater network) to low sensitivity (SH1 and stop banks) to the depth and quantity of stormwater.

5 Description of the Proposal

5.1 Area and Activities

The Temuka SMA boundary is defined by the area shown in Figure 1.1. Within this area the scope of the application includes the discharge of contaminants (stormwater) to land and water for the following activities:

- Existing and future industrial sites that discharge via the TDC stormwater network.
- Stormwater from residential and commercial roofs.
- Stormwater from residential and commercial hard stand areas and structures.
- Construction-phase stormwater from development construction areas with a phase of land disturbance of less than 5 ha.

Existing and future industrial sites that discharge on-site into land or via their own system to surface water are excluded from this consent and those that have an existing individual consent will need to continue to hold and renew these discharge of stormwater consents.

The following discharge activities are excluded from the application:

- Construction-phase stormwater to land and water from a development construction area with a phase of land disturbance greater than 5 ha.
- Discharges of construction-phase stormwater or stormwater from a ‘piece of land’ associated with a development construction area or a facility that land is contaminated above acceptable levels/guideline values.
- Construction-phase stormwater onto land or into surface water within a natural wetland
- Stormwater from sites (typically industrial but could include commercial) that represent an unacceptable risk to achieving the receiving environment
- Stormwater onto land or surface water within a natural wetland.

For the avoidance of doubt the discharges of stormwater from rural land use and associated buildings, hardstand areas and dwellings do not form part of this application.

A comprehensive description of the activities sought and excluded, with associated abbreviations and definitions are included in the proposed conditions in Appendix 8 of this AEE. The proposed conditions are also discussed further at the end of this section

The current active stormwater discharge permits within the Temuka SMA are detailed in Section 2.2.

Note that the individual consent holders of the existing residential discharge consents to land (that may now be a permitted activity) may elect to not surrender their consents. Also, the Refuse Transfer Station site stormwater discharge permit is likely to not be surrendered.

5.2 Stormwater Quality and Loads

5.2.1 Sources and Concentrations

The potential contaminants from the developed areas within the Temuka SMA are:

- Microbiological
- Nutrients
- Toxic organic compounds
- Hydrocarbons from vehicle exhaust fumes, oil leaks, etc.
- Sediment from pavement wear, rainfall erosion, and vehicles
- Heavy metals (including cadmium, nickel, copper, zinc and lead) from tyre wear, vehicle exhaust, vehicle moving parts, and roofs etc
- Organic matter from plant material such as grass clippings, leaves etc
- Litter

A review of literature research and databases on urban stormwater (residential, commercial and roading) (Schueler 1991, ARC 1992, Williams 1993, Kingett Mitchell 2001, Brough et al 2012, NIWA URQIS) [20] [21] [22][23] [24] [25] has provided the expected contaminant concentrations for stormwater that may be in Temuka stormwater which is presented in Table 5:1.

The main trace metals that have been commonly measured in carparking and vehicle movements are zinc, and copper. Recent studies have shown that the introduction of unleaded petrol has contributed to a drop in lead levels nationwide. Cadmium and nickel concentrations in general urban runoff are also expected to be very low.

Roof material leaching of older development areas is likely to be the main source and result in the highest concentrations of zinc. Roof renewal of older houses, commercial and industrial buildings with roof materials such as COLORSTEEL ® will result in reductions of zinc loads over time from these land uses.

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[20] *Schueler, T. R. 1991. Stormwater Management Re-commendations for the Auckland, New Zealand Region. Prepared for: Rivers and Erosion Control, Auckland Regional Water Board, Auckland.*

[21] *Auckland Regional Council Technical Publication #10, "Stormwater Treatment Devices Design Guideline Manual" (TP10) October 1992*

[22] Kingett Mitchell and Associates Limited 2001. *Pre-liminary Examination of the Nature of Urban Runoff in New Zealand.* Kingett Mitchell and Associates Limited, Auckland.

[23] *Williams, R. B. 1993, Urban Runoff Data Book: A manual for the preliminary evaluation of urban stormwater impacts on water quality, Water Quality Centre Publication No. 20, National Institute of Water and Atmospheric Research, Hamilton*

[24] *Brough et al.2012 Stormwater quality – an analysis of runoff from modern subdivisions and the implications for stormwater treatment. Water New Zealand Stormwater Conference 2012*

[25] https://urqis.niwa.co.nz/#/report

New residential subdivisions that consist of new houses with COLORSTEEL ® roofs, and slower low intensity traffic roading design would be expected to have considerably reduced levels of metals, suspended sediment than shown in Table 5:1 as these practices result in a substantial reduction in the contaminants being available for stormwater entrainment.

Microbiological contamination in stormwater is typically from animal faeces, mainly associated with dogs, terrestrial birds and waterfowl in reserves.

The Table 5:1 reported a median 8,000 fc/100 mL value for the stormwater quality being generated in flows which is based on that reported in Williams (1993). This value was based on research from Australia, Auckland and the United States. It should be noted that Auckland and most United States cities have combined wastewater and stormwater pipes, meaning human waste sources are present in stormwater flows.

This will not be the case for Temuka where wastewater flows do not routinely, enter a stormwater catchment or system. The risks of a newer wastewater infrastructure within new greenfield development having a catastrophic failure or being undersized, and subsequently entering stormwater catchments is very low.

A local greater Christchurch study (Brough et al 2012) of modern post 2000 residential subdivision stormwater quality focused on monitoring data collected of untreated stormwater. This study, reported that *E.coli* concentrations from the residential subdivision ranged from 2 to 145 MPN / 100mL, significantly less than reported in Williams 1993.

Table 5:1 – Expected stormwater contaminants and untreated concentrations

Stormwater Parameter	Literature / URQIS - Stormwater Quality
Total Suspended Solids (g/m^3)	
Developed (unpaved)	<500
Developed Residential /Commercial	50 -170
Developed Industrial	<300
Construction	<4,000
pH (mean)	7.0
Turbidity (mean)	25
Dissolved Oxygen Saturation % (mean)	93
Hydrocarbons (g/m^3)	
TPH	0.5 - 5
PAH (mean)	0.007
Toxic Organics (g/m^3)	<0.004
Nutrients (g/m^3)	
Nitrate-Nitrogen	0.4 - 2.0
Total Nitrogen	1 – 2.5
Total Phosphorus	0.2 - 0.4
Total Metals (g/m^3)	
Zinc	0.1 - 0.8
Copper	0.015 - 0.02
Lead (mean)	0.007
Cadmium (mean	0.00011
Nickel (mean)	0.004
Faecal Coliform (fc/100 mL sample) - median	8,000

5.2.2 Loads and Changes in Due to Development

A contaminant load modelling (CLM) assessment tool was developed for Temuka and the results are reported in Appendix 5. As seen in Table 8 of the CLM Report there is an apparent change in land use area in Temuka between the two scenarios, but the reflected change in loadings in Table 9 is expected to be less than 3%. This is due to the change in area being relatively small in the wider Temuka context, and the resultant change in contaminant loads is within the limit of uncertainty in the model.

The CLM allows the identification of areas that contribute the highest contaminant loads and would therefore likely benefit the most from stormwater treatment. The results of this assessment (under the proposed scenario) identified four urban catchment and one rural dominated catchments within the Temuka SMA that contribute the highest contaminant loads, being:

- South-east Temuka, that discharges to land
- Central Temuka including the Domain catchment, that discharges onto land
- The upper reach of the Taumatakahu Stream, which indirectly discharges into the Taumatakahu Stream
- North Temuka catchment has discharges into the North Branch of the Taumatakahu Stream
- Northwest Temuka discharges from an outfall into the upper reach of the Taumatakahu Stream

These catchments account for more than 50% of the total load of total suspended solids, zinc, copper, and TPH. The industrial area in the southwestern part of the SMA showed the highest loads of zinc, copper, and TPH, whilst the more rural catchments had the highest total suspended solids loads.

Typically, after initial subdivision and building construction phases, the sediment loads in the catchment will decrease from that which occurred from the rural land use, due to the replacement of pasture and cropping with roofs, concrete and asphalt.

5.3 Stormwater Quantity

No comprehensive hydraulic modelling of the Temuka stormwater system flows for individual catchments has occurred. Also estimating the urban volumes or peak flows for a range of storm events contributing to each discharge point (a soakpit or each surface water outfall) cannot be currently undertaken accurately due to limitations of the information available at present, nor is it considered necessary.

Using the rational method, and the catchment areas from the CLM Report (Table 14) contributing to the Taumatakahu (including its tributary) and the Te Uma kaha (Temuka River), a rough order estimate of the total stormwater flows from can be estimated.. The rough order estimates of stormwater flows for a 2 mm/hr rainfall intensity to each surface water environment are:

- Taumatakahu (178 ha+50.9 ha) = 510 L/s
- Te Uma kaha (Temuka River) margins (3.2 ha) = 5 L/s

It is assumed that the storm event duration is sufficient that all of the catchments is contributing at the points of discharge.

5.4 Adaptive Management Approach

TDC is to apply an adaptive management approach to the management of the stormwater in Temuka. Adaptive management is an investigational approach to management, often defined as ‘structured learning by doing. It has three elements, (1) monitoring, (2) adapting and (3) learning, as presented in Figure 5:1.

The Monitoring Plan will assess the performance of the management of Temuka's stormwater management systems relative to the specified receiving environment Objectives and Targets (refer Section 5.5), as well as being one way to identify projects or management actions that would progressively improve the management of stormwater or address a specific issue(s) (previously summarised in Section 3.5).

As the Targets may evolve in response to community concerns or changes in the environmental regulatory environment such as implementing Te Mana o te Wai , TDC's approach will need to adapt.

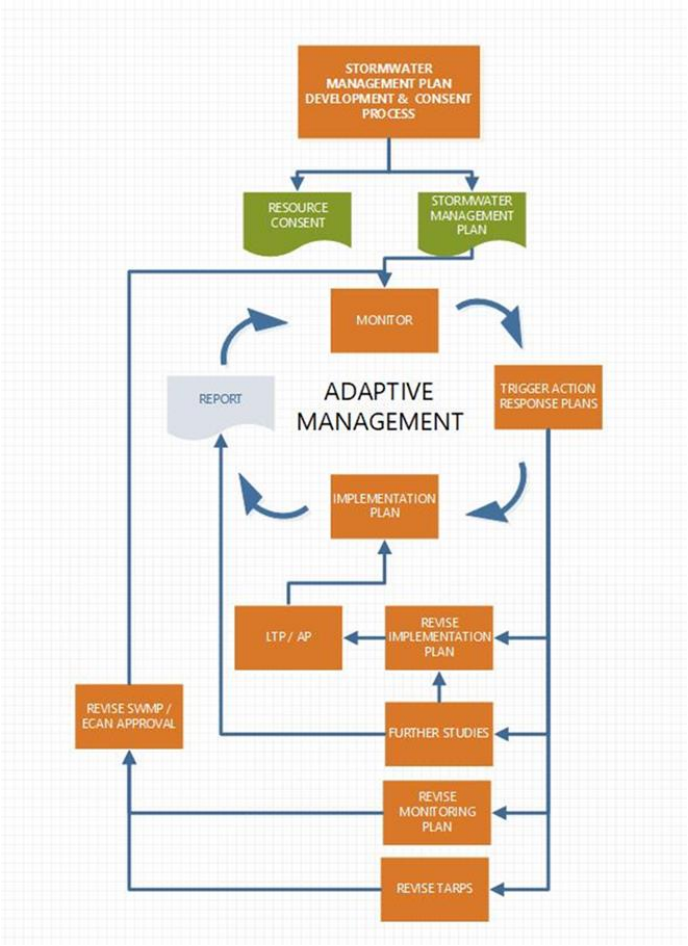

Figure 5:1 – Temuka Stormwater Management Plan Adaptive Management Approach

5.5 Stormwater Management Objectives and Targets

Section 2 of the SMP discusses the stormwater management hierarchy that lead to the development of the objectives and targets that are proposed to form part of the Temuka stormwater discharge permit.

A vision for Temuka stormwater management (that is likely to apply to other SMAs) and the objectives and targets were developed in collaboration with AECL/Arowhenua .

The vision statement for stormwater management in Te Umu Kaha/Temuka is:

> *Together we value, protect and restore the mauri/lifeforce of the waterways so that it enables Mahinga kai, ki uta ki tai (mountains to the sea).*

Temuka specific objectives and targets were then identified, and are expressed in the context of the order of the three priorities of Te Mana o te Wai which is the key concept of the National Policy Statement for Freshwater Management 2020 (NPSFM), and "*…refers to the fundamental*

importance of water and recognises that protecting the health of freshwater protects the health and well-being of the wider environment."

TDC will in collaboration with Te Rūnanga o Arowhenua and other stakeholders, with respect to the effects arising from the stormwater discharges to be consented will prioritise the best practicable options to meet the objectives for Temuka's stormwater management and achieve the associated targets.

The 10 objectives for Temuka's stormwater management are to:

A. First, the health and well-being of water bodies and freshwater ecosystems

1. Progressively reverse the diminished ecosystem health in the Taumatakahu Stream
2. Protect and enhance the ecosystem health of the Te Uma Kaha / Te Uma kaha (Temuka River).
3. TDC advocate for ki uta ki tai (from the mountains to the sea) in Te Uma Kaha catchment during TDC's involvement as a stakeholder and regulator in RMA and LGA processes
4. Where practicable prioritise addressing effects of stormwater quality and quantity at or close to their source rather than at the end of pipe into surface water or instream.

B. Second, the health needs of people (such as drinking water)

5. Stormwater discharges do not cause or exacerbate the risk to human health where groundwater is abstracted from bores for drinking water.
6. Progressively reduce the acute and cumulative impacts of the stormwater network and stormwater discharges on waterbodies connected to and within the Opihi Mātaitai downstream of Temuka so the habitat is healthy and suitable for safe mahinga kai harvesting, and the mahinga kai species are safe to eat.

C. Third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.

7. Recognise and respect mana motuhake – the whakapapa and the relationship Kati huirapa have with water ecosystems in their rohe and actively involve them in stormwater management.
8. When investing in stormwater infrastructure environmental, social and cultural benefits are optimised.
9. Stormwater is managed so that run-off from urban areas, the primary stormwater network and overland flow paths, does not exacerbate the flooding, erosion or damage to property or infrastructure or cause risks to human safety.
10. Temuka township is more resilient to the effects of flooding and the associated the adverse impacts of climate change.

The objectives will form part of the consent conditions, and the targets are proposed to be contained in an attached schedule to the consent and can be amended via certification by the consent authority in line with the adaptive management approach being applied. The amendment of the targets will have to meet a criteria to be certified..

The combined objectives and targets are included in Appendix 8 .

The key aspects of the targets in relation to the first priority "health and well-being of water bodies and freshwater ecosystems" is :

- A stretch target is proposed for Taumatakahu near the expiry period for that are above the LWRP PC7 outcomes sought and in line with the mid range of Band B in the NPS-FM
- Improvement of baseline scores for macroinvertebrates in the Te Uma Kaha / Te Uma kaha (Temuka River),

- Improvement s Riparian vegetation in
- For Taumatakahu Stream the targets for surface water quality being the LWRP standards for 90% species is not going to be assessed using wet weather results, instead dry weather results will be used (refer discussion and justification in 8.6.4)

There may be influences out of the control of TDC that may impact on the targets being achieved such as larger nitrates inputs from the surrounding agricultural origins that cause nitrate toxicity in surface water limiting macroinvertebrate and fish species health and richness.

5.6 Implementation

5.6.1 Stormwater Management Plan

This SMP (draft attached as Appendix 1) captures the long term vision for the management of stormwater within Temuka and outlines how the remedial and improvement programmes are identified and prioritised, and how they will realise the communities goals and objectives for the management of Temuka's stormwater.

The SMP is considered a live document and it is not proposed to have it attached to the consent if granted, this will allow the flexibility for it to evolve without having to apply to change the conditions of consent, or for its evolution to be through a third-party approval process. Despite this a proposed condition included that allows the consent authority to request a review in light of certain circumstances arising. Any revision will be required to be constituted to key stakeholders.

5.6.2 Implementation Plan

Section 6 of the attached SMP describes the Implementation Plan that TDC intends to meet the objectives set.

The Implementation Plan provides a summary of the schedule of projects or management actions that TDC will implement to progressively improve the management of stormwater in Temuka. The plan includes indicative costing for each action or program (if the actions can be grouped into programs) as this is useful for planning and setting budgets in TDC Annual Plans and Long-term Plans; similarly, any funding limitations will be reflected in the scheduling of projects or actions.

The Implementation Plan defines who is responsible for implementing the actions and includes an implementation timeline from planning, design and implementation.

The Implementation Plan will be revised annually. During the year new potential projects or management actions will be identified, either as the recommendation as to the result of the Monitoring Plan or other sources (e.g. council officers, working party recommendations, etc).

Annually these potential projects or actions are evaluated, along with the existing projects or actions in the Implementation Plan the process is detailed in Section 6 of the SMP. A formal review of the Evaluation Report includes AECL / Arowhenua. The evaluation considers how well the projects or actions will progressively improve the management of stormwater, specifically to achieve the Objectives and Targets of the discharge consent / SMP. Working within existing funding budgets the new and existing projects will be rescheduled, where the projects and actions with the greatest benefit being prioritise.

The annual review process will allow the schedule of projects and action to adapt to changes in, the environment or social issues, and regulatory changes during the life of the consent.

Similarly, whilst the schedule of projects or actions will be matched to budgetary restraints, the Implementation Plan can demonstrate and support the business case for possible increases in Annual Plan and Long-term Plan funding.

At this point in time TDC is working on the process to evaluate options and weightings (the criteria) in collaboration with AECL / Arowhenua. Given the implementation plan is to be adopted across all SMAs in the Timaru District this will take time.

As such the possible options and projects for the short term (next ten years) are yet to be identified. First year monitoring requirements that are extending from that considered during the baseline investigations are also likely considered to assist in project identification.

5.6.3 Implementation Mechanisms

Implementation methods or mechanisms are the internal processes that need to be in place to execute the SMP and achieve the objectives set. The implementation mechanisms are typically regulatory tools that will give TDC authority to enforce certain aspects of the SMP.

A Stormwater Bylaw under the Local Government Act 2002 is operative. Chapter 15 Part 1 General Conditions and Part 4 Stormwater drainage are applicable. The Bylaw Chapter 15 Part 1 allows power of entry to the Council, and can require existing sites connected to the stormwater network to undertake improvements to stormwater management on site such as install interceptor traps (or proprietary devices, clause 1509.1).

The Bylaw Part 4 specifies what is considered prohibitive stormwater substances (clause 1529). Also the Council can cancel any time an approval to discharge to the stormwater network (clause 1530). Cancellation includes, but not limited to, if a "customer discharges any prohibited substance into the stormwater network infrastructure" or "*the customer fails to comply with any condition of any approval to discharge to the stormwater network infrastructure which in the opinion of Council may cause Council to be in breach of any general authorisation or discharge consent.*"

The Bylaw will be the main tool to implement the non-residential site management assessments (refer Section 5.8).

Also the Timaru District Plan Review (DPR) is further enabling best practice stormwater management to be applied in terms of Quantity and Quality through objectives, polices, rules and land-use zones [26]. This will make the minimum requirements for stormwater management more transparent to the community for new development.

For example a rule that applies to all zones make it a non-complying activity under Rule SW-R5 for "*The use of any copper, galvanised metal, unpainted zincalume or any other unpainted metal, used in roof material, gutters, downpipes or external cladding of buildings or structures.*"

It is acknowledged, that the draft District Plan has no legal weight, and will be subject to change prior to notification and through the hearing of submissions and possibly appeals processes.

In addition or as a backstop, stormwater management is also implemented through new or redevelopment connections that are required to obtain 'stormwater discharge certification' from TDC [27] in line with the Bylaw.

TDC is developing infrastructure design standards (IDS) that align with the stormwater management goals and acceptable solutions are being developed to meet the stormwater management requirements for Quantity and Quality.

TDC has draft Stormwater Design Guidelines in collaboration with the Ashburton District Council (ADC). The purpose of this guide is to:

[26] https://timaru.isoplan.co.nz/eplan/#Rules/0/206/1/0/0

[27] https://www.timaru.govt.nz/services/environment/storm-water/stormwater-discharge-certification#:~:text=What%20is%20a%20Stormwater%20Discharge,with%20Environment%20Canterbury%20discharge%20requirements.

- Assist Council in meeting the objectives of their SMPs.
- Provide guidance on what a new development, or re-development, must achieve in order to be granted certification from Council to discharge stormwater to the Council stormwater network and design of systems to obtain subdivision consent.
- Provide a selection of methods and tools to mitigate the effects of stormwater runoff from developments.
- Outline and demonstrate the preferred approach for stormwater management in commercial / industrial and residential developments in the Timaru districts.

TDC is currently considering moving the Stormwater Design Guidelines content into the IDS being developed.

Education is a key component of improving stormwater management. The wider public may be unaware of the consequences of activities such as washing their vehicles or waste bins into the stormwater network or may not understand the steps they can take to improve the quality of stormwater in their neighbourhood. The TDC website[28] contains advice to its residents on how to protect waterways.

5.7 Drinking Water Supply Well Protection

It is proposed that at the concept stage of a new discharge to land being established, being a TDC stormwater network project, or private redevelopment or new development (within the scope of this consent), that an investigation of the existing active and proposed drinking supply wells that could be impacted is undertaken. A 500 m radius from the soakage system would be the extent of the initial screening for potentially affected domestic supply bores, and the protection zones of a group or community well, would be used.

It may be that a residential development less than 5 lots is excluded from this requirement as this is a permitted activity under the current rules in the regional plan. Potentially roof discharges from commercial properties via sealed systems to specific roof water only soakpits could also be excluded.

This will identify the numbers (if any) of group, community and domestic drinking-water supply wells that exist at the time. These are potentially affected by the concept soakage mitigation facilities location. Should any group or community drinking-supply wells protection zones be intersected or domestic drinking - supply wells be in a 500 m radius, and it is unlikely reticulated water supply will be made available via the TDC project or development or additional extension to the water network supply to these existing wells, then alternative mitigation facility locations or methods (don't discharge to land) should be considered.

If a stormwater management facility is still proposed that intersects an active Group or Community drinking-supply protection zone or a captured domestic drinking well, unless the discharge is roof water or small scale residential hardstand, the discharge shall not commence unless:

- In the case of domestic drinking water supply, the Consent Holder has made a reticulated water supply available to the property prior to the discharge commencing; or
- An assessment of site-specific information undertaken by the Consent Holder, and certified by the Canterbury Regional Council, Attention: Regional Leader – Monitoring and Compliance, demonstrates that the ability of the domestic and/or community drinking water supplier to meet the water quality standards for drinking water set out in the Drinking-Water Standards for New Zealand 2005 (Revised 2018) or any successor document is not compromised as a result of the stormwater discharge.

[28] https://www.timaru.govt.nz/services/environment/storm-water/stormwater-and-your-property

5.8 Non-residential Site Management

Non-residential site assessments (NRA) have been undertaken by PDP for Temuka (and other Timaru district townships and Timaru city) in early 2021. The assessment involved and evaluation of properties within the SMA that have the potential to contribute to poor water quality in the stormwater discharges from the SMA. The evaluation was undertaken in two parts: a desktop study and a detailed assessment of an initial set of high risk sites.

The NRA assessment identified within Temuka 28 commercial or industrial properties that present an increased potential risk to the quality of stormwater.

The full NRA is attached as Appendix 11.

Following the desktop assessment, high-risk sites were identified for detailed site assessments which involved a site walkover using a GIS-based survey to record areas of interest and notes from the site. Five sites were deemed to be high-risk due to the type of activities occurring at the site.

Two high risk sites in Temuka were audited in person by PDP, The purpose of these site assessments is to check compliance with TDC's stormwater bylaw and to identify opportunities for progressive improvement in water quality. Recommendations have been made for improving stormwater management and reducing potential environmental impacts at both sites.

Within three years of the commencement of the consent, TDC is proposing audit via on-site inspections the remaining initially assessed high risk sites as a priority , and the remaining 23 properties.

Following the site inspections, the site owners and/or occupiers will be notified by letter outlining whether:

- The site is not considered a high risk. This is on condition that the site continues to implement best practice environmental and stormwater controls as part of continuing improvement; or
- The site requires an assessment of stormwater quality to determine the relative risk that the site represents to surface waterways and/or groundwater via the network before the sites risk classifications can be confirmed; or
- The site is a high risk site and poses a risk to surface water and or groundwater via discharging to the stormwater network. The site owners/occupiers will be advised of the requirement to implement measures to the satisfaction of TDC. The measures may consist of one or more of the following:

    - Reduce contaminants at source through improved site management practices or isolations measures
    - Implement best practice environmental and stormwater management controls
    - Implement best practice onsite stormwater treatment

Where industrial sites are unable to meet the required standards for discharge into the network, the site will be removed from the consent by surrender of the respective land parcel.

It is expected that in most cases, TDC and industrial site owners/occupiers will be able to find the best solutions or appropriate level of stormwater and contaminant source controls.

A short to medium term goal is to endeavour to have high risk industrial site discharges improvements and become more reflective of residential stormwater quality.

New industrial sites are expected to have contaminant isolation and source controls as part of their building code and HSNO compliance requirements. However all new development will need to be given approval to discharge to the stormwater network.

5.9 Operations and Maintenance

Currently the stormwater system mainly consists of sumps, kerb and channel, pipes outfalls and soakage pits. There are several swales and two first flush attenuation treatment basins.

Any sophisticated treatment and attenuation systems that are designed by TDC or to be vested to TDC as part of a subdivision development would likely have an operation manual.

A standard maintenance schedule is attached to the proposed conditions in Appendix 8 that applies to a wide range of stormwater assets that is currently foreseeable in the near future.

5.10 Monitoring Plan

A Temuka Stormwater Monitoring Plan is attached as Appendix 10. This includes the monitoring requirements that are recommended to be included in the resource consent as well as additional monitoring provided to assist TDC management of the network and understanding of the base environmental characteristics better.

The Monitoring Plan outlines the proposed frequency of monitoring, parameters to monitor, and monitoring locations for:

- Groundwater quality
- Surface water quality and quantity
- Sediment quality
- Ecology quality
- Cultural monitoring
- Flooding complaints
- Commercial and industrial site audits
- Stormwater network outfall inspections

The monitoring programme has been designed to monitor the performance and ecological impact of the stormwater discharges on the environment and guide both reactive and proactive management and any additional maintenance of the stormwater infrastructure in Temuka. This includes the monitoring requirements that are linked to the targets proposed to meet the objectives as well as additional monitoring provided to assist TDC management of the network and understanding of the base environmental characteristics better. Current adaptive management actions are detailed within the TARP (trigger, action, and response plan) that is included in the Monitoring Plan.

There are typically three levels of triggers with respect to groundwater and surface water quality, sediment quality, and ecology quality. Trigger Level 3 is a limit that no action is required. Trigger level 2 exceedances require a moderate level of action. Trigger Level 1 requires a high level of action.

The Monitoring Plan will be reviewed annually. The annual review shall identify the monitoring parameters that should be added, dropped or frequency changed, and if changes are considered necessary these have to be certified by the consent authority before adoption, but not including cultural aspects.

The Monitoring Plan has placeholder basic cultural monitoring elements already within it such as fish community monitoring. More or a replacement cultural monitoring is in development with AECL / Arowhenua and Kitson Consulting Limited. This will also likely have elements of triggers, action and response requirements. This is being worked on initially at a high level now with a focus

on Temuka but is also considering how it (as a framework) can apply to the other townships to be consented at a later date.

As such it is proposed to be an action to be competed after decisions are made. A tentative timeframe for its completion and integration into the TARP document within 6 months after commencement of the consent.

A certification process will occur with Arowhenua and once this has occurred, and any subsequent cultural monitoring amendments, the updated Monitoring Plan with respect to cultural aspects only will be provided to the consent authority for their information.

5.11 Proposed Conditions and Duration

The proposed conditions of the Temuka SMA stormwater and construction phase stormwater discharge permit is attached as Appendix 8

A duration of 35 years has been requested given:

- The level of established baseline information provided with the application, and the monitoring proposed means there is a reasonable certainty as to the current state of the environment and that changes and trends will be detected.
- The application has not prescribed a strategy or set methods for reducing sources of contaminants or treating them therefore allowing greater flexibility to adopt new technology and practices.
- The adaptive management approach proposed and integrated into a range of certification and review consent conditions allows for:
    - An early adoption of changes to legislation (e.g. regional plans giving effect to Te Mana o te Wai),
    - Responding to changes to monitoring and response to emerging issues, triggers being exceed adverse trends or changes receiving environment standards
    - Dealing with adverse effects in the broader receiving environment from other influences if they were to increase or vary during the term of the consent
- The significant existing capital investment in the activity/assets
- Given the existing urban area and associated stormwater discharges have previously formed part of the environment (as permitted activities for 30 years +) and the time that would be required to address those legacy effects
- The overall significant investment to prepare the application and that a longer duration would better achieve administrative efficiency.

  As assessed Section 8, the effects on the environment are considered to be only minor, with effects on cultural values and use thought the SMP implementation will over time be diminished or addressed..

6 Activity Classification

6.1 Resource Management Act 1991

Section 15 of the RMA places restrictions on discharges of contaminants to water or land where it may enter water. Section 15(1) states that:

No person may discharge any –

(a) Contaminant or water into water

(b) Contaminant 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 water; or

[…]

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 discharges of stormwater (developed and construction-phase) will involve discharges of contaminants into water, and onto and into land in circumstances that may result in that contaminant entering groundwater.

There are no national environmental standards (NES) that apply to the discharge activities sought so a NES does not expressly allow them (refer section below). Therefore, the discharge of stormwater needs to be expressly allowed either by a rule in a regional plan and a proposed plan or by a resource consent (discharge permit).

6.2 National Environmental Standard or Regulation

The NES-Freshwater 2020 (NES-F) has regulations that relate to construction and maintenance of specific infrastructure (which includes stormwater networks) within or near natural wetlands (Part 3 Sub-part 1).

The entire Part 3 Sub-part 1 - Natural wetlands of the NES-F has been deliberately drafted to not control 'a discharge of contaminants', unlike other NES-F Parts that do specifically refer to a 'discharge of contaminants' for example rainfall derived sediment laden runoff from winter grazing or increased nutrient losses in land drainage associated with intensification of agricultural land uses. As such the NES-F does not apply to actual stormwater discharges under the natural wetland provisions.

Within Part 3 Sub-part 1 - Natural wetlands there are classifying regulations relating to the construction or specified infrastructure and maintenance and operation of specified infrastructure. The activities regulated include vegetation clearance and earthworks, the taking, use damming, diversion or discharge of water. No existing parts of the stormwater network are within 10 m or within the potential natural wetlands identified in Section 4.9, or no s14 RMA restricted water related activities or discharge of water are occurring within 100 m of these potential wetlands.

Potentially new stormwater infrastructure could be constructed near a natural wetland as part of a development or a TDC implementation project. If and when this is proposed a planning assessment would be undertaken by the developer or TDC and if required the appropriate national, regional and district resource consents would be sought.

There are no other relevant National Environmental Standards or Regulations that have a classification regulating that applies to the proposal.

6.3 Opihi River Regional Plan

The Opihi River Regional Plan (ORRP) is still operative and relates to discharges to surface water Plan Change 7 to the LWRP involves adding new Opihi River catchment provisions into sub-regional Section 14 (Orari-Temuka- Opihi-Pareora) and then withdrawing the ORRP. The decisions on PC7 have been appealed so this process has been delayed.

As the proposed activities are not permitted by another regional plan (i.e. the LWRP) the discharges do not qualify for an exemption from the relevant Rule 1 in the ORRP for the activity.

Rule 1 Discretionary Activity

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 ORRP has the following Class OPIHI Water Standards and Terms for the discharge of stormwater to a river activity, to manage for: the aquatic ecosystem, fishery, contact recreation, water supply and particular cultural and aesthetic purposes of the river.

The activity is required to comply with the following standards after reasonable mixing, but in the event an activity doesn't it does not change the activity status from discretionary.

Standards and Terms

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 a contaminant.
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.
3. BOD5 of GF/C-filtered water shall not exceed 2 grams per cubic metre, as a result of any discharge of a contaminant.
4. The visual clarity of the water shall not be rendered so low as to be unsuitable for bathing, by the presence of contaminants.
5. The concentration of dissolved oxygen shall be not less than 80% of saturation concentration, as a result of any discharge of a contaminant.
6. Fish or other aquatic organisms shall not be rendered unsuitable for human consumption by the presence of contaminants.
7. There shall be no significant adverse effect on aquatic life as a result of any discharge of a contaminant.
8. The natural temperature of the water shall not be changed by more than 3° Celsius and shall not exceed 25° Celsius, and the temperature of the water shall not adversely affect the spawning of trout or salmon during the spawning season.
9. The median faecal coliform concentration, based on not less than five samples taken within any 30 day period, shall not exceed 200 faecal coliforms per 100 millilitres.
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.

<u>Assessment:</u>
The discharge of stormwater directly into the Taumatakahu Stream is unlikely to comply with Standard 9 nor is Standard 9 likely to be observed all the time due to other such contaminant sources other than stormwater. Possibly Standard 4 would not be complied with due in part to stormwater contributions to Taumatakahu Stream but the stream is not used for bathing.

It is a reasonable assumption that the small quantity of stormwater discharges to the Te Uma kaha (Temuka River) margins that may enter surface water would meet all of these standards.

6.4 Land and Water Regional Plan

6.4.1 Overview

The LWRP operates at two levels, region-wide and zone specific (i.e. sub-regional). The region-wide policies and rules act as the holding position and apply across the region unless a sub-regional section of the plan contains a more specific policy or rule.

The operative sub-regional Section 14 and the still proposed PC7 (decision version being appealed) changes to Section 14 Orari-Temuka-Opihi-Pareora of the LWRP does not contain any sub-regional rules relating to stormwater system discharges.

Initially there are three separate regional rules to consider in the LWRP to establish the classification of the stormwater discharges (operatively into land, and the PC7 decision version that has legal effect into surface water) sought for the Temuka SMA:

- Rule 5.93 - The discharge of stormwater and construction phase stormwater from a reticulated stormwater system
- Rule 5.95 - The discharge of stormwater into a river, lake, wetland or artificial watercourse
- Rule 5.96 - The discharge of stormwater onto or into land where contaminants may enter groundwater

6.4.2 Reticulated Stormwater System

The LWRP provides a definition of a reticulated stormwater system as:

> ***Reticulated stormwater system*** *means a system of pipes, swales, drains, kerbs and channels owned or operated by a network utility operator that collects stormwater within areas used or proposed to be used for urban-residential, commercial or industrial purposes and conveys that stormwater to any device, wetland, retention or detention pond or infiltration basin for the treatment of stormwater, prior to a discharge to land, groundwater or surface water. It excludes any drainage system that has been constructed for the primary purpose of collection, conveyance or discharge of drainage water.*

The existing and proposed TDC stormwater system is consistent with the LWRP reticulated stormwater system definition. The relevant rule for reticulated systems in the LWRP is:

> *5.93 The discharge of stormwater or construction-phase 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 water body 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.*

This application has been lodged prior to an agreed extension to the 30 June 2018 deadline so has meet the timeframe requirement of Condition 1. A SMP has been prepared and attached to the application lodged so the requirement of Condition 2 has been meet. The relevant table from Schedule 8 described in Condition 3 has been copied and inserted as Table 6:1.

Table 6:1 – Schedule 8: Region-wide water quality limits for certain rivers, and groundwater (tables extracted from LWRP)

Rivers

River type	Parameter	Measurement	Limit
Spring-fed plains Spring-fed plains urban	Nitrate toxicity	annual median	3.8 mgN/L

Groundwater

Contaminant	Measurement	Limit
Nitrate-N	Maximum concentration	<11.3 mg/L
Nitrate-N	Annual average concn	<5.65 mg/L
E.coli	95% of samples	<1 organism/100 millilitres
Other contaminants[2]	any sample	<50% MAV[3]

[2] Other contaminants of health significance as listed in NZ Drinking-water Standards.

[3] Maximum acceptable value (as listed in [2] above)

Rivers (surface water)

The Te Uma kaha (Temuka River) is classified Hill-fed Lower, so does not have a region wide water quality limit.

The Taumatakahu Stream and its northern tributary is classified as Spring-fed Plains-Urban. The Baseline EA reported Nitrate-N concentrations in these streams at 3 sites (TE_S4 to TE_S6 from two dry weather (summer and winter) monitoring events in a year. There were not a significant difference between the two streams in terms of concentrations. The median of these 6 results was 1.02 mg/L. So this suggests with the data available the Schedule 8 river limit is being achieved now.

Nitrate-Nitrogen in urban stormwater typically ranges between 0.4 and 2.0 mg/L (refer Table 5:1), and the direct discharges to surface water (or indirectly via groundwater) will be in the order of that observed in Taumatakahu.

The stormwater discharges will occur for a small percentage of time per annum. It is considered that the stormwater volume and concentrations compared to nitrates inputs from the surrounding agricultural land drainage origins, will not cause or will be the cause in the future of the Taumatakahu Stream and its northern tributary potentially not meeting the regional limits for nitrate toxicity.

Groundwater

The maximum Nitrate –N concentration in Table 6:1 is the Maximum Allowable Value (MAV) in the Drinking Water Standards for New Zealand 2005 (revised 2018)(DWSNZ). The annual average concentration limit is half the MAV. The DWSNZ are applicable to water intended for drinking by the public, the extract with respect to Groundwater from the DWSNZ revision that applied refers to: *'any sample taken from a drinking supply well abstraction'*.

The NES for Sources of Drinking water applies the same principle that regional consent authorities considers the effects at the abstraction point.

If this is not clear that logically the groundwater limits apply at a drinking water abstractions. LWRP Policy 4.14 for discharges of contaminants into land provides more direction on how to

apply the Schedule 8 groundwater quality limits with respect to each type of contaminant. The policy requires nutrients to meet limits at the point of discharge to land anticipates plumes in groundwater for toxicants and sufficient distance between the point of discharge, any other discharge and drinking-water supplies to allow for the natural decay or attenuation of pathogenic micro-organisms in the contaminant plume. Recent previous S42A reports and decisions for townships stormwater reticulated network discharges applied the Schedule 8 limits at wells where groundwater is very shallow or less than 10 m bgl being Rangiora (CRC184601), Hanmer Springs (CRC17351), and West Melton (CRC167465). As do numerous other recent decisions for urban development discharges to land at Rolleston sought by developers.

The current background concentrations of Nitrate – N in groundwater can be reasonably be assumed to be above the annual average of 5.65 mg/L, but no conclusions can be drawn with the limited information used in this AEE as to if the maximum limit of 11.3 mg/l is being exceeded.

Nitrate-Nitrogen in urban stormwater typically ranges between 0.4 and 2.0 mg/L (refer Table 5:1). After discharge of stormwater to land the Nitrate –N concentrations it is likely that shallow groundwater quality in most areas of the SMA will be reduced as a result of the lesser concentrations in the treated stormwater. So the stormwater discharges would not be the cause of any exceedances of the nitrate nitrogen limits.

It is not expected that, as a result of the discharges onto and into land (after informal treatment), the residual metals and hydrocarbons ('other contaminants') will result in exceedances of the limits in Table 6:1 - Groundwater of '*any sample*' taken from a drinking supply well abstraction, or even at a short distance from a soakpit.

PDP have assessed the risk of micro-organisms (e.g. *E.coli*) in stormwater discharges to land via the existing soakpits on existing wells used for drinking water supply. There is potential that there is not sufficient distance (as per LWRP Policy 4.14 (c)(iia)) between the existing discharge points for stormwater to not be a cause of water in existing wells to exceed <1 *E.coli* /100 millilitres.

Given a potential non-compliance with Condition 3 of Rule 5.93 with respect to *E.coli* in groundwater at a drinking water supply well, the discharges from the existing and any potential new TDC reticulated stormwater system, to land and water is classified by Rule 5.94 (as below) as a non-complying activity.

5.94 The discharge of stormwater or construction-phase 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 that does not meet the conditions of Rule 5.93 is a non-complying activity.

6.4.3 Individual Sites to Surface Water

With respect to the discharges to surface water (not via the TDC stormwater network) from individual residential or commercial properties covered by this application the following rule applies:

5.95 The discharge of stormwater, other than into or from a reticulated stormwater system, into a river, lake, wetland or artificial watercourse or onto or into land in circumstances where a contaminant may enter a river, lake, wetland, or artificial watercourse water is a permitted activity provided the following conditions are met:

1. *The discharge is not from, into or onto contaminated or potentially contaminated land; and*

2. *The discharge is not into:*

   (a) a water race, as defined in Section 5 of the Local Government Act 2002; or

(b) a wetland, unless the wetland is part of a lawfully established stormwater or wastewater treatment system; or

(c) a water body that is Natural State, unless the discharge was lawfully established before 1 November 2013; and

3. *The discharge does not result in an increase in the flow in the receiving water body at the point of discharge of more than 1% of a flood event with an Annual Exceedance Probability of 20% (one in five year event); and*
4. *The discharge meets the water quality standards in Schedule 5 after reasonable mixing with the receiving waters, in accordance with Schedule 5; and*
5. *The concentration of total suspended solids in the discharge shall not exceed:*

(a) 50 g/m³, where the discharge is to any spring-fed river, Banks Peninsula river, or to a lake except when the background total suspended solids in the water body is greater than 50 g/m³ in which case the Schedule 5 visual clarity standards shall apply; or

(b) 100 g/m³ where the discharge is to any other river or to an artificial watercourse except when the background total suspended solids in the water body is greater than 100 g/m³ in which case the Schedule 5 visual clarity standards shall apply; and

6. The discharge to water is not within a Group or Community Drinking-water Protection Zone as set out in Schedule 1; and

7. The discharge does not occur where there is an available reticulated stormwater system.

Does Not Comply: There may be instances where larger individual residential or commercial properties pipe stormwater discharges directly to the Taumatakahu or its tributary which will result in:

- Increases in flows by more than 1% in a one in five year event so will not meet Condition 2(c); and
- Concentrations of metals (i.e. zinc from older roof materials) from untreated commercial carparking areas) in the discharge that exceed the standards in Condition 4 .
- TSS concentrations greater than 50 g/m³ to in Condition 5.

Note: even best practice stormwater treatment swales, wetlands, or attenuation basins may never achieve these TSS standards if the condition is not interpreted to be an on average concentration.

Given that discharges to, contaminated land have been excluded from the activity, and the discharges will not be into a water race, natural wetland or natural classed river, or within a Group or Community Drinking-water Protection Zone it is considered that the other conditions and sub-clauses of Rule 5.95 will be met.

6.4.4 Individual Sites to Land

With respect to the discharges onto and into land (not via the TDC stormwater network) from individual residential and commercial properties covered by this application the following rule applies:

5.96 The discharge of stormwater, other than into or from a reticulated stormwater system, onto or into land where contaminants may enter groundwater is a permitted activity provided the following conditions are met:

1. *The discharge is not from, into or onto contaminated or potentially contaminated land; and*

2. The discharge:

(a) does not cause stormwater from up to and including a 24 hour duration 2% Annual Exceedance Probability rainfall event to enter any other property; and;

(b) does not result in the ponding of stormwater on the ground for more than 48 hours, unless part of the stormwater treatment system; and

(c) is located at least 1 m above the seasonal high water table that can be reasonably inferred for the site at the time the discharge system is constructed; and

(d) is only from land used for residential, educational or rural activities; and

(e) does not occur where there is an available reticulated stormwater system, except where incidental to a discharge to that system; and

(f) is not from a system that collects and discharges stormwater from more than five sites.

Does Not Comply: As commercial land use is part of this application; the proposal will not comply with Condition 2(d).

Given that discharges to contaminated land have been excluded from the activity, and implementation methods will require only suitable ground conditions to be used for soakage facilities, it is considered that the other conditions and sub-clauses of the Rule 5.96 will be meet.

6.4.5 Individual Sites - Final Classification

Individual sites that do not meet one or more of the conditions of Rules 5.95 and 5.96, are classified by the Rule quoted below:

5.97 The discharge of stormwater, other than from a reticulated stormwater system, into a river, lake, wetland or artificial watercourse or onto or into land in circumstances where a contaminant may enter water that does not meet one or more of the conditions of Rule 5.95 and Rule 5.96; and the discharge of stormwater or construction-phase stormwater into a reticulated stormwater system that does not meet the condition of Rule 5.93A; is a discretionary activity except that within the boundaries of Christchurch City it is a non-complying activity.

Under Rule 5.97 the existing and future individual properties discharges would be classified as a *discretionary activity*.

6.5 All Activities Classification Summary

Table 6:2 summarises the activity classifications for the range of stormwater activities sought. The proposal is considered to have an overall non-complying activity classification.

Table 6:2 – Activity classification summary

Activity	Plan	Rule	Classification
TDC stormwater network to land	LWRP	5.94	Non-complying
TDC stormwater network to surface water	ORRP	1	Discretionary
	LWRP (PC7)	5.93	Restricted discretionary
Individual Properties to Land	LWRP	5.97	Discretionary
Individual Properties to Surface Water	ORRP	1	Discretionary
	LWRP (PC7)	5.97	Discretionary
		Overall Classification:	**Non-complying**

7 Consultation

7.1 Overview

Schedule 4 Clause 6(f) of the RMA indicates that an AEE should identify: "*those persons affected by the proposal, the consultation undertaken and any response to the views of those consulted*".

TDC has consulted with potentially affected stakeholders. the wider Temuka community and the likely interested parties to this application. Also they have collaborated with Te Rūnanga o Arowhenua.

7.2 General Public Consultation - Stormwater Management Plans

General public consultation for all the urban areas that SMPs were being developed (including Temuka) for was undertaken in October 2021 with open house drop in sessions where members of the public could meet in person at an advertised venue or via a survey (both online and published in the Courier).

Four drop in sessions were held including an evening at the Temuka Stadium on the 28th October 2021.

TDC received 51 submissions (online or via hardcopy, or at the open houses), of which only 13 lived in Temuka. The key findings for all responses (including other townships) were: [29]

- Of the total number of survey respondents, the most commonly experienced stormwater issues were flooding and pollution (both affecting 57% of respondents), followed by lack of maintenance (55%), poor stream health and climate change (51% each).
- When stormwater issues were rated in terms of the most critical, the two top issues identified were: loss of aquatic life/habitat, followed by polluted stormwater entering waterways.
- All survey respondents identified some usage of their local waterways and surrounding areas, including for running/walking, relaxing, fishing, food gathering and kayaking.
- Survey respondents reported low overall levels of satisfaction with the quality of our waterways. Timaru and Temuka waterways scored higher than the quality of Pleasant Point and Washdyke waterways (Washdyke was the lowest).
- 25% of survey respondents perceived Timaru District Council's management of stormwater in their area as being either very good or excellent, 45% perceived it to be average, whereas 30% of respondents thought Council's stormwater management to be either poor or very poor.
- The greatest threats identified to local waterways by survey respondents were: fertilisers/pesticides (highest) and rubbish/litter and industrial pollution (second equal). Car/house washing and animal waste were perceived to be the lowest overall threats.

Specific comments received from Temuka submitters are below:

- *Better management of leaves in street grills*
- *No weather monitoring in Temuka: Timaru airport data not sufficient.*
- *No issues at my property*
- *Regional Council... Vegetation in major riverbeds need more frequent maintenance.*
- *Need a case by case approach for stormwater standards for new buildings - some don't actually need it and others need more.*
- *Spraying herbicides into waterways*

[29] https://www.timaru.govt.nz/services/environment/storm-water/stormwater-management-plan

- *Stream routes under road bridges too small for water flows in extreme rain events. Water backs up then flows over the bridge causing damage.*
- *Weed content choking waterways not addressed often enough if at all. Fallen trees/shrubs in waterways not cleared following extreme weather.*
- *Need to be realistic as to what the local community can afford. Forward planning is the key to long term improvements. We live on flood plains! Nature always rules in the end.*
- *Council doesn't pay attention to leaf build-up on Domain Ave - sweeper only comes once a week. Curb flooding happens from drains getting blocked by leaves! More maintenance needed in autumn.*
- *Flood-prone areas map inaccurate – it's been a long time since Opihi College grounds were flooded, but flooding of areas around Taumatakahu stream is becoming a regular event (1986, 2000, 2017, 2018 and 2021)*

The general responses to the specific comments are:

- The maintenance of the streams through Temuka is the responsibility of the ECan River Engineers.
- TDC is development of an effective maintenance programme to prevent debris blockages and sediment build-up.
- Comprehensive hydraulic modelling will enable some sites / buildings to be excluded from attenuation stormwater standards. This modelling will also investigate the incidences of Taumatakahu Stream overtopping its banks and potentially causing damage to infrastructure.
- The flood mapping that has been undertaken wasn't available at the time of the public consultation so the older flood maps were out of date and inaccurate.

TDC sent a thank you letter on 8 March to all persons who made a formal submission during SMP consultation in October and November last year (excluding those people whose submission said they did not want us to contact them).

7.3 Temuka Community Board

Two presentations by the TDC Drainage and Water Manager occurred with the Temuka Community Board.

The first was in November 2021 to introduce to the Board the reasons for developing a SMP for Temuka, some initial issues identified in technical reports prior to community engagement, the vision for Temuka, draft objectives, followed by a high level process for developing the SMPs and resource consent applications.

On the 23 May 2022, an update was provided to the Community Board. This was primarily focused on the outcomes of the public engagement surveys, the objectives, and progress with the key resource consent application documents such as the Implementation Plan and Monitoring Plan.

7.4 Collaboration with Te Rūnanga o Arowhenua

TDC and AECL (on behalf of Te Rūnanga o Arowhenua (Arowhenua)) have entered into a collaboration agreement for the Timaru, Washdyke, Temuka and Pleasant Point SMPs and associated resource process. This was signed off in May 2021.

The purpose of the agreement was to establish clear expectations of the engagement and information being provided during the preparation and applications assist for the projects delivery. Also it was to establish the process during the processing of the resource consent application

During the processes for the development of the SMP and this application, the engagement with AECL / Arowhenua that has occurred (but not limited to) is summarised as:

- AECL representatives have collaborated with TDC to develop the vision for stormwater management for the townships and also the objectives and targets for Temuka (that form part of the application).
- Cultural site walkovers of waterways including (Temuka's) attended by Arowhenua Cultural advisors, TDC and WSP or PDP. This was to assist in understating the cultural landscape and monitoring locations.
- AECL worked with TDC to develop the issues assessment.
- Arowhenua cultural advisors supported TDC in public engagement open houses.
- Arowhenua cultural advisors presented supporting stormwater process and assisting the understanding of Councillors workshop on the SMPs and resource consent process.
- AECL presented to the Temuka Community Board and detailed what Arowhenua would like from the SMP and its support for what has been included.
- AECL has collaborated on the development of the implementation plan process, and Monitoring Plan.
- AECL were provided early drafts of the SMP for comment, and has been given drafts of the AEE and proposed conditions for comment.
- The Stormwater Management Plan outlines the ongoing intent of TDC to collaborate with Arowhenua by ensuring Arowhenua will part of the working group to identify, prioritise and evaluate projects for Temuka's stormwater management or improvements to the environment.

It is TDCs understanding that AECL / Arowhenua are generally supportive of the application, and that during the course of the processing they will be working in partnership with TDC to enable their views to be at the forefront of the decision making process.

7.4 ECan River Engineers

ECan River Engineers are the managers of the Taumatakahu and its tributary and the Te Uma kaha (Temuka River) and have been engaged with through pre-application meetings with the Environment Canterbury Consents Section and Science Teams, and an in person meeting. .

Pre-application engagement has mainly occurred through providing issues summary documents for ECan to review , and this included Temuka, which was also provided to the ECan River Engineers for comments. Also ECan River engineers were provided copies of the WSP network capacity and flooding assessments (including Temuka).

A video call meeting was subsequently held between TDC, ECan River engineering representatives, Nick Reuther (ECan Consent Planner and WSP who undertook the network assessments on the 2 November 2021. The main topics discussed were 'Flooding Issue Summaries' and 'Waterway Ownership/Responsibility'.

The meeting notes for Temuka and any relevant general matters were:

- In Temuka and Pleasant Point, floor levels area generally governed by river flooding (as opposed to localised stormwater flooding) and a high percentage in Pleasant Point have been built up and most if not all since the mid-1990s (when legislation came in requiring setting of floor levels relative to flood risk). There would be relatively few buildings sitting at Building Code minimum height so the mapped 'at risk buildings' in the issues report are over-representing the risk.
- General:- Where a stream is identified as being a Bylaw waterway, ECan generally operate on an urban = TDC and Rural = ECan divide regarding responsibility for waterway maintenance. However in the case of Taumatakahu Stream – this is an exception. This may be a legacy arrangement due to ECan depot located in Temuka.

- ECan maintenance of Taumatakahu an include vegetation spraying and clearing of fallen trees.
- Te Uma kaha (Temuka River) – is part of OTOP rating district and is the responsibility of ECan.
- Rating of properties is for Te Uma kaha (Temuka River) flood protection works not Taumatakahu flooding
- There has been stream planting around Fish and Game office and spawning areas.
- General – consideration of access for maintenance and impact on flood risk in regard to water quality / restoration work.

It is clear that Taumatakahu and its tributary that is identified as ECan managed under their Bylaw and is ECan's responsibility. TDC is working with ECan River Engineers as to whether in the TDC district, TDC take on any other responsibilities for Bylaw waterways within urban areas.

At the time of completion of the AEE, TDC is not in any active process of seeking written approval of the ECan River Engineer Section. It is expected that once lodged the ECan Consent Section will engage internally with the ECan River Engineering Section to determine if there is any concerns.

7.5 Temuka Drinking-Water Supply Wells

TDC has made contact with registered well owners and properties that probably have unregistered wells within and downgradient of the Temuka SMA. Through TDC making contact via phone those wells no longer used for drinking supply were established as well as the sources of drinking supply for properties that had nether registered wells or reticulated supply. Following this initial contact letters were sent to remaining active drinking water supply well owners informing them of urban area stormwater discharge permit was being sought, and that the discharges of stormwater to land via soakpits were part of the application.

This initial contact was followed up by face to face meetings with the parties individually where a written summary of the PDP Contaminant Transport Assessment was provided included a plan that showed the SMA boundary. A summary table of the well / property owners contacted is included in Appendix 9. Also attached in Appendix 9 is the TDC's letter content and the information summary provided to the well owners.

The summary table includes: the confirmed use of the wells or not for drinking water; where owners volunteered information if there supply water was treated or not; and whether or not they had provided their written approval, intended to provide written approval or were unlikely to provide written approval. Those written approvals received by TDC to date are also included in Appendix 9.

Ongoing engagement is occurring only with those parties that have indicated verbally they are willing to sign the affect parties form.

7.6 Other Key Stakeholders

7.6.1 SMP General

The following other key stakeholders were sent TDC letters informing them of TDC and Te Rūnanga o Arowhenua were developing stormwater management plans (SMPs) for Timaru, Washdyke, Temuka and Pleasant Point to help develop long term management and improvement plans for our urban stormwater systems.

Firstly these stakeholders were informed on the process being undertaken on the 3 August 2020 in a TDC letter, and subsequently of the issues identified for each township on 13 October 2021 in a second TDC letter.

The stakeholders were encouraged in the second letter to have a say and potentially influence how the SMP addresses issues in the future or if they had any concerns about stormwater in the

townships. The stakeholders were advised that TDC was seeking one-to-one meetings in person or via video calls or to complete the survey form found at a TDC website link.

- Waka Kotahi NZ Transport Agency
- Department of Conservation
- Fish and Game (F&G)
- Orari-Temuka-Opihi-Pareora Zone Committee (OTOP)
- KiwiRail
- Otipua-Saltwater Creek Catchment Group
- Waitarakao Taskforce
- Pleasant Point Museum and Railway
- Timaru District Council Parks and Land Transport Unit

7.6.2 Temuka Relevant

Angela Christensen (F&G) and Lucy Millar who is the Chair of OTOP were recently invited to TDC's update presentation to the Temuka Community Board on 23 May 2022. Unfortunately neither were able to make it but TDC emailed them a copy of the report and Powerpoint slides.

Other than Fish and Game (refer below) no further engagement has occurred following the TDC approaches with respect to Temuka with DoC, NZTA or KiwiRail. It is not anticipated that the Temuka SMP is of as much relevance to these stakeholders compared to the other SMPs in development.

7.6.3 Fish and Game

Fish and Game attended a one on one meeting. This was held on the 28 October 2021 and meeting minutes were taken. The Fish and Game Representative was Angela Christensen (AC) who is in the Central South Island Resource Office and for F&G evaluates all the resource consent applications within the central SI region. Her office is based on the bank on the Taumatakahu Stream.

The notes of the meeting with respect to Temuka were:

- *AC noted that Schedule 17 of the LWRP delineates protected salmon spawning sites* [i.e. Te Uma kaha (Temuka River) adjacent to and Opihi river downstream of the SMA]
- *F&G collects spawning fish counts. This data could be made available to TDC. Includes the Taumatakahu Stream and other spawning sites. AC to provide TDC spawning data.*
- *F&G was involved in the habitat restoration work in the Taumatakahu Stream. This work was completed in conjunction with ECan (and possibly some community groups). This work was completed approximately 10 years ago.*
- *F&G own and operate a 'Sand Wand' that can remove fine sediment from streams*
- *AC noted that the recent flood flows in the Taumatakahu Stream has relocated the fine sediments from the upper stretch of the stream to the lower reaches.*
- *TDC thought that an old weir on the Taumatakahu Stream - near the Temuka Oxidation Ponds (which was part of the Old Mill) could still be acting as a fish barrier. AC noted that the presence of trout in the upper stretch suggests that this was not the case for introduced species.*

General notes with respect to all SMPs being prepared were:

- *AC wanted to understand how the reviews will work and who will undertake the reviews – specifically if F&G could feed into the review.*
- *AC would like any works to be undertaken outside spawning dates.*

F&G haven been added to the proposed conditions as to being involved in any reviews to the SMP. With respect to works occurring outside spawning periods, these activities are subject to separate s9 and s13 RMA restrictions. The regional plans rules for these restrictions have permitted activity

conditions relating to spawning periods, so are already dealt with, and as such are not within the scope of this application.

7.7 Interested Land Development Parties

The following interested land development parties (Developers, Surveyors, Consultants) in the Timaru district were sent TDC letters informing them of TDC and Te Rūnanga o Arowhenua were developing stormwater management plans (SMPs) for Timaru, Washdyke, Temuka and Pleasant Point to help develop long term management and improvement plans for our urban stormwater systems.

- Paul Smith Earthmoving Timaru
- Rooney Earthmoving
- Jennians Homes Mid & South Canterbury
- Stonewood Homes
- Lone Pine Building Ltd
- Nolan Building Ltd
- Trident Homes Timaru
- Milward Finlay Lobb Ltd
- Davis Ogilvie (Aoraki) Ltd
- Land Services Group
- Argyle Holdings
- Ryan De Joux

Firstly these parties were informed on the process being undertaken on the 3 August 2020 by TDC letter, and subsequently of the issues identified for each township on 13 October 2021 in a second letter.

The parties were encouraged in the second letter to have a say and potentially influence how the SMP addresses issues in the future or if they had any concerns about stormwater in the townships. Attendance was encouraged at either the open house for each township to provide verbal feedback or to complete the survey form found at a TDC website link.

For Temuka, none of the above parties indicated they would be attending open house session on the 28 October 2021 held at the Temuka Stadium Lounge.

8 Actual and Potential Effects

8.1 Overview

Section 88 of the RMA requires that an applicant make an assessment of any actual or potential effects that the proposed activity may have on the environment, and the ways in which any adverse effects may be avoided, remedied or mitigated

In accordance with Section 104(1)(a) and (ab) of the RMA, when considering an application for a resource consent, the consent authority must, subject to Part 2, have regard to:

- *any actual and potential effects on the environment of allowing the activity.*
- *any measure proposed or agreed to by the applicant for the purpose of ensuring positive effects on the environment to offset or compensate for any adverse effects on the environment that will or may result from allowing the activity*

In the RMA, unless the context requires otherwise, the term effect includes—

(a) any positive or adverse effect; and

(b) any temporary or permanent effect; and

(c) any past, present, or future effect; and

(d) any cumulative effect which arises over time or in combination with other effects—

regardless of the scale, intensity, duration, or frequency of the effect, and also includes—

(e) any potential effect of high probability; and

(f) any potential effect of low probability which has a high potential impact.

The effects in relation to this application include the past, present, and future effect given it involves the stormwater reticulated network activity that has occurred for decades and is still occurring, and given the scale and duration of consent sought any cumulative effect which arises over time or in combination with other effects. Temporary effects could be considered to apply to construction-phase discharges when managed appropriately.

Section 104(2) of the RMA states;

> *When forming an opinion for the purposes of subsection (1)(a), a consent authority may disregard an adverse effect of the activity on the environment if the plan permits an activity with that effect.*

Rule 5.96 permits the discharges to land from up to 5 residential properties, the discharges will have similar *E.coli* concentration in their discharges as reported in the literature. The effects on groundwater quality in particular micro-biological impacts from this activity is not expected to be any material different to the larger urban catchments sought.

Case law has also determined that the existing environment is a component in considering permitted baseline effects, extracts from the relevant caselaw is quoted below.

> *"Existing activities carried out under […] existing use rights are not part of the statutory baseline (because it only applies to activities permitted by rules). However, they are likely to be part of the existing environment against which effects must be assessed at least for the purposes of s95D which uses the word "environment".*
>
> *The Court of Appeal in Queenstown Lakes DC v Hawthorn Estate Ltd (2006) 12 ELRNZ 299; [2006] NZRMA 424 (CA), considered that the "environment" embraces the future state of the environment as it might be modified by […] the implementation of resource consents which have been granted at the time a particular application is considered, where it appears that those resource consents will be implemented."*

To add further clarity to the case law quoted above it is noted that "environment", as defined in the RMA, includes amongst other resources and values, and "people and communities".

The majority of the existing stormwater network and minor discharges sought (otherwise not permitted or separately consented) were previously lawfully established under the Transitional Regional Plan and the Natural Resources Regional Plan for Canterbury that predated the LWRP. The previously lawfully established existing discharges could be considered to form part of the permitted baseline effects. This provides a useful starting point for assessing the potential adverse cumulative effects relating to the increase in stormwater discharges from future development (at expected better quality than the existing discharges), in combination with improvements to existing discharges over a longer period of time.

Stormwater discharge via the stormwater reticulated systems is a long existing activity. It is actually not feasible for TDC to cease these existing network discharges, nor can private individuals for the other minor discharges sought. The applicant cannot prevent rainfall coming into contact with

these urban impervious surfaces and pervious surfaces, nor can it block up its network pipes to prevent a discharge as this would cause damage to property and discharges would occur via secondary flow paths to either the same receiving environment or another receiving environment. The LWRP promotes disposal of stormwater by way of a reticulated system.

The following effects are considered relevant to the proposed activities:

- Effects on soil quality
- Effects of slow entry into land
- Effects of groundwater quantity (recharge and mounding)
- Effects on groundwater quality and human health
- Effects on surface water quality and aquatic ecology
- Effects on cultural values and use
- Effects on flood carrying capacity and hazards
- Effects on amenity and recreational values
- Effects on wider community

These effects listed above are assessed in the subsections below.

Written approval has been provided from potentially affected drinking water supply well owners (Refer Section 7.5 and Appendix 9) and therefore pursuant to s95E of the RMA, adverse effects (such as effects on groundwater quality and human health) on these person(s) cannot be considered. Other well owners have indicated verbally they will provide written approval.

8.2 Effects on Soil Quality

Biomediafiltraiton stormwater treatment systems function by filtering stormwater through a constructed soil/media mix, these are aften in the form of a basin that is for larger catchment management. As the stormwater passes through to be disposed of to land or collected for disposal to land or surface water, most contaminants will be trapped or adsorbed in the soil/media of the biomediafiltration treatment device. This process will result in the accumulation of certain contaminants in the treatment media. In particular, contaminants such as trace metals (zinc and copper) that do not degrade, are likely to remain bound to the soil.

The rate of accumulation will depend on the concentrations of the contaminants in stormwater. It is expected that some business and industrial catchments will include higher levels than some residential areas.

No constructed biomediafiltration systems exist within the Temuka SMA area currently. There are two stormwater basins but primarily they provide treatment first flush treatment via attenuation (slow release). Given the very flat nature of the SMA the use of centralised systems to manage larger development is restricted.

At this stage the monitoring programme, attached as Appendix 10, does not detail periodic soil monitoring of biomediafiltration systems. Any new biomediafiltration devices for development will be added to the monitoring regime as required.

It should also be noted that vegetation health is also an indicator of soil contamination, and contamination levels that causes stress in plants for some contaminants can be below those that pose a risk to human health for some stormwater contaminants.

Overall, it is considered that the proposal will have no more than minor adverse effects on soil quality.

8.3 Effects of Slow Entry into Land

8.3.1 Overview

Infiltration systems and in particular soil lined basins have had reasonably high failure rates in Canterbury in the past. This has often been due to poor construction and understanding of the environmental restrictions on site.

Discharge of stormwater onto or into land can cause ponding or localised flooding if the disposal system has been insufficiently sized or has not been maintained adequately. Ponding stormwater can cause damage to neighbouring properties, affect amenity values, and cause odour from decomposition of organic material under anaerobic conditions.

It should also be noted that in particular cases increased duration of ponding will also increase the risk that a significant rainfall event will bypass or cause overflows to secondary flow paths designed, thus increasing stormwater quantity effects.

There are three main components to consider in relation to causes of slow entry into land – clogging of treatment media, subsoil permeability, and shallow water tables.

8.3.2 Soil Treatment Media Clogging

A critical consideration for the suitability of infiltration (biofiltration) practices is how to avoid clogging of the constructed soil treatment media used to line a basin or raingarden (if used). Usually the treatment media is constructed with native soil (depending on clay and silt content) and combined with sand and/or peat.

Pre-treatment devices should be more closely considered where a constructed media is used in a communal system, such as a swale, sediment forebay or at the very least submerged outlet collection sumps, to remove larger solids.

Blinding of soak pits inverts and walls (typically lined with a geotextile) can occur over time reducing infiltration rates to be less than the design the soakpit was sized to. Rejuvenating or replacement of these soakpits (adjacent) may need to occur.

Pre-treatment of stormwater prior to discharge to a biomediafiltration device or soakpit can reduce maintenance requirements.

8.3.3 Subsoil Permeability

Sub soil permeability is the most critical consideration for the suitability / feasibility of infiltration devices. For infiltration systems to function, free draining gravel strata has to be present immediately below a basin invert or the soakage device (infiltration trench, soakage pit or raingarden). It is noted that:

- Auckland Regional Council's TP10[30] states that the soil should not have more than 30 percent clay or more than 40 percent clay and silt combined.
- Christchurch City Council's WWDG[31] states soakage rates of the underlying strata needs to be greater than 50 mm/hr.

Mitigation of poor or imperfectly drained soils within an area used for stormwater disposal can be achieved for example by either:

- Removing the poorly or imperfectly draining strata (usually only practical or cost effective if <1.5m deep) and replacing with clean free draining material; or

[30] Auckland Regional Council, 2003. *Stormwater Treatment Devices: Design Guidelines Manual*. Technical Publication 10 (TP10).
[31] Christchurch City Council, 2003. *Waterways, Wetlands Drainage Guide – Part B: Design*.

- Constructing under drainage below the soil treatment media to collect filtered stormwater and discharge it into a soakage chamber located either in an area where free draining strata is present or drilled to a depth such that free draining material is encountered.

CCC's WWDG states that when soakage systems for public utilities are used, free draining gravel strata needs to be within 5 m of the ground surface.

Developers will be required to provide validation of the sub soils permeability via a soakage test undertaken in accordance with the ADC/TDC Stormwater Design Guidelines. This should occur regardless of the fact that reliable and relevant bore logs for the area or test pits undertaken at the location of the disposal area show the strata is 'very free draining'. Also whilst a test pit or borelog may indicate free draining material is present at a particular location, vertical and lateral changes in strata thickness can occur over short distances.

8.3.4 Shallow Groundwater

The performance of an infiltration basin, soakage pit or trench will also depend on the depth to groundwater. The shallower the water the slower the drainage from the basin, soakage pit or chamber will be. Depth to groundwater below the ground surface is provided by the ECan GIS database, which indicates that groundwater depth varies from approximately 1 to 2.4 m below ground level (bgl).

Further scrutiny of the effects of localised changes in groundwater levels and the additional stormwater loading will need to be considered by TDC for any longer term strategies, and any individual developers, as well as any impacts on groundwater levels from climate change.

Groundwater levels monitoring using water loggers is proposed in the Monitoring Plan at four locations which will build up information on seasonal changes in water levels, trends over longer periods of time and their response to rainfall events. This longer term information can assist in calibration and regression analysis with developers site specific water level monitoring.

8.3.5 Summary

It is considered that with proper understanding of the site constraints informing design, adequate conservatism in design and use of appropriate media in biofiltration systems and performance monitoring, the adverse effects of slow entry into land can be adequately mitigated to be less than minor.

8.4 Effects on Groundwater Quantity

8.4.1 Recharge

There is not expected to be a significant change in the groundwater balance associated with the rainfall recharge across the SMP Area from a fully developed and likely redevelopment scenario, due to the following reasons:

- It is unlikely that large areas of existing urban development would be able to be retrofitted to discharge stormwater to land due to the high shallow groundwater levels.
- Discharging to land for smaller new greenfield development will be encouraged where feasible.
- Localised recharge within the SMA is not the major influence on groundwater levels and baseflows to the streams.
- Increasing groundwater levels could also lead to an increase in groundwater losses to streams which may provide a buffering effect.

Overall the effects of directing stormwater into land is expected to have a beneficial effect on groundwater quantity (more recharge.)

8.4.2 Mounding

The collection of stormwater from large urban catchments and concentrating the disposal into land at centralised locations can result in the occurrence of localised changes in increases groundwater levels (i.e. mounding).

Discharges to land occur now with the use of 37 soakpits and discharges onto land occur within the Domain. Currently there is no large scale centralised soakage mitigation facility for large urban catchment areas. Given the flat nature of the catchment as so it expected that volumes retained or catchment areas for individual developments will be less than 2ha, which whilst small the shallower groundwater is still considered to be a potential issue. The TDC / ADC Stormwater Management Guidelines specifies the use of a flooded pit test where groundwater separation is less than 2 m and for communal systems in accordance with the methods described in can account for the effects of groundwater mounding when correctly carried out.

For any communal system in the SMA, groundwater mounding in their design needs to be considered and may need additional features such as underdrainage to manage the groundwater mounding impact or limiting to only discharging first flush runoff via infiltration, with larger events discharging to surface water.

The proposed conditions include a requirement to consider mounding and a general performance standard to avoid adverse effects.

8.4.3 Summary

Overall, it is considered that the adverse effects associated with slow entry to land will be less than minor.

8.5 Effects on Groundwater Quality and Human Health

8.5.1 Overview

The use of soakage facilities has the potential to affect groundwater quality in the immediate area, as infiltrated stormwater may introduce contaminants found in stormwater runoff into the groundwater.

Groundwater quality will be affected to some degree by the discharges to rural land, and from formal stormwater management systems such as soak pits, infiltration basins and raingardens and any associated overflows to rapid soakage devices; designed to retain and dispose of stormwater into the underlying free draining subsoils. However, this effect is predicted to be limited to shallow localised areas immediately around discharge points, and that the effect will be reduced with time and distance downgradient following the discharge event.

The Monitoring Plan includes broad monitoring of shallow groundwater quality for a range of parameters including cooper, lead and zinc and *E.coli.* These will have associated trigger levels linked to either er being detected, moderately elevated and encroaching on a drinking water standard Maximum Allowable Standard (MAV) or exceeding the MAV.

However no objectives or targets (other than at drinking water wells) in relation to *E.coli* are proposed for the general state of the ground water environment water quality. This is due to contaminants occurring from other sources not related to stormwater (surface water) or from stormwater from sites not covered by this application (private industrial sites to land), and in particular the overall lack of risk for metals. A more detailed reasoning for this is discussed for this in the sections below.

8.5.2 Discharge Quality

Urban stormwater typically contains contaminants such as suspended solids, nutrients, hydrocarbons, metals and microbes (bacteria). These contaminants have the potential to affect the water quality of the groundwater environment.

Table 8:1 presents an estimation of the discharge quality for the main stormwater contaminants to land from urban stormwater through a rapid soakage system or via a treatment system and associated overflow rapid soakage systems. Construction discharges of TSS to land are not a material risk to groundwater quality are not discussed further. Turbidity will also be removed by in situ subsoils gravels

Table 8:1 – Estimated discharge quality to land compared to guideline values

Determinand	Concentration Generated (g/m^3 unless otherwise stated) [a]	Treatment System Efficiency [b - c]	Discharge Concentration (g/m^3)	NZDWS (g/m^3 unless otherwise stated)
Turbidity	25	95	1.25	2.5 (GV)
NO_3	2	0 - 75	2 - 0.5	11.3 (MAV)
TP	0.4	0 - 75	0.4 - 0.1	-
Copper	0.02	25 - 75	0.015 – 0.005	2 (MAV), 1 (GV)
Zinc	0.8	25 - 75	0.6 - 0.2	1.5 (GV)
PAH	0.007	25 - 75	0.0053 - 0.0017	0.0007 (MAV) [d]
Microbiological	8,000 fc/100 ml (median)	0 - 75	8, 000 - 2,000	*E.coli* <1 MPN/100 ml (MAV)

Notes:

[a] Highest values taken from Table 5:1 unless stated otherwise.

[b] Soakage pit only, efficiency based on ability for contaminants to be in-solid form (i.e. bound to suspended sediment) and contained in blinding of soakage pit's gravels.

[c] Except TSS, based on mid-range value treatment efficiency for an infiltration basin (US EPA (1993), Stormwater Center (2002), Watershed Protection Techniques (1997)). A swale and raingarden will also have a similar efficiency

[d] There is no PAH DWSNZ limit, as benzo (a) pyrene is the main PAH compound of interest this limit has been used and it has been assumed conservatively that all the PAH concentration is benzo (a) pyrene

(MAV) Maximum Acceptable Value for inorganic determinands of heath significance/ for microbiological determinands, NZ Drinking Water Standards, MoH, 2005 (Rev 2008)

(GV) Guideline Value for aesthetic determinands, NZ Drinking-Water Standards MoH, 2005 (Rev 2008)

When comparing the concentrations in generated stormwater prior to disposal to land, only cadmium, PAH and E.coli are likely to exceed a MAV. After considering the removal of contaminants via the immediate in-situ gravels or prior a treatment device, the same determinants prior to migration to groundwater flows may still exceed a MAV.

8.5.3 Local Groundwater Quality

Overview

The individual contaminants of concern in relation to discharge quality to groundwater presented in Table 8:1 are discussed below.

TSS / Turbidity

Residual suspended solids or turbid water not removed by the stormwater management facilities (refer Table 8-1) will be removed in the insitu unsaturated and saturated subsoils beneath the facilities, and is highly unlikely to have an impact on groundwater quality beyond the immediate vicinity of the infiltration basins or rapid soakage devices.

Organic and Inorganic

The MAVs for organic and inorganic determinands are based on the risk to the health of a person who consumes two litres of that water a day over their lifetime (usually taken as 70 years).

Organic and inorganic substances that are dissolved or dissolve in groundwater will mix with the flowing groundwater from the continual flow of fresh groundwater from up-gradient areas. Advection, dilution and dispersion will occur, as the movement caused by the flow of groundwater causes a gradual dilution of the contaminant plume.

The dispersive spreading of a contaminant plume is due to aquifer heterogeneities. Dispersion on the macroscopic scale is caused by variations in hydraulic conductivity and porosity, and is three dimensional.

Once in groundwater, contaminants such as metals and hydrocarbons are subject to other reductions in concentrations due to:

- Adsorption: when contaminants interact with and adsorb tightly onto aquifer particles, a process which acts to retard some of the contaminant migration.
- Transformation, decay and biodegradation: Chemical transformation, natural decay and biodegradation are processes that modify contaminants during the course of their groundwater transport. They result from the chemical environment in the groundwater, and the presence of bacteria that cause chemicals from a contaminant source to be changed once they are in the groundwater environment.

Any remaining hydrocarbons and dissolved metal concentrations will be subject to mixing, adsorption, biodegradation in the shallow groundwater. Given the low concentrations and intermittent nature discharged and the natural processes in the groundwater environment the effects on local groundwater from organic and inorganic contaminants would be minor.

Micro-biological

PDP have undertaken microbial transport modelling which provides a conservative assessment on groundwater quality. The microbial transport within the groundwater system has been modelled using a three dimensional analytical model that allows for analytical solution of equations for contaminant transport. Other microbial removal processes such as adsorption have been ignored at present. Pang (2009)[32] presents information on other removal processes such as adsorption based on field testing. Schijven et al. (1999), Pang, and Ying (2017) also summarise the removal rates from Pang (2009). Adsorption could be modelled if required, but at this stage, only die-off has been provided for.

The Maximum Acceptable Value (MAV) for *E. coli* within drinking water is less than 1 cfu/100 ml and this is the standard against which the modelling results have were assessed.

Modelled effects from measured levels of *E. coli* in stormwater and aquifer characteristics in the surrounding area indicate that the cumulative effect of the discharges as potentially causing *E.coli* levels to exceed 1 cfu/100 ml no more than 132 m from Temuka. A sensitivity analysis using very high *E. coli* levels based on national and international stormwater studies and highly permeable aquifer conditions observed elsewhere in alluvial gravel aquifers on the east coast of New Zealand, indicates that the cumulative effects from the discharges could be between up to 200 m from Temuka. This is a similar distance to the accepted effect from a permitted activity discharge of stormwater to land from up to five residential properties allowed for in the LWRP.

It is important to note that these bores identified in the vicinity of the SMAs, particularly shallow bores, will be vulnerable to microbial pathogens from a number of other sources. Such as onsite

[32] Pang L. 2009. *Microbial Removal Rates in Subsurface Media Estimated From Published Studies of Field Experiments and Large Intact Soil Cores*. Published in J. Environ. Qual. 38:1531–1559 (2009).

wastewater discharges, agricultural land use and river water recharge and should be receiving appropriate treatment if they are in use, regardless of the discharge of stormwater to ground.

Differentiating between these sources and intermittent stormwater would be inherently difficult.

Nutrients

Whenever nitrogen-containing compounds come into contact with soil, it is expected that nitrate leaching into groundwater will occur. The current background concentrations of Nitrate – N in groundwater has been assumed to be above 5.65 mg/L (half the MAV) at times,.

Nitrate-Nitrogen in urban stormwater typically ranges between 0.4 and 2.0 mg/L (refer Table 5:1). After discharge of stormwater to land the Nitrate –N concentrations it is likely that shallow groundwater quality in most areas of the SMA will be reduced as a result of the lesser concentrations in the treated stormwater.

8.5.4 Effects on Drinking Water Wells

It is considered that only microbiological contamination of the local groundwater from the stormwater discharges represents a risk to drinking water supply wells.

No existing community water supply is expected to be at risk from the exiting discharges or any other future one in the SMA. It is unlikely that new community drinking water supply wells within or 500 m downgradient of the SMA will be established.

It is considered that the effects on private wells owners that are used for drinking water supply within the SMA and a conservative 500 m distance downgradient could be impacted should they not treat their drinking water supply they may be potentially affected.

The following objective and targets are proposed with respect to drinking water quality:

- **Objective**: Stormwater discharges do not cause or exacerbate the risk to human health where groundwater is abstracted from bores for drinking water.
- **Target**: No recorded incidents of E.coli concentrations in abstracted water that is not treated confirmed as being related to stormwater discharges

A recognised practice is to apply a protection zone to a community or group supply well to ensure the groundwater quality of wells used for drinking water supply are not compromised by the potential effects of land use and discharge activities. This practise has been adopted for this application (refer Section 5.7).

With respect to single household domestic supply wells, a capture zone of a 500 m radius approach is proposed (refer Section 5.7) which is considered to be conservative,.

Overall it is considered that risks to future drinking water supplies can be avoided, or remedied (alternative supply provided).

8.5.5 Cumulative and Summary Effects

The discharge of stormwater from the Temuka SMP Area into land in combination with other existing and future consented or passive discharges in the area, has the potential to result in the cumulative degradation of groundwater quality. This typically applies to persistent or cumulative contaminants.

The low level concentrations of nitrate mitogen are expected to reduce the concentrations in the shallow groundwater.

PDP considered that with the Te Uma kaha (Temuka River) width, depth to groundwater and reach length through Temuka and likely bed permeability, that the Te Uma kaha (Temuka River) could easily lose more water to groundwater in the SMA than the stormwater discharges, especially during flooding. On this basis, the expected impact on pathogen concentrations in

groundwater near the river is likely to be typically higher than the stormwater discharges. Therefore *E.coli* in groundwater already occurs from natural processes, and with the stormwater discharges could be exacerbating this effect on groundwater quality spatially in combination with onsite wastewater discharges.

Given the:

- Lack of heavy industry and landfilling in the SMA area; and
- The regional and district controls on future activities in the area; and
- Dilution and dispersive characteristics of unaffected groundwater from the aquifer systems,

it is considered that the discharge of toxicants (metals, hydrocarbons) in stormwater from the existing and future urban areas is unlikely to result in any significant cumulative effect on the environment that would arise over time or in combination with other discharges.

Overall, it is considered that the proposal will have only minor adverse effects on groundwater quality within and downgradient of the SMA. This minor effects could also apply to those existing persons who use shallow groundwater for drinking water supply that do not have microbiological treatment.

Pursuant to Section 95E (2)(a) in assessing an activity's adverse effects on a person the consent authority may disregard an adverse effect of the activity on the person if a rule or a national environmental standard permits an activity with that effect (referred to as 'permitted baseline'). In this case the proposal is expected to have the same adverse microbiological adverse effects on groundwater quality as the permitted activity Rule 5.96.

8.6 Effects on Surface Water Quality and Aquatic Ecology

8.6.1 Overview

The effects on surface water quality and aquatic ecology for this application include the past, present, and future effect; and any cumulative effect which arises over time or in combination with other effects.

The 1st objective for the proposal is to "*Progressively reverse the diminished ecosystem health in the Taumatakahu Stream". The 2nd objective for the proposal is to "Protect and enhance the ecosystem health of the Te Uma Kaha / Temuka River.*"

Table 8:2 provides a summary of the baseline assessment results (Appendix 7), the current LWRP standards and relevant attribute limits in the NPS, and the proposed targets in relation to surface water quality and aquatic ecology. The observable effects of the past and present stormwater discharges are evident in the sediment quality in Taumatakahu Stream and the diminished macroinvertebrate community although the QMCI scores are close to the LWRP

It should be noted that the Monitoring Plan includes monitoring of water quality stressors such TSS, pH, and Dissolved Oxygen and has associated dry weather trigger levels however there are no specific targets set associated with the objectives. Both PH and DO parameters in untreated stormwater quality are not of a concern. However these water quality factors including hardness, DOC, and high temperature. affect the toxicity of copper and zinc to stream biota. These (NIWA 2017).

The Monitoring Plan also includes the following additional ecology quality monitoring: Periphyton cover (filamentous algae); Emergent macrophyte cover, and Total macrophyte cover ,. There are also associated trigger levels in line with LWRP and NPSFM requirements. However no specific targets are set associated with the proposed objectives as these are usually a symptom of a system stressed by factors such as nutrient enrichment, high light (from removal of bankside vegetation) and high temperatures, which are not strongly associated with stormwater, but will inform the overall state of the environment.

Table 8:2 – Summary of baseline, standards and proposed targets in relation to surface water quality and aquatic ecology

Attribute	Baseline	LWRP (PC7)	NPS	**Primary Target** (and ongoing unless Stretch Target applies)	**Stretch Target**
Taumatakahu Stream					
Deposited Fine Sediment (%)	50 - 100	30	29	By 2040 - Reducing fine sediment depth and cover	≤ 30% of fine sediment
Sediment Quality	> DGV (Pb & Zn) < GV -high	N/A	N/A	By 2040 < DGV	
MCI	86 -91		≥90 to <110	By 2040 100	≥ 120
QMCI	4.29 – 4.85	4.5	≥4.5 to<5.5 (Band C)	By 2040 ≥ 5	≥ 6 (NPS Band B)
F-IBI [1]	N/A	N/A	<28 to ≥18	By 2040 improvement from baseline (to be established)	≥28
Water Quality Toxicants - Cu, Pb, Zn (dry weather)	<90% species	<90% species	N/A	From commencement <90% species, no trends upwards	
Te Uma Kaha (Temuka) River					
Deposited Fine Sediment	50 - 100	30	27	None proposed, major influences in catchment not stormwater related and out of TDC's control (e.g. agricultural sediment losses)	
Sediment Quality -TPH, Cu, Pb , Zn	> DGV (Pb & Zn) < GV -high	N/A	N/A	From commencement: Maintain and improve trends in stormwater derived toxicants sediment quality from baseline and no exceedance of ANZG Sediment Quality DGVs or any revisions or successors to this guideline	
MCI	101 -103		≥110 and <130	None proposed, major influences in catchment not stormwater related and out of TDC's control (e.g. nitrate toxicity)	
QMCI	5.13 -5.26		≥5.5 to <6.5 (Band B		
F-IBI	N/A	N/A	<34 and ≥28		
Water Quality Toxicants - Cu, Pb, Zn (dry weather)	<90% species	<90% species	N/A	None proposed, TDC network discharges currently only to margins at 5L/s (2 mm / hr intensity), SH1 Discharges greater, relying on sediment quality trends	

Table Notes:

[1] may be replaced by cultural assessment including eDNA assessments

8.6.2 Discharge Quality and Loads

Unmitigated discharges of sediment construction phase stormwater from developments under construction can have TSS concentrations of up to 4,000 g/m^3.

Table 8:3 presents an estimation of the discharge quality for the main stormwater contaminants from developed urban areas to surface water via no treatment (as occurs to Taumatakahu) or via a treatment system that could apply to new or redeveloped sites. Also considered is the amount of dilution in the receiving environment that would need to occur to meet the ANZG 2018 [33] (or LWRP Standards) for the Taumatakahu Stream, assuming that no contaminants occur in its baseflows.

As seen in Table 8 of the CLM Report with the change in land use area in Temuka between the existing and future urban area scenarios, the reflected change in loadings in Table 9 is expected to be less than 3% without any mitigation.

Table 8:3 – Estimated stormwater discharge quality from developed urban areas or sites to surface water, and the number of fold dilution compared to guideline values /standards

Determinand	Concentration Generated (g/m^3 unless otherwise stated) [a]	Treatment System Efficiency [b - c]	Discharge Concentration (g/m^3)	Approx. # Fold Dilution Required to achieve DGV	ANZG 2018 90% DGV (g/m^3) (unless otherwise stated)
TSS	170	0	170	3.4	50 [d]
NO_3	2	0 - 75	2 - 0.5	10 – 2.6	0.195 [e]
TP	0.4	0 - 75	0.4 - 0.1	17 – 4.3	0.023 [e]
Copper	0.02	0 - 75	0.02 – 0.005	11 – 2.8	0.0018
Zinc	0.8	0 - 75	0.8 - 0.2	53 – 13.3	0.015
PAH	0.007	0 - 75	0.007 - 0.0017	5 – 1.2	0.0014 [f]
Microbiological	8,000 fc/100 ml (median)	0 - 75	8, 000 - 2,000	8 - 2	≤1000 [g]

Notes:

DGV = Default Guideline Value

a Highest values taken from Table 5:1 unless stated otherwise.

b no formal treatment.

c Except TSS, based on mid-range value treatment efficiency for an infiltration basin (US EPA (1993), Stormwater Center (2002), Watershed Protection Techniques (1997)). A swale, wetland or raingarden will also have a similar efficiency

d LWRP Permitted activity rule value for stormwater

e ANZG 2018 stressor Warm Dry Low-elevation 80th percentile

f There is no total PAH value, as Fluoranthene has a DGV value and was the highest recorded PAH parameter in Taumatakahu sediment (TE_S4 summer) this value has been used and it has been assumed conservatively that all the PAH concentration is Fluoranthene

g LWRP PC7 outcome 95th percentile *E.coli* / 100 mL

[33] ANZG 2018. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at www.waterquality.gov.au/anz-guidelines

8.6.3 Surface Water Quality - Stressors

Construction

Poorly managed construction sites with respect to erosion and sediment control have the potential to discharge high loads of suspended sediment to water ways affecting water clarity and water colour impacting fish function, movement and spawning activities. The effect of sedimentation is discussed in Section 8.6.6.

The main factors influencing sediment loss from earthworks sites and mobilisation in runoff are

- **Climate** - Precipitation intensity, duration and frequency, temperature and wind
- **Soils** - Soil texture and other soil characteristics affect the soil's potential for erosion.
- **Slope** – Erosion increases as the slope steepens and lengthens
- **Size of disturbance** - The size of disturbance also impacts on sediment yield.

From the descriptions of the environment and limits on scale in the proposal neither of the above main factors are preeminent for Temuka (compared to other areas like Auckland that has clay soils moderate slopes and dominant winter rainfall), except perhaps cold temperatures in winter affecting grass growth to establish and stabilise disturbed soils.

Overall the erosion potential, and weather risks are low (due to low rainfall and intensities). The main risk factor is those greenfield development areas within catchment areas that will discharge to the Taumatakahu stream as the network has no treatment systems in place.

With effective erosion and sediment controls the risk to surface water quality aquatic ecology is considered low. Whilst no TSS limits are proposed for short term construction-phase stormwater it is in the interest of TDC to effectively regulate these sites as poor practices will mean achieving objectives and targets for the health of the water bodies (including reducing sediment cover) will be compromised.

The construction-phase discharges will be to the TDC stormwater network as such will be mixing with cleaner stormwater and in the receiving environment it is not expected to result in a significant change in clarity and colour.

Developed Urban

High nutrient loads in New Zealand streams and rivers typically have agricultural origins. Major sources include nitrate and phosphorus leaching following the land application of fertiliser or effluent and leaching and/or direct inputs from stock excreta. In contrast, sources of nutrients to stormwater include garden fertilisers, pet and yard waste.

Nutrient concentrations in stormwater as shown in Table 8:3 are above DGVs and will be entering surface water that already has a baseflow elevated concentrations of nutrients. However as discussed in the toxicant section below stormwater discharges are intermittent and represent a very low percentage of exposure compared to the chronic effects of the baseflows.

8.6.4 Surface Water Quality - Toxicants

Overview

TPH may enter stormwater mainly due to accidental spills on land, accidents on roads, leaking vehicle engines when in motion or commonly observed hydrocarbon patches in carparks below engines typically from older vehicles. TPH are not expected to be a significant water quality issue, and there is no aquatic ecology water quality guideline value for TPH compounds. It is also noted there was a lack of TPH accumulation in aquatic sediment in Temuka waterways (refer next section).

PAH are generated following the incomplete combustion of organic materials (e.g., coal, oil, gas and wood). Anthropogenic sources include residential heating, asphalt, coal-tar based sealcoats, and motor vehicle exhaust. With the clean air regulations in Canterbury the use of coal and wood as a residential heating method has dramatically reduced in Canterbury therefore deposition onto surfaces in urban areas for entrainment in stormwater will be less. The main source now will be from vehicle emissions, over time this could be reduced with alternatives to hydrocarbon fuel burning vehicles to meet New Zealand's carbon reduction goals . Overall it is considered that PAHs in stormwater is less likely to be a significant toxicity issue compared to some metals as conservatively shown in Table 8:3.

The PDP Baseline Report discusses the toxicity of all metals in freshwater and the impacts on aquatic ecology in general from that described international and Australia and New Zealand studies, and the development of the chronic Default Guideline Value (DGVs) which are also discussed below.

As discussed in Section 5.2 the metals coper and zinc are the main contaminants of concern in present day stormwater.

Copper is expected to be mostly sourced from wear of brake pads in vehicles, and untreated concentrations represent the highest toxicity risk. Lobbying by local government to central government to legislate to implement a restriction on copper in brake pads (as has occurred in some of countries) has yet to gain traction, and if occurred would be a lengthy process. Copper spouting, downpipes and cladding material will be present in Temuka but this has not been quantified.

Zinc measured from urban surface water which originates from vehicle tyres and brake pads, galvanised roofs, roadside fittings, and pipes. Zinc is released to the environment and ultimately to stormwater during the daily wear and tear and/or corrosion of these sources.

The draft District plan is attempting to make use of any copper or high zinc leaching materials for buildings and structures a non-complying activity, to discourage new sources being added to the urban area.

It is expected (without any regulation) that over time the like for like replacement of the existing older galvanised iron building roofs in Temuka will occur with COLORSTEEL™ or other roof products which will reduce Zinc leaching and loads to the environment. Education an incentives could make this transition more rapid and reliable.

NIWA 2017 [34] summarised aquatic toxicity and factors affecting toxicity of copper and zinc in water bodies:

- Zinc toxicity occurs by interfering with calcium transport in the body, disrupting the calcium balance and causing a lack of calcium.
- Copper is more toxic than zinc for invertebrates and fish, and substantially more toxic to algae. For example, it takes only 0.013 g/m^3 of copper to kill 50% of a test sample of NZ native waterflea (Ceriodaphnia dubia) in 48 hours, but it takes 0.35 g/m^3 of zinc.
- Tolerances for copper and zinc vary according to species and taxonomic groups (groups of species). For copper, insects appear to be more tolerant than fish, which are more tolerant than water fleas. The least tolerant (most sensitive) groups appear to be algae and the larval stage of freshwater mussels (Glochidia). For zinc, insects are more tolerant than most crustacea, which are more tolerant than some fish which, in turn, are more tolerant than water fleas.

[34] NIWA (2017). *Copper and zinc aquatic toxicity: Frequently Asked Questions.* Prepared for Environment Canterbury May 2017

- Because metals must be taken into the organism to cause toxic effects, the toxicity of metals is related to their form in a waterbody:
    - freely dissolved (soluble),
    - mixed with large molecules to form an inorganic or organic complex, or
    - associated with particulate matter.
- The proportion of each form depends on other characteristics of the waterbody, such as the amount of suspended particulate matter, dissolved organic matter (DOM), pH, alkalinity and hardness. In natural waterbodies, a large proportion of the total zinc and copper is found in particulate form, which has low ability to be taken up (low bioavailability), particularly by microorganisms and microalgae (phytoplankton). The rest is considered to be dissolved (this operationally defined as the fraction that passes through a 0.45 μ m filter).

Assessing Toxicant Impacts of Stormwater

Stormwater is inherently "flashy" – not only flows constantly change, but so do concentrations. Occasionally concentrations will have very high peaks, however these flush through quickly and could have limited effect on biota as stormwater discharges are intermittent and not continuous, and will not be in the surface water flows for extended periods (as can happen in Canterbury in the summer months) .

The receiving water standards set in the LWRP within Schedule 5 include metal toxicants for species protection. These standards are based on the ANZECC 2000 guideline default values (without adjustment of hardness). The guidelines are currently subject to a revisions and have become ANZG 2018. The beforementioned NIWA 2017 Report (by the national experts assisting with revisions to ANZG 2018) commissioned by ECan contains advice of the proposed changes and the application of the guidelines with respect to stormwater management.

Section 4 of the NIWA 2017 report advises:

- The ANZECC guidelines [now ANZG 2018] are most appropriate for assessing long-term risk because they are based on chronic toxicity data. There are currently no New Zealand guidelines to protect against short-term effects (acute toxicity).
- Stormwater discharges are intermittent and therefore represent an acute risk, so the chronic-based ANZECC guidelines may not always be appropriate for stormwater management). However, the potential exists for the discharges to increase chronic risks because a) the repeated nature of the discharges means that organisms may not be able to fully recover from one event before the next event occurs and b) metals from the stormwater can build-up in sediment, representing an on-going source to the water column, exacerbated under low oxygen conditions.

An estimate of the short-term nature of stormwater discharges entering a receiving environment for a local area can be calculated via the following equation:

% of time stormwater in receiving environment = (annual wet days / days per year) x average duration of a rainfall event x correction factor for storms that produce no runoff [35] *x 100*

Applying the above formula to Temuka with mean annual wet days of 75 per year, and assuming a conservative 9 hr duration average for rainfall events, this gives the following percentage:

(75/365) x 0.375 (or 9hrs) x 0.85 x 100 = ***6.55%*** *(per annum)*

Given the estimated 6.6% where stormwater from the Temuka SMA is entering surface water, and the minor impacts on sediment quality observed to date, it would appear that the application acute guidelines would be more appropriate. However, as noted previously, there are currently no

[35] Christchurch City Council 2003. *Waterways Wetlands and Drainage Guideline* Part B Design - Eqn (6-1).

acute guidelines developed for New Zealand. Given the low per annum percentage of discharge and that the Canterbury plains has long periods of dry weather (months in summer) applying chronic based guideline values (ANZG 2018) as a standard in the regional plan or as an absolute indication of a more than minor adverse effects is not considered appropriate.

What would be also of interest is the state of the surface water quality for the rest of the time during the 93% of time stormwater discharges are not occurring during dry weather, to understand underlying chronic impacts that stormwater flows would be contributing cumulatively to. The Dry weather baseline monitoring although limited has shown that toxicant ANZG DGVs are not being exceeded (mostly below detection level) currently in baseflows, although there was detection of dissolved and total zinc in the monitoring site TE_S6 located at the downstream site from the SMA on the Taumatakahu in both winter and summer (dissolved 0.0012 and 0.0011 g/m^3).

The ongoing actual, potential and cumulative impacts of the stormwater discharges on aquatic ecosystem and ecology from the intermittent stormwater discharges is primarily being determined by the aquatic sediment, macroinvertebrate and fish monitoring (ecosystem health). This in in accordance with best practice and national expert advice.

Taumatakahu Stream

As shown in Table 8:3, due to the relatively small baseflow of the Taumatakahu Stream and its northern tributary of 40 L/s and 10 l/s respectively it is expected that during most rainfall events, given the large urban area of approximately 157.5 ha contributing to them the LWRP receiving water standards for the chronic based toxicants - zinc and copper, would not be met.

For example should a rainfall event of 2 mm/hr be occurring, the average stormwater flows from the urban and rural catchments contributing to Taumatakahu Stream would be 510 L/s compared with its baseflow of 50 L/s. Given the discharge flows are 10 times greater than the baseflow, as shown in Table 8:3 even with retrofitting best practice treatment on each of the 26 direct outlet it is unachievable to comply with the LWRP receiving water standards for zinc and copper in the Taumatakahu.

In order to meet the SMP objectives to manage urban stormwater for improved ecosystem health and the outcomes set for the receiving streams, first flush treatment for all new developments will be required. This will likely use a combination of treatment devices to achieve a general 75 % contaminant removal efficiency.

There is expected to be some benefits in a reduction of loadings, associated with the industrial site auditing programme and improvements in industrial site management.

Retrofitting treatment in redevelopment, improvements in industrial site management and roof renewals will all contribute to improving water quality however it is difficult to provide more than a qualitative assessment of these benefits.

In evaluating capital works projects the existing CLM can be utilised to estimate load reduction benefits where source control or treatment systems are being considered. It may be ethe case that other capital projects are evaluated as achieving greater gains towards targets and a wider range of the objectives for Temuka.

The CLM identifies that three sub-catchments in Temuka that discharge to the Taumatakahu and its tributary have high loads that could be selected for treatment. These three catchment combined have an area of 103.7 ha and apart from one catchment discharge at one point.

Monitoring of the dry weather water quality within the Taumatakahu and its tributary is proposed to determine if any chronic impacts are occurring as a result of stormwater discharges to land and other non-rainfall related discharges from the urban area. Trigger exceedances would place a

greater priority as to finding sources, undertaking source controls and treatment of existing stormwater to reduce cumulative impacts.

Improvements in stormwater quality to the Taumatakahu from the existing urban areas in the long term is expected, however not meeting this chronic based standard for the intermittent and short duration stormwater discharges is not representative of a more than a minor adverse effect.

Te Umu Kaha (Temuka) River

There are three existing stormwater network outlets set back from the margins of the Te Uma kaha (Temuka River), one at the end of Cass Street, and one upstream and downstream of SH1 bridge and swimming monitoring area. These discharges at 60m, 80m and 40 m from a tributary or the river onto and into land will receive informal treatment through vegetated channels before migration into land or possibly overland (in large storm events) to the Te Uma kaha (Temuka River).

With the flood banks along the true left bank of the Te Uma kaha (Temuka River) adjacent to the Temuka SMA western boundary, and that the SMA topography slopes away from the Temuka area in the larger greenfield areas that future development will occur it is unlikely that any new direct or margins discharges to the Te Uma kaha (Temuka River) will occur.

The Te Umu Kaha (Temuka) River that has a water quality class of hill-fed – lower (95% species protection for toxicants).

The actual, potential and cumulative effects of the stormwater discharges that may enter the Te Umu Kaha is not expected to have any measurable adverse effect on its surface water quality and aquatic ecology given:

- Upstream and downstream of the Te Uma kaha (Temuka River) does not receive any direct or significant migration amounts of other urban area (than the Temuka SMA) stormwater
- The existing discharge outlets adjacent to the SH1 Bridge are set back from the river itself in the riparian margins where filtering of metals, hydrocarbons occurs through grass, topsoil, and alluvial sand and gravels occurs before stormwater migrates to the main channels.
- Nutrients in urban stormwater are of low concentrations, the stormwater rates and volumes from the SMA will be small and very infrequent, any elevated nutrient concentrations in the river are likely a result of activities occurring upstream of the SMA.
- The impacts of *E.coli* on water quality are most likely the water fowl present in the river itself at times not linked to rainfall events. Rural runoff also has high microbiological contamination.
- The larger flow in the river (mean annual flow rate of 6.28 m^3/s) compared to a discharge rate of 2 l/s during a 2 mm/hr rainfall event
- Further downstream the groundwater inflows in the river will be greater.

Overall it is considered that the proposed existing and future activities will not compromise the LWRP outcomes sought and NPS bottom lines for Te Uma kaha (Temuka River) in the short or long term.

8.6.5 Sediment Quality

Sediments provide habitat for many benthic and epibenthic organisms, and they also influence the environmental fate of many chemical substances in aquatic ecosystems by acting as both sinks and sources of substances that have entered the aquatic environment.[36] Many substances form associations with particulate matter and are eventually incorporated into bed sediments[37];

[36] Canadian Council of Ministers of the Environment (CCME) 1995: Protocol for the Derivation of Canadian Sediment Quality Guidelines for the Protection of Aquatic Life. CCME EPC-98E.
[37] Allan, R. J. 1986: *The role of particulate matter in the fate of contaminants in aquatic ecosystems*. Sci. Ser. 142. Inland Waters Directorate, National Water Research Institute, Burlington, Ontario.

consequently, sediments may also act as long-term sources of these substances to the aquatic environment.[38] [39] [40]

Sediments can have a profound influence on the health of aquatic organisms, which may be exposed to toxicants through their immediate interactions with bed sediments, e.g., sediment-associated contaminants may cause acute and chronic toxicity to aquatic organisms and may inhibit the presence and health of benthic biota that would otherwise inhabit these sediments.

The elevated lead concentration in sediment in Te Uma kaha (Temuka River) could be indicative of the cumulative effects of stormwater discharging into the Te Uma kaha (Temuka River), but the location is upstream of the only two TDC stormwater network outfalls into the Te Uma kaha (Temuka River) margins.

The sediment samples indicate an accumulation of lead, zinc, and PAHs resulting from stormwater discharges to the Taumatakahu Stream and its tributary. The exceedance of just the ANZG DGV for Zinc and Lead was at the TE_S6 monitoring site immediately downstream the SMA. This result is not surprising, given that a significant portion of the stream's catchment is urban. The target set for sediment quality proposed to bring metals to less than or equal to the ANZG 2018 DGV by 2040.

Copper results showed only marginal accumulation at the TE_S6 site with 24 and 21 mg/kg, all other results were below 7 mg/kg and one was 13 mg/kg. The background soil concentration for the regional YGE group in the Taumatakahu is 12.4 mg/kg. [41]

Monitoring is proposed to allow a response to any unexpected adverse trends on sediment quality.

8.6.6 Ecology Quality

Sediment Quantity

Urban development has the potential to degrade aquatic ecosystem health due to short-term and long-term disturbances. Short-term disturbances occur during the construction phase and include fine sediment deposition on streambeds. Although the duration of sediment discharges may be short, deposited sediment persists in low-gradient spring fed streams, resulting in poor quality aquatic habitat and long-term ecological effects.

Long-term disturbances include changes in hydrology, riparian and in stream habitat from stormwater quantity effects resulting in bank slumping and bed erosion.

With respect to short term disturbances, large scale development areas (> 4ha) are excluded from this application to enable the effects and the erosion and sediment control methodology to be assessed by the ECan via a separate discharge consent application process.

Those smaller scale development sites that are no more than 4 ha of disturbance will be managed by the subdivision or building consent application and compliance process under taken by TDC. As discussed previously the main factors for sediment loss and risk in Temuka, are low, and can be easily managed with appropriate erosion and sediment control management.

Long term disturbance due to increased peak flows and duration of high flows in the streams caused by unmitigated urban development and infilling has probably been a major contributor to high substrate embeddedness in the Taumatakahu, along with the upstream rural sediment

[38] Larsson, P. 1985: *Contaminated sediments of lakes and oceans act as sources of chlorinated hydrocarbons for release to water and atmosphere*. Nature 317:347–349.
[39] Salomons W.; De Rooij N.M.; Kerdijk H.; Bril J. 1987: *Sediments as a source for contaminants*. Hydrobiologia 149.
[40] Loring, D. H.; Rantala, R.T.T. 1992: *Manual for the geochemical analysis of marine sediments and suspended particulate matter*. Earth-Science Rev. 32: 235.
[41] Environment Canterbury (2007). *Background Concentrations of Selected Trace Elements in Canterbury Soil Addendum 1: Additional Samples and Timaru Specific Background Levels*. Report No. R07/1/2, February 2007.

inputs. In particular changes in the hydrological regime has resulted in scour and erosion and bank slumping in the Taumatakahu.

Taumatakahu bank stabilisation would be subject to Ecan River Engineering works. Works can incorporate a range of structural treatments including stone placement, gabions, batters, and a stronger focus on landscaping.

Sediment removal by a range of techniques (dredging, suction etc) could be applied to remedy sedimentation impacts. If bank and bed stabilisations successful upstream and within the urban reach then flood flows would hopefully flush high sediment area over time.

A target has been set in the long term to have ≤ 30% of fine sediment within Taumatakahu. Sediment cover triggers are included in the Monitoring Plan for the Temuka River however given the lack of construction-phase stormwater and stormwater discharges and wider catchment influences this is not a target to be included in the consent.

Macroinvertebrate and Fish

The MCI and QMCI scores for Taumatakahu were lower than for the Te Uma kaha (Temuka River), indicating fair ecological health and probable moderate organic pollution, although all sites met the NPSFM national bottom line. Site TE_S6 does not meet the LWRP Plan Change 7 (decisions version) freshwater outcome values for QMCI of 5.

A target for Taumatakahu is to have by 2040 MCI scores improved from baseline (86 -91) to 100 and QMCI scores increased from baseline (4.29 – 4.85) to ≥ 5. Further to this a long term stretch target is to further improve these MCI scores to ≥ 120 and QMCI scores to ≥ 6.

Tentative F-IBI targets for improvements from baseline is to be established and a long term target of F-IBI scores ≥28 is proposed. The fish monitoring may be replaced by cultural monitoring which may include eDNA methods.

The Te Uma kaha (Temuka River) sites had higher MCI and QMCI scores, consistently indicating moderate ecological health, albeit with probable mild organic pollution. All sites met the NPSFM national bottom line; however, all sites were slightly below the LWRP Plan Change 7 (decision version) freshwater outcome value for QMCI of 6.

8.6.7 Cumulative and Summary Effects

The cumulative effects of the proposed discharges along with other discharges and stressors to aquatic ecology will be assessed primarily by the long term state of the aquatic macroinvertebrate community and fish community (or eDNA) . Although the macroinvertebrate abundance and richness can vary seasonally and due to other factors like flow disturbances (flood events), and fish communities can be subject to migration and movement variations.

It is considered that with the objectives and targets that the proposed discharges on surface water in combination with other discharges on surface water quality and aquatic ecology will not be significant.

Overall, it is considered that the proposal will have no more than minor adverse effects on surface water quality and aquatic ecology.

8.7 Effects on Natural Wetlands

There are no existing discharges to natural wetlands, two potential wetlands are either within or immediately adjacent to the SMA.

No discharges are being sought directly to natural wetlands, to avoid sediments, contaminants such as metals and hydrocarbons and plant seeds entering these wetlands.

Discharges to land in the vicinity of the wetland identified could potentially occur to a natural wetland if site constraints such as groundwater levels and subsoil permeability allowed. It is not considered that these potential discharges would result in migration of contaminants through groundwater connection or a material change to their hydrological regime.

The effects of the proposal (discharges to land) are considered to be less than minor on natural wetlands

8.8 Effects on Te Rūnanga o Arowhenua Values and Use

8.8.1 Overview

The association of Te Rūnanga o Arohwenua to the Temuka area and greater Ōpihi catchment has been acknowledged in Section 4.2 of the AEE. Of particular significance is its history for mahinga kai area which today includes the Ōpihi Mātaitai Reserve status.

Overall Te Rūnanga o Arowhenua consider the waterbodies in the Opihi river catchments are degraded and that stormwater management associated with Temuka township has contributed to this degradation. This is further discussed in Section 4.8.4 which discusses how the current state of the Taumatakahu and Te Uma Kaha is considered by Arowhenua to be poor and there are significant issues that impact on the Mauri and mahinga kai of these of the waters.

The ability to safely consume mahinga kai species like Tuna (eel) is of significance to Arowhenua. The health of the water directly affecting the health of the species and in turn those who might eat them. This is evidenced by NIWA 2010a [42] undertook the analysis of organochlorine concentrations and heavy metals; on fish tissue, watercress, and sediments in catchments throughout the Arowhenua rohe. This included 3 sites on the Opihi River (upsteam of SH1 Downstream of SH1 And at the river mouth (horseshoe bend) and one on the Te Uma kaha (Temuka River). The following are two just two extracts from the NIWA conclusions:

- Contaminant analysis indicated differential uptake of specific contaminants by different species. For example, watercress recorded much higher levels of cadmium, nickel, chromium, lead, zinc and copper than fish. Eel tissue had the highest concentrations of DDT, PCBs and mercury, whereas arsenic levels were highest in trout tissue;
- Sediment metal concentrations were below ANZECC guidelines, with one exception. Doncaster recorded a value of 220 mg/kg for zinc, just above the low ISQG low guideline value of 200 mg/kg;

Following the investigation NIWA 2010b [43] undertook risk assessment was carried out on the contaminant data, using established US EPA formulae. The risk assessment calculated allowable monthly meals for the whole catchment, using median and 95th percentile contaminant concentration data to approximate harvesting of kai with random contamination concentrations that might be expected from harvesting randomly across all sites (median) or predominantly from the most contaminated kai (95th percentile), that might be expected from harvesting predominantly at the most contaminated sites. Furthermore, a risk assessment was performed for each species harvested from each site to gain an understanding of potential "hotspots" in the catchment. Contaminants found to be contributing most to this risk were p,p'-DDE, dieldrin arsenic and mercury.

NIWA 2010b stated in the executive summary that in terms of the whole catchment, 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 those consuming the species. t However, if

[42] NIWA 2010a. *Contaminants in Kai – Arowhenua rohe Part 1: Data Report*. Prepared for Te Runanga o Arowhenua & Health Research Council of New Zealand
[43] NIWA 2010b. *Contaminants in kai – Arowhenua rohe Part 2: Risk Assessment*. Prepared for Te Runanga o Arowhenua & Health Research Council of New Zealand

harvesting were to occur predominantly at the most contaminated sites and consumption rates were as calculated from the questionnaire data, then a significant risk exists for consumption of eel. Trout are also a probable cause for concern with safe consumption limit being virtually the same as the consumption rate. The risk of eating eels was greater than other species, with 8 out of 10 eels sampled allowing for less than 4 meals per month, which is less than 1 meal per week.

The Cultural Values AEE (refer Appendix 4) states that management and planning going forward will require restoration and sensitivity to the environment and cultural needs to protect and enhance the Mauri of the waterbodies in the Temuka catchment.

TDC has collaborated with Arowhenua on establishing a vision, objectives and targets for stormwater management and the receiving environment for this application. These have been included in the Stormwater Management Plan accompanying this AEE.

8.8.2 Mahinga Kai - Resources, Consumption and Access

The following objective is proposed for the consent:

- Objective: Progressively reduce the acute and cumulative impacts of the stormwater network and stormwater discharges on waterbodies connected to and within the Opihi Mātaitai downstream of Temuka so the habitat is healthy and suitable for safe mahinga kai harvesting, and the mahinga kai species are safe to eat.

The other targets to improve and maintain the health of the waterways associated with the SMA such as sediment cover and quality, macroinvertebrate and fish communities, and riparian margin improvements will attribute to meeting this objective.

With respect to the above objective this includes a specific target of "*No human source incidents of E.coli concentrations entering waterways via the stormwater network (e.g. through cross connections or wastewater overflows)*" This is set from the commencement of the consent. The Monitoring Plan includes *E.coli* analysis during dry and wet weather sampling, and faecal source tracking for the first 2 years. TDC has recognised that there is a need to add further cultural indicators and that these will be developed with Rūnanga over time. .

Whilst no objectives and targets have been developed to address improved access to mahinga kai sites for Temuka SMA targets may occur at a later date under the placeholder of ·"Satisfaction in cultural use indicators".

8.8.3 The Relationship and Ki Uta Ki Tai

As well as the vision, objectives and targets to improve and maintain the health of the waterways associated with the SMA, the following objectives have been included in the consent conditions:

> *Recognise and respect mana motuhake – the whakapapa and the relationship Kati huirapa have with water ecosystems in their rohe and actively involve them in stormwater management.*
>
> *TDC advocate for ki uta ki tai (from the mountains to the sea) in Te Uma Kaha catchment during TDC's involvement as a stakeholder and regulator in RMA and LGA processes*

The first objective does not have a target, rather its specifies that proposed consent conditions need to secure Arowhenua involvement in revisions to the SMP, Monitoring Plan and the targets that will form part of the consent or its implementation (i.e. SMP).

The second objective does not have a target either. However, it is recognised that there may be a role for TDC in decisions around wider management of the catchment in which the water flows and that this will be looked at in the SMP process but also wider in matters such as RMA planning processes. Such as TDC advocating in wider matters to improve the environment to better sustain mahinga kai so it is generally at or closer to a state of hauora (robust and healthy enough to take

knocks). An example would be if renewals of the existing Taumatakahu stream and tributary surface water takes at their headwaters occurred. There are two water permits to take 50% of the combined mean flow of the streams (refer section 4.8.5.) TDC could request to the consent authority to be treated as an affected party in partnership with Arowhenua if renewals were sought (despite not being consistent with Te Mana o te Wai) as the continuation of the takes would compromises the ability of TDC to meet its objective to progressively improve the health and wellbeing of the streams being met.

The SMP implementation plan project identification process for TDC's stormwater management LTP / Annual plan budgets includes the opportunity for projects of importance to Arowhenua as part of a working group to be put forward. Cultural weightings will be part of the evaluation criteria and review of all projects by Arowhenua.

8.8.4 Summary

In summary the effects of the past, and present stormwater discharges within the catchment on the values of Arowhenua are considered to be significant.

TDC has collaborated with Arowhenua, through AECL over the last year on the development of SMPs and processes to allow ongoing active participation of Arowhenua in the future management of stormwater in Temuka.

The SMP assumes an improvement over time in order to meet the objective and visions. It is considered that should the consent and accompanying SMP process be implemented this will mean that over time the issues raised by Arowhenua are diminished or addressed.

8.9 Effects on Flood Carrying Capacity and Hazards

There are currently no significant flooding issues in the Temuka SMA that require immediate addressing or retrofitting of large scale attenuation systems.

The network capacity assessment highlighted the potential need for increased capacity in the Temuka stormwater network to reduce the frequency of predominantly nuisance flooding in parks, roads, and private properties.

The following objective and targets is proposed to form part of the consent with respect to stormwater quantity management:

- **Objective:** Stormwater is managed so that run-off from urban areas, the primary stormwater network and overland flow paths, does not exacerbate the flooding, erosion or damage to property or infrastructure or cause risks to human safety.
- **Target 1:** Zero flooding for rain events up to a 1 in 5 year return for residential zones, and a 1 in 10 year return for commercial and industrial zones.
- **Target 2:** Stormwater does not exacerbate flood events that affect Te Hapa o Niu Tirena Marae and Arowhenua Native Reserve 881
- **Target 3**: Zero deaths and notified injuries from stormwater runoff

TDCs approach to managing future flooding risks long term and Targets 1 and 3 is to be developed but will include but not be limited to:

- New developments are to design hydraulic neutrality for their stormwater systems to match pre-developed runoff rates.
- Allowance for climate change to be built into designs and groundwater levels assessment.
- Development of an effective maintenance programme to prevent debris blockages and sediment build-up.
- Develop an accurate hydraulic model of the townships network and interactions with waterways so as to evaluate areas and options/solutions for improvements to nuisance

flooding effects and the resulting impacts downstream, that mitigation for new development and any other implementation improvement projects are effective.
- Identify, define and protect overland flow paths.

It is noted that any network capacity improvements would need to be considered alongside the potential impact on flows in the Taumatakahu Stream is tributary. In particular increases in bank full frequencies and duration during 50% to 10% AEP events that are the primary cause of exacerbation of bank scour and erosion. The development of a hydraulic model for the SMA is a proposed condition of the consent and part of the target for dealing with climate change.

The Temuka SMA only makes up less than 1% of the total Te Uma kaha (Temuka River) catchment, any increase in stormwater quantity generated with future development if unmitigated at the lower end of the Temuka catchment would be insignificant on the Te Uma kaha (Temuka River) flood flows and any increase in risk.

Target 3 above is qualitative and as above it is not expected that the townships stormwater represents a risk to Te Hapa o Niu Tirena Marae and Arowhenua Native Reserve 881. However this has been included as there may be a role for TDC in decisions around wider management of the catchment in which the water flows and that this will be looked at in the SMP process but also wider in matters such as LGA and RMA planning processes.as previously noted.

With the implementation of the above stormwater management measures, it is considered that there are no significant actual adverse effects or potential cumulative effects on the flood carry capacity of the stormwater reticulate system, the Taumatakahu Stream streams or the Te Umu Kaha (Temuka) River as a result of the proposed stormwater discharges from the urban areas.

Overall, it is considered that with the investigations and implementation methods proposed the proposal will have no more than minor adverse effects on flood carrying capacity and hazards within the SMA and downstream.

8.10 Effects on Social (Amenity and Recreational) Values

8.10.1 Amenity

Historically, stormwater management systems have been known to impact on the amenity of an area, as they are generally associated with engineered structures, which can be visually unappealing. In addition, stormwater management systems have been known to create odour in locations where stagnant pools form.

Stormwater systems that mimic natural systems and processes can provide for enhanced ecology and landscape values.

The amenity value of urban streams can also be improved by riparian habitat enhancement and creation of a walkway or other form of public access to stream bank areas.

Riparian margin improvement where related to stormwater management is a target associated with the heath of the waterways objectives.

8.10.2 Recreational

Sport Fishing

The discharges to the margins of Te Umu Kaha (Temuka) River will not be impacted the spawning reach within the adjacent river.

Spawning sites with the Taumatakahu will be impacted by sedimentation issues and potentially toxicants in sediment.

Fish and Game are part of the working party to identify projects for the implementation plan and are to be consulted in any revision to the SMP.

Bathing

The Taumatakahu Stream and its northern tributaries have no contact recreational values and their suitability for contact recreation is not an outcome sought for spring-fed plains-urban rivers in the LWRP.

The Te Umu Kaha (Temuka) River has a water quality class of hill-fed – lower. The outcomes sought for this classification in the LWRP is a suitability for contact recreation grade of good to fair.

Currently the Te Umu Kaha (Temuka) River at SH1 bridge is graded 'Poor'. There are two existing stormwater network outlets set back from the margins of the Te Uma kaha (Temuka River) one upstream and downstream of SH1 bridge and swimming monitoring area. These discharges at 80m and 40 m from the river onto and into land will receive informal treatment through vegetated channels before migration through land or overland to the Te Uma kaha (Temuka River).

The impacts of *E.coli* on water quality are most likely the water fowl present in the river itself at times not linked to rainfall events. Rural runoff also has high microbiological contamination.

It is considered that the proposed existing and future activities will not compromise the LWRP objective to improve the suitability of the Te Uma kaha (Temuka River) for recreational use in the short or long term, due to the major influences being incidence and density of birdlife and high intensity agriculture/rural activities.

8.10.3 Summary

It is considered that the proposal will have less than minor effects on amenity and recreational values.

8.11 Effects on Wider Community

The management of stormwater undertaken by TDC for Temuka has provided and will continue to provide social benefits as the network reduces flooding of properties and avoids flooding of habitable dwellings, and heritage buildings. The network service to the community is in line with TDC jurisdictional functions under the Local Government Act.

The following further social benefit of more integrated management stormwater through h the scope of the consent to the residents of Temuka and wider community, and key stakeholders within the community, are as below:

Reduction in Financial Costs

- Removing the need for multiple resource consents, will reduced compliance costs and administration costs for TDC and ECan respectably.
- Reduced consenting costs to developers who will gain approval to be authorised by the discharge permit.
- Reduced costs to key stakeholders by not having to review and comment or submit on individual applications lodged.
- Reduced ad-hoc development and stormwater system development, through consistency of stormwater design, opportunities to centralise stormwater systems for multiple small development, which can lead to reduced operational and maintenance costs.
- Overall reduction of costs by linking the processes required under the RMA with those required under the LGA, thereby reducing duplication of effort.

Management

- Assists the TDC in recognising the stormwater related impacts of land-use activities within catchments and on their reticulated system.
- SMP's provide an important source of consolidated information for long term asset management and land use planning and for financial programming.
- Assists in developing 'best practice' management strategies and programmes to address those impacts at the catchment level.
- Providing greater flexibility for the management of each 'system' to enable innovation and adoption of improvements to stormwater management and design and knowledge of impacts.
- Providing greater security and certainty for administration by giving Territorial Authorities the overall control of stormwater discharges within catchments.

It is considered the social effects on the wider community of having a reticulated stormwater network and a more inclusive scope (some activities not connected to the network) is overwhelmingly positive.

9 Consideration of Alternatives

9.1 Overview

Schedule 4 (6)(1)(d) of the RMA requires for discharges of any contaminant, the AEE must also consider the nature of the discharge and the sensitivity of the receiving environment to adverse effects; and any possible alternative methods of discharge, including discharge into any other receiving environment.

9.2 Alternative Receiving Environments

A different receiving environment strategy for Temuka's discharges is unlikely to change from existing which involves a mixture of discharges to land and surface water.

Due to the amount of investment in the existing stormwater network asset, the lack of greenspace flat catchments, and soil permeability and groundwater level site constraints, the mass retrofitting of the existing urban catchment areas to discharge to land, instead of the Taumatakahu Stream is not likely to be practicable.

Where areas of new greenfield development occur, and is considered suitable for long term land disposal, discharging to surface water would be discouraged.

9.3 Alternative Mitigation Methods

Source control can provide significant reductions in existing urban areas metal loads to improve surface water quality. The objectives have a focus on source control rather than specifying treatment at the point of discharge.

The draft DPR has provisions to require a resource consent for zinc leaching materials. This is still subject to a district plan notification and decision process. The NRA identification and audit process is expected to achieve some gains in contaminants load reduction.

Also targeting specific problem catchments for treatment which have been identified the CLM is seen as the best approach to achieve gains. Further to expedite the existing impacted sediment quality from historical long term stormwater discharges potentially instream sediment removal could be a project that will achieve the objectives and targets.

Not using the implementation plan process to identify and evaluate projects against a wide criteria, and simply adding end of pipe treatment devices to the existing outlets that discharge

directly to the Taumatakahu has been considered and is not seen as an alternative for most instances. This is due to the flat nature of the catchment installing proprietary treatment device at most of the 26 outlets or further up a pipe for discharges to the Taumatakahu and its tributary may not be practicable and every case, as there would not be sufficient hydraulic velocity/ drop into the device and a compromised approach would exacerbate nuisance surface flooding. Pumping water through such devices is also not considered practicable.

Despite not being practicable or physically possible in most cases, the cost of retrofitting all 25 piped outfalls and maintaining and replacing filter cartridges for a StormFilter ™, has been estimated over a 35 year duration to be on order of $30M without making adjustments for inflation. This was not considered affordable to the community.

10 Statutory Planning Matters

10.1 Overview

Section 104(1) of the RMA sets out those matters in addition to the actual and potential effects on the environment that the consent authority must have regard to when considering an application for resource consent as follows:

> *Subject to Part 2*
>
> *[..]*
>
> *(b) any relevant provisions of—*
>
> *(i) a national environmental standard:*
>
> *(ii) other regulations:*
>
> *(iii) a national policy statement:*
>
> *(iv) a New Zealand coastal policy statement:*
>
> *(v) a regional policy statement or proposed regional policy statement:*
>
> *(vi) a plan or proposed plan; and*
>
> *(c) any other matter the consent authority considers relevant and reasonably necessary to determine the application.*

In relation to the statutory instruments referred to in 104(1)(b), the following are considered to contain provisions relevant to this application (in order of precedence):

- National Policy Statement for Freshwater Management 2020 (NPSFM)
- Canterbury Regional Policy Statement 2013 (RPS)
- Opihi River Regional Plan 2000 (ORRP)
- Canterbury Land and Water Regional Plan 2017 (LWRP including PC7)

For the avoidance of doubt, it is considered that the:

- NES for Freshwater 2020 does not apply to the proposal to discharge construction phase stormwater and stormwater as the wetland subpart does not control the 'discharge of contaminants" . No existing stormwater infrastructure is located within 100 m of or within a natural wetland. Potentially future specified infrastructure relating to stormwater management may be located near potential natural wetlands, a planning assessment would determine the applicability of the NESFW for construction and maintenance activities when and if required.

- NES for Sources of Human Drinking Water 2007 does not apply. The Community Drinking Water Protection Zones (CDWPZ) located southwest of Temuka do not currently overlap with the SMA. These are based on microbiological risk which is expected in this case considerably higher compared to the toxicant risks in stormwater discharges (as demonstrated in Table 8:1). There is a slight overlap with the 500 m buffer of the SMA in the southern area of these CDWPZ, however the community supply bores are located on the opposite side of the Te Uma kaha (Temuka River) and cross-gradient in terms of the groundwater flow direction and therefore the stormwater discharges are not expected to be of concern to the community supplies.

In relation to the 'any other matter' referred to in 104(1)(c), the following documents are considered to contain provisions (objectives and policies), relevant to this application:

- Te Rūnanga o Ngāi Tahu Freshwater Policy Statement 1991 (NTFPS)
- Iwi Management Plan of Kati Huirapa for the area Rakaia to Waitaki 1992
- Draft Kati Huirapa Iwi Management Plan (2020)
- Timaru District Stormwater Management Strategy 2018 -
- Canterbury Water Management Strategy

In determining this application that includes a discharge activity the following sections of the RMA are applicable

- Section 104B/D
- Section 104G
- Section 105
- Section 107

The relevant statutory instruments, other documents, and Part II in relation to the proposal is discussed in the subsections below.

10.2 National Policy Statement for Freshwater Management 2020

The NPSFM 2020 is a replacement of the NPSFM-2017 that applied at the time of the applications lodgement. The NPSFM-2020 took effect on the 3rd of September 2020.

The NPSFM-2020 now provides the most up to date direction to local authorities on how they should manage freshwater under the RMA 1991.

Underpinning the NPSFM 2020 is the "fundamental concept" of Te Mana o te Wai. There is a hierarchy of obligations in Te Mana o te Wai and Objective 2.1 which is to ensure that natural and physical resources are managed in a way that prioritises first, the health and well-being of water bodies and freshwater ecosystems. It then priorities second, the health needs of people, and third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.

The regional LWRP provisions have been drafted to give effect to the NPSFM 2017 and its predecessors. The provisions of the regional LWRP have not yet commenced review as to how they do or do not give effect to the NPSFM-2020. This includes the consent authority needing to:

- Engage with communities and tangata whenua to determine how Te Mana o te Wai applies to the waterbodies and freshwater ecosystems
- Develop long term visions for freshwater

- Actively involve tangata whenua (to the extent they wish to be involved) in freshwater management; and
- Adopt a ki uta ki tai, integrated approach

The necessary plan changes to give effect to the NPSFM require the Consent Authority by way of a notified plan change by 2024.

The LWRP PC7 decision on submissions released on the 17 November 2021 includes changes to the sub-regional Chapter 14 for the Orari-Temuka-Opihi-Pareora (OTOP). This decision was prepared under the NPSFM 2017, the NPSFM being only in draft. PC7 did include (but not limited to) provisions for managing freshwater quality; and for protecting of sites of cultural significance., including mahinga kai sites. This decision has been appealed by several parties including Te Rūnanga o Ngāi Tahu and Te Rūnanga o Arowhenua. The Ngā Rūnanga appeal was for various reasons but fundamentally that the decision did not provide for Te Mana o te Wai

This consent application is prepared in advance of both Environment Canterbury giving full effect to the NPSFM-2020 through a notified plan change, and also the appeals to the PC7 decisions being resolved. This means substantive decisions on this application the consent authority must have regard to the objectives and policies of the NPSFM-2020. It is suggested, this should be focused on the direction of the NPSFM-2020 and the concept of Te Mana o te Wai.

In looking at this application with Arowhenua it has been understanding whether the water bodies in the catchment are at or close to a state of hauora (typically health but also expressed by Ngā Rūnanga as being robust and healthy enough to take knocks) and if not what that state looked like previously and the stepped level of change over time to achieve this status. This approach is considered also key to giving effect to the first priority being the health and well-being of water bodies is or can be provided for. It should be acknowledged that it may be the case that achieving hauora (and therefore provide for the mana of the water body) may not be possible over the duration of the consent sought. It is also recognised that the discharges from the Temuka stormwater catchment is also not the only source of contaminants affecting the receiving water environment and the health of the waterbodies that flow through the township.

An assessment of the proposal against the NPSFM each of the relevant policies is provided in Appendix 12.

Overall it is recognised that the Taumatakahu and Temuka are not in a state of hauora. The proposal is however within the context of the larger catchment and the nature and scale of the discharges from the SMA must be considered in this context. The application proposes stepped improvements to improve the health of the Temuka River, and as far as practicable Taumatakahu Stream and its tributary. The application also applies and adaptive management approach which will continue to engage Arowhenua and the wider community in improving the stormwater system. Overall it is considered that this application is consistent with the objective of the NPSFM, and generally gives effect to the policies of the NPSFM.

10.3 Canterbury Regional Policy Statement 2013

The RPS was made operative on 15 January 2013. Subsequent amendments and insertions have occurred since. The current version is dated October 2020.

An assessment of the relevant land-use and infrastructure, and freshwater, objectives and policies of the RPS to this application are provided in Appendix 12.

Overall the implementation of the SMP and associated discharge consent (if granted) will allow consistency with the identified RPS land-use and infrastructure objectives and policies, and is not inconsistent with the freshwater objectives and policies.

10.4 Regional Plans

The Opihi River Regional Plan (ORRP) is still operative and relates to discharges to surface water Plan Change 7 to the LWRP involves adding new Opihi River catchment provisions into sub-regional Section 14 (Orari-Temuka- Opihi-Pareora) and then withdrawing the ORRP. The decisions on PC7 have bene appealed so this process has been delayed.

The LWRP plan has been operative since 2017 and the operative components apply to discharges to land. Chapter 14 Orari-Temuka-Opihi-Pareora (OTOP) sub-region (being the sub-regional for this application) has been subject to a Plan Change #7 which will apply to the discharges to surface water.

The LWRP PC7 decision for OTOP would insert new provisions for managing land use; for managing freshwater quality and quantity (including abstractions, allocation of freshwater, and minimising nutrient losses from farming activities); and for protecting of sites of cultural significance in that sub-region (including certain rock art sites (tuhituhi neherā) and waipuna (springs)). The decision would divide the OTOP sub-region into six freshwater management units (FMUs). There are FMUs specifically for the Temuka River, and the Opihi River, and their tributaries. This version has legal weight but is subject to appeals.

An assessment of the proposal against the relevant individual objectives and policies of the ORRP and LWRP are provided in Appendix 11.

Overall the application sets objectives and targets to be generally consistent with the objectives policies of the LWRP and PC7 version that is under appeal, with respect to improvement the ecological quality of Taumatakahu Stream in the long term it exceeds the outcomes sought by the regional plan. However it should be made clear that the application is not seeking to meet the standards for metal toxicants during wet weather flows in the receiving environment as this is completely unachievable in the short term and foreseeable long term of the duration sought (unless central, regional and district legislation bans the use of coper and zinc in brake pads, building materials etc).

10.5 Iwi Management Plans

Iwi Management Plans (IMPs) must be taken into account when preparing or changing regional policy statements and regional and district plans (sections 61(2A)(a), 66(2A)(a), and 74(2A). Iwi Management Plans (IMPs) can be used in the resource consent process to provide guidance to decision makers in particular the relevant Part 2 matters pertaining to Māori cultural values and interests (section 104(1)(c)) and highlight any other matters important to the tangata whenua of the district/region that may be relevant and necessary to determining the application. [44]

At the time of preparing the AEE, Kāti Huirapa had prepared a proposed IMP. As this has not been lodged with the relevant council(s) this has not been taken into account. This consent application has been prepared in collaboration with Arowhenua and the information and analysis that they have indicated that the information and analysis that they have provided has been cognisant of the proposed IMP.

An assessment of the proposal against the Te Rūnanga o Ngāi Tahu Freshwater Policy, and the current Iwi Management Plan of Kati Huirapa (1992) and draft Proposed Kati Huirapa Iwi Management Plan (2020) is provided in Appendix 12.

Overall given the collaboration, SMP implementation processes and the setting of consent objectives and targets this means that the proposal is generally consistent with the IMPs.

[44] https://www.qualityplanning.org.nz/node/1015

10.6 Strategies

10.6.1 TDC Stormwater Strategy

The stormwater strategy aims to provides direction to TDC's decision-making on stormwater using an integrated management approach. The Strategy establishes TDC's stormwater management vision and goals for the next 30 years and beyond; and what TDC will do to achieve those goals. The Strategy includes objectives which are the detailed, measurable statement of the goals

Potentially the vision and other objectives developed with AECL for Temuka and other townships will be used in an update to this Strategy document.

An assessment of the proposal against the Strategy objectives is provided in Appendix 12.

Overall the application is considered to be in its entirety consistent with the objectives of the strategy.

10.6.2 Canterbury Water Management Strategy

The CWMS is not a policy statement or plan prepared under the RMA, and it cannot override the provisions of the RMA or the statutory policy statements and plans prepared under that Act. However, the Council may have regard to other relevant strategies or plans in preparing the Regional Policy Statement and any regional plans and this could include Regional and Zone Implementation Plans. The CWMS vision, principles and targets are integral to promoting the sustainable management of water under the RMA, and as such have been incorporated into the objectives and policies of this chapter of the CRPS, where they meet the requirements of the RMA.

In addition, the Zone Implementation Plans (ZIP) prepared by the CWMS committee may identify matters which that committee would like to be addressed in a plan prepared under the RMA. An addendum to the OTOP ZIP was released in time for the PCA process in December 2018. [45]

Also the Canterbury Regional Council PC7 will also have considered components of the ZIP by where the council agrees it is necessary to achieve the purpose of the RMA and the request complies with the other statutory requirements of the RMA.

It is considered that the RPS and more recent PC7 decision in principle has considered the requests of the CWMS Committees as such an assessment against

10.7 Part II

The overriding purpose of the RMA is "to promote the sustainable management of natural and physical resources" (Section 5). The broader principles (Sections 6 to 8) are to inform the achieving of that purpose.

When considering an application for a resource consent and any submissions received, the consent authority, must subject to Part 2, have regard to those matters listed under Section 104 of the RMA.

With regards to the application of the subject to Part 2' under Section 104, case law findings have directed that decision makers / Commissioners may now only have recourse to Part 2 of the RMA if it is determined that one of three exceptions apply:

1. If any part or the whole of the relevant plan(s) are invalid;
2. If the relevant plan(s) did not provide complete coverage of the Part 2 matters;
3. If there is uncertainty of the meaning of provisions as they affect Part 2

[45] Orari-Temuka-Opihi-Pareora Water Zone Committee. *Orari-Temuka-Opihi-Pareora Zone Implementation Programme Addendum*, December 2018.

In essence what this means is that decisions makers only need to 'go back to' Part 2 of the Act if the relevant planning documents have not fully addressed the Part 2 matters. If a Regional or District Plan has not fully addressed the Part 2 matters, then decision makers can 'go up the tree' to the RPS and then any relevant NPS in relation to any Part 2 matters.

Plans, which have to "give effect" to the higher order statutory planning documents (RPS and NPSs), should have appropriately addressed Part 2 of the RMA.

With the exception of possibly the ORRP (given it is 20 years old and has not been subject to previous amendments) , it is considered that none of the three exceptions listed above apply and that the Part 2 matters have adequately been addressed through the RPS, and LWRP. Based on the assessment of the proposal being consistent with the RPS and LWRP as per above, the proposal is considered to be consistent with Part 2 of the RMA.

Considering PC7 and fundamentally giving effect to the NPSFM 2020 would deal with any inadequacies to the ORRP.

10.8 Determination of Applications

10.8.1 Section 104/B/D

Section 104B of the RMA relates to the determination of applications for discretionary or non-complying activities and directs that Council may grant or refuse the application and may impose conditions under Section 108 of the RMA.

Section 104D of the RMA sets out particular restrictions for non-complying activities and provides that a consent authority may only grant a resource consent for a non- complying activity if it is satisfied that either of the tests provided for in sections 104D(1)(a) or (b) is met.

Section 104D(1)(a) and (b) have been described by the Environment Court as "gateways". If neither gateway is satisfied, the application fails. If the application satisfies either gateway, then the application is considered under Section 104 of the RMA. The gateways of Section 104D(1)(a) and (b) are disjunctive, meaning that in order to satisfy section 104D it is necessary to satisfy only one of these gateways, not both.

With respect to Section 104D(1)(a), the adverse effects of the activity on the environment are described in this AEE Report. With respect to Section 104D(1)(b), the relevant objectives and policies have been assessed in this AEE Report.

It should be noted that the case law regarding whether a proposal is "not contrary to" objectives and policies means that a proposal is not "repugnant to" or opposed to the relevant objectives and policies[46]. It is also important to note that those objectives and policies in plans need to be read collectively rather than individually[47]. In other words, the objectives and policies are not a series of hurdles each of which must be cleared.

The regional plan statutory assessment shows that overall the proposal is generally consistent with the objectives and policies.

10.8.2 Section 104G

Under Section 104G of the RMA when considering an application for a resource consent, the consent authority must have regard to

- the actual or potential effect of the proposed activity on the source of a drinking water supply that is registered under section 55 of the Water Services Act 2021; and

[46] Monowai Properties Ltd v Rodney DC A215/03
[47] NZ Rail Ltd v Marlborough DC (1993) 2NZLR 641

- any risks that the proposed activity may pose to the source of a drinking water supply that are identified in a source water risk management plan prepared in accordance with the requirements of the Water Services Act 2021.

The Community Drinking Water Protection Zones (CDWPZ) located southwest of Temuka do not currently overlap with the SMA. These zones are based on microbiological risk which is expected in this case to be considerably higher compared to the toxicant risks in stormwater discharges (as demonstrated in Table 8:1). There is a slight overlap with the 500 m buffer of the SMA in the southern area of these CDWPZ, however the community supply bores are located on the opposite side of the Te Uma kaha (Temuka River) and cross-gradient in terms of the groundwater flow direction and therefore the stormwater discharges are not expected to be of concern to the community supplies.

10.8.3 Section 105

Under section 105 of the RMA, the consent authority must also have regard to:

- The nature of the discharge and the sensitivity of the receiving environment to adverse effects; and
- The applicant's reasons for the proposed choice; and
- Any possible alternative methods of discharge, including discharge into any other receiving environment.

These matters have been addressed in the 'Consideration of Alternatives' in Section 9 of this AEE report.

10.8.4 Section 107

Under Section 107 of the RMA, the consent authority must not grant a discharge permit allowing the discharge of a contaminant into water, or a discharge of a contaminant into land in circumstances that may result in that contaminant entering water, if, after reasonable mixing, the contaminant discharged is likely to give rise to all or any of the following effects in the receiving waters:

The production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;

- Any conspicuous change in the colour or visual clarity;
- Any emission of objectionable odour;
- The rendering of fresh water unsuitable for consumption by farm animals;
- Any significant adverse effects on aquatic life.

None of the above effects will occur in the groundwater or a downgradient surface water body..

11 Conclusion

TDC provides a urban stormwater collection and disposal network in Temuka, and is responsible for ensuring the urban stormwater system provides an adequate level of service for the community.

TDC has prepared a Stormwater Management Plan for these existing urban areas and a future urban growth scenario (the Temuka Stormwater Management area (SMA)) which is based on the operative and draft District Plan zoning. This plan details an integrated and adaptive approach to the management of stormwater discharges from a catchment perspective.

In association with the development of the Stormwater Management Plan, and Implementation Plan and Monitoring Plan, TDC is applying for a discharge permit (or resource consent) for the stormwater discharges from their managed stormwater network for these urban areas, and

existing and future individual residential and commercial properties discharges, subject to risk and design criteria.

The identification of current and foreseeable future issues with stormwater management and the environment has taken place by TDC in collaboration with AECL / Arowhenua, and subsequently canvassed with the greater Temuka community for additional issue identification.

A vision and associated objectives and targets for Temuka stormwater management and receiving environment have been developed by TDC in collaboration with AECL / Arowhenua.

The Implementation Plan process that is to gives effect to Te Mana o te Wai and achieve the objectives is still being developed in collaboration with Arowhenua.

The assessment of adverse effects with respect to the discharges sought has been undertaken and concluded that, the effects on the environment excluding cultural values are no more than minor.

In summary the effects of the past, and present stormwater discharges within the catchment on the values of Arowhenua are considered to be significant. It is considered that should the consent and accompanying SMP process be implemented this will mean that over time the issues raised by Arowhenua will be diminished or addressed.

With respect to adverse effects on shallow domestic drinking supply users impacted by the discharges could be also minor should they not have appropriate treatment. Ongoing engagement is occurring with well owners who have indicated that they are willing to provide a written approval.

Social benefits to the Temuka and Timaru community have been identified as positive effects associated with the applications scope and integration of stormwater management for Temuka.

In accordance with section 104(1)(b) of the RMA, regard has been given to all relevant objectives and policies for this application. It is considered that the granting of this resource consent will not compromise any of the relevant sections of the RMA (Part II, s105 and s107), National Environmental Standards, National Policy Statements or the Canterbury Land and Water Plan. Other matters including cultural policy have also been given consideration pursuant to section 104(1)(c).

It is considered that the application for a discharge permit can be granted, subject to the proposed conditions.

A duration of 35 years has been requested given the improvements sought and diminishing effects, the level of investment the former permitted status of the bulk of the discharges sought, the lack of alternatives and that the discharges cannot be ceased, it would seem appropriate to grant the maximum duration available under the RMA, namely 35 years.

Appendix 1
Temuka Stormwater Management Plan

Appendix 2
WSP Network Capacity and Flood Mapping Assessment

Appendix 3
AECL Mana Whenua Impact Assessment

Appendix 4
Kitson Consulting Cultural Values

Appendix 5
PDP Contaminant Load Model Report

Appendix 6
PDP Contaminant Transport Assessment for Temuka (and Pleasant Point)

Appendix 7
PDP Baseline Environmental Assessment

Appendix 8
Proposed Conditions and Targets Schedule

Appendix 9
Drinking Water Supply Well Owners Consultation

A: Summary Table

B: TDC Consultation Material

C: Received Written Approvals

Appendix 10
Temuka Monitoring Plan

Appendix 11
PDP Non-residential Site Assessment

Appendix 12
Objectives and Policies Assessment

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