
Geraldine Stormwater Management Plan Executive Summary

- Prepared for

Timaru District Council

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Executive Summary

This management plan ('Plan') sets out a framework for enhancement of the primary drainage functions of the Geraldine stormwater network and to ensure that the effects on the receiving environment are minimised. The Plan seeks to maintain the current water quality in the Waihi River, which is unaffected by urban stormwater discharge, while also improving the water quality of the Serpentine Creek.

Geraldine is fortunate to have favourable topography and soil conditions which have historically facilitated a satisfactory standard of stormwater drainage. However, it has been identified that the level of service, in some areas of the locality, is particularly limited compared with current national standards and guidelines. This is particularly the case in the areas to the south of the town centre, where the stormwater network has yet to be extensively developed and to the east of the Waihi River, where the stormwater is drained to the ground by a combination of private and public soakaways.

Ultimately, all stormwater discharges from Geraldine are discharged to the Waihi River, whether it be via initial discharge to the shallow groundwater aquifers, to the Raukapuka Stream, Downs Creek, Serpentine Creek or directly to the Waihi River floodway. However, the stormwater discharges from urban Geraldine form only a very small proportion of the total discharges to the Waihi River which has a total upstream catchment area of over one hundred square kilometres.

The urban stormwater drainage network in Geraldine has primarily been developed to avoid nuisance and damage from flooding via runoff generated from the urban area of Geraldine. Stormwater runoff from the Geraldine urban area has a negligible impact on the hydraulic capacity and flooding in the Waihi River floodway. Although the impact of urban flows are greater on Serpentine Creek, the water way is considered to have sufficient capacity to convey runoff from at least a rainfall event with a 2% probability of occurring in any single year (2% AEP) without significant flooding. The critical section of Serpentine Creek is located at the downstream periphery of the urban area. At this location the capacity of channel to receive stormwater to an acceptable standard is dependent on the channel being maintained free of excess vegetation and debris. This includes various fencing structures that cross the channel downstream of the stormwater management area. Maintenance of channel vegetation is currently the responsibility of the individual landowners but may be undertaken by Environment Canterbury. Additional flooding in all the receiving waterways may occur with debris blockages of culverts and bridges.

Adverse water quality effects in the receiving waterways associated with discharge from the stormwater network may potentially occur. This would be as a result of stormwater discharges with high concentrations of sediment, heavy metal and hydrocarbon contaminants in rainfall related runoff, as well as non-rainfall related discharges, where the stormwater network can also act as a pathway for accidental spills, or unintentional discharges of other contaminants from the adjacent land-use activities. It is important that all of these potential sources of contaminant discharges are adequately controlled to avoid adverse effects on the receiving environment from discharges from the stormwater network.

Proposed Stormwater Management Strategy

An adaptive management strategy is proposed to ensure that the stormwater network is managed to achieve the objective of minimising flooding and protecting the water quality of the receiving environment.

This will include but is not limited to the following aspects:

- Network management;
- Capital works upgrades;
- Operations and maintenance;
- Monitoring of network performance and effects on the environment;
- Pollution control measures and awareness to minimise the effects of contaminant discharges associated with land-use activities; and
- Improved awareness and training of management staff, Timaru District Council staff, Te Rūnanga o Arowhenua, Aoraki Environmental Consultancy Limited, Ngai Tahu, external stakeholders and general public.

Management of impacts of stormwater discharges on surface water quality

The potential adverse effects of stormwater contaminants in a water body depend on both the water quality characteristics of the discharge(s) and the receiving water body, and any dilution provided by the waterway.

The level of dilution provided by the receiving waterway varies quite considerably. At times low flows are lost to and gained from groundwater along both the Serpentine Creek and the Waihi River. Significant concentrations of nutrients and microbiological contaminants are also likely to be periodically discharged to both the Waihi River and Serpentine Creek from their respective rural catchments.

In the absence of any relevant base environmental data collected by Environment Canterbury, Timaru District Council has undertaken a programme of water quality sampling in the Waihi River and Serpentine Creek. This was undertaken to assess the baseline characteristics of these waterways, and to assess if there are any long-term effects associated with the urban stormwater discharges. This included an initial evaluation of sediments and ecological indicators to assess the general health of the waterways and specifically identify if there is any change in the ecological condition of the waterways.

Waihi River Water Quality

Investigations undertaken by TDC have, to date, shown that there were no obvious changes in the waterway water quality and ecological conditions downstream of the urban stormwater discharges to the Waihi River. The Waihi River remains in a “healthy” ecological condition with some elevated bacteria and nutrient concentrations throughout the section of the river investigated.

Serpentine Creek Water Quality

Serpentine Creek has lower water quality characteristics and ecological condition than the Waihi River, with high levels of nutrients, bacteria and heavy metal contaminants. There is some evidence of an increase in nutrients and bacterial concentrations downstream of the urban catchment where the stream channel passes through farmland. While, the heavy metal contaminants observed are consistent with effects of stormwater discharges, there are particularly high concentrations of dissolved zinc in the dry weather baseflow(s) that may not appear to be directly related to stormwater discharges. Therefore, additional investigations and monitoring are recommended to determine the sources of heavy metal contaminants in the Serpentine Creek.

Environmental Monitoring

The water quality assessments to date are limited to two water quality sampling rounds and a single assessment of sediment bound contaminants in Serpentine Creek. The understanding of the effects of stormwater discharges will improve with further monitoring and sampling and water and sediment quality sampling are considered to be important management tool to provide details of the effects of stormwater discharges on the receiving environment.

Defining the characteristics and effects of stormwater discharges is a complex problem and can be difficult and time consuming to definitively quantify. The cost and benefit of environmental monitoring needs to be balanced against undertaking/implementing physical (or educational) improvements to reduce stormwater contaminants discharged to the receiving environment.

Management of Effects of Discharges to Groundwater

Infiltration into the ground is considered the most effective measure of reducing the effects of contaminants in the stormwater may have on adjacent waterways. Geraldine has significant areas of the network to the east of the Waihi River (Raukapuka) and to the south of the town centre that contain soils potentially suitable for discharging some or all of the stormwater discharges to the ground. This approach is consistent with the expectations of Te Rūnanga o Arowhenua that discharges are filtered by Papatūānuku before discharge to the receiving waters.

More investigations are desirable to confirm the long-term maximum groundwater levels to establish the effectiveness of this stormwater disposal method during wet years when groundwater levels would be elevated.

The discharge of stormwater to the ground is generally considered an effective stormwater management strategy and mitigates the environmental and health impacts on local surface waterways. Whilst this Plan recognises that stormwater discharges have the potential to contaminate surrounding groundwater, and could impact private drinking-water supplies (e.g. with microbial contaminant), no monitoring or anecdotal evidence suggests this is occurring. On-going management of these potential effects is provided with additional groundwater monitoring to understand these risks better. It is also important to note that there are no public drinking water supplies and very few domestic drinking water supplies potentially affected by stormwater discharges to the ground in Geraldine. Therefore, the potential contamination from stormwater

discharges to the ground are considered to present a low health risk and would be undisguisable to the potential health risks from existing surrounding agricultural land uses and any discharges into the surrounding waterways .

In addition to the proposed monitoring groundwater for possible stormwater contaminants, Timaru District Council proposes to (1) control where new developments will discharge stormwater and minimise the effect on any surrounding bores and (2) implement a public education programme with the intent to control some of the principal sources of microbial contamination in stormwater, specifically from domestic animals in public and private places, and actively promote sound land-use activities to minimise the risk contaminants entering groundwater.

Management of Land Use Activity Effects

The extent of contaminants in stormwater discharges may be influenced by variations in climate as well as land use activities. Whilst the cause of climate change and the resultant increase in intensity of rainfall events cannot be changed, the effect of land use activities on water quality can be mitigated through provision of stormwater treatment facilities, controls and limits on discharges and public education.

Intermittent discharges from the stormwater network resulting from accidental spills and unintended discharges can occasionally cause severe environmental effects that are potentially much greater in effect than those resulting from regular contaminant discharges associated with more regular climatic events.

It is proposed that the Timaru District Council will be actively involved in ensuring adequate erosion and sediment controls are in place to limit sediment leaving construction sites and passing sediment through the stormwater network into the receiving waterways. It is anticipated that this will require consideration and specification of sediment control requirements during the subdivision and building consent approval processes.

Site specific operational controls with specific design (and consenting) will be necessary to monitor and control the potential spills risks of activities that involve hazardous materials as listed in Schedule 3 of Environment Canterbury's Land and Water Regional Plan from discharging to the stormwater network.

Similarly, specialist assessment of possible effects and consent approvals are likely to be recommended for contaminated land where soil contaminant concentrations are higher than accepted background concentrations.

Education of internal and external stakeholders and the general public is considered an important tool to minimise the effects of adverse activities such as littering, discharge of vehicle/property wash-down water to stormwater, control of domestic animal faecal material being washed to stormwater, as well as the development of feedback publication and information of the performance of the Geraldine stormwater network and effects on the environment.

Affordability

Consideration of likely cost to provide full best practical stormwater treatment and desirable capacity capital upgrades to the existing stormwater network to bring the discharges up to current standards is estimated to require an annual expenditure in the order of \$1,000 per property per year over thirty years or at least \$20M capital investment by the community. The improvements that this investment would provide need to be considered against other competing needs and

costs faced by the community including the effects of upstream Waihi catchment activities may have on the water quality in the Waihi River.

Therefore, an adaptive management programme is proposed with on-going environmental monitoring and improvements only being undertaken within the financial capacity of the community and when the environmental improvements warrant the expenditure.

Future Management Opportunities

Future management of the stormwater network is expected to continue to include provisions in the following areas:

i. Asset Management

On-going review and replacement of the stormwater asset condition is currently provided for within the Timaru District Council's Stormwater Activity Management Plan. This includes condition assessments of the pipes within the stormwater network to identify assets that are nearing the end of their life. During any programmed replacement of assets it is anticipated that opportunities to upgrade the capacity of the network will be considered.

ii. Operations and Maintenance

The maintenance of the Serpentine Creek channel condition is critical in the lower reaches of Serpentine Creek for the channel capacity to be sufficient to receive stormwater discharges from the Geraldine SMA.

The channel maintenance programme needs to specifically focus on the in-channel vegetation condition and fence structures in lower Serpentine Creek to minimise flooding risks. This will be a collaborative implementation with TDC and Environment Canterbury's Rivers and Drainage Department with a Memorandum of Understanding between the two parties that clearly defines the responsibilities between the two parties to maintain the channel of Lower Serpentine Creek so that the objectives of this Plan can be achieved.

iii. Provision for Growth

Growth of up to 15% over the next 30 years is proposed. New development is anticipated to be located to the north-east of the Waihi River and to the south of Geraldine town centre. The majority of new discharges from these new development areas are anticipated to be either to the Waihi River or by soakage to ground. A best practical treatment standard is proposed for all new development, to minimise any impacts of new development on water quality.

iv. Capacity Upgrades

A preliminary assessment of the capacity of the existing stormwater network in Geraldine has identified that a large proportion of the network has a lower level of service than the current Timaru District Council and New Zealand Building Regulation requirements for new developments. Therefore, any infill development may require network upgrades to accommodate new developments along with meeting the expectations of the general public regarding the acceptable level of nuisance flooding (inundation) to the streets and private property. Similarly, changes in public expectations with respect to the nuisance flooding (inundation) may also occur with population increases and land use changes within Geraldine, and a higher level of service may also be expected by the community.

Timaru District Council maintains a hydraulic computer model of Serpentine Creek to ensure the receiving waterway channel has sufficient hydraulic capacity to receive additional stormwater discharges. Similar assessments will need to be undertaken for the Raukapuka Stream and Downs Creek waterways to accept any significant new stormwater discharges from new developments.

v. Stormwater Treatment

General Requirements

New development and capacity improvements to the existing stormwater network are likely to result in stormwater discharges entering the receiving waterways quicker and with a greater peak flow rate.

Best practical levels of treatment will be required for new development to minimise increases in the contaminant mass discharged to the receiving waterways. Also, any capacity upgrades to the existing stormwater network will need to consider measures to provide or retain the same level of stormwater treatment, so as to avoid adverse effects of conveying higher masses of contaminants to the receiving waterway(s).

Although treatment of stormwater at the point of source is considered more desirable, more cost-effective stormwater treatment may be achieved by providing fewer yet larger treatment devices near the point of discharge to the receiving waterway.

A number of direct stormwater discharges occur from individual private properties to the Waihi River or Serpentine Creek and its tributaries without passing through the Timaru District Council's stormwater network. It is likely that Timaru District Council will have had historical responsibility for approving these discharges. However, the council now has limited means to manage these discharges. In the Serpentine Creek urban catchment, approximately 20% of the catchment does not discharge via the Council stormwater network.

Treatment Standards and Requirements for New Development and Upgrades

Timaru District Council is in the process of developing a Code of Practice for development to encourage the use of Low Impact Design Solutions as a preferred option for stormwater management where it is a practical solution. The aim of this is to mimic natural processes, as close as practical to the source of the stormwater, thereby helping to reduce adverse effects associated with the discharges.

This will be used for new development, upgrades of the existing network or street renewal upgrades and its purpose will be to assist TDC, and to inform and assist developers, to provide effective and appropriate stormwater treatment solutions.

Review of current best practice methods used nationally and internationally to provide engineered stormwater treatment devices indicates that, at best, these will only provide removal of up to 75% of sediment and 50% of other typical stormwater contaminants. Discharge of at least the initial first flush of stormwater flows to ground is considered the most effective means of reducing contaminants discharged to the receiving waterways. The preferred method of stormwater treatment will be determined on a case by case basis; predominant factors affecting selection are likely to be (a) land area to locate, (b) suitability of soil types to soak to ground and (c) cost.

Ongoing environmental monitoring is intended to assist with the selection of an efficient stormwater treatment device(s) in the design. This will permit requirements to be

adapted to meet current best understanding of the issues as they are uncovered and discovered.

Specific treatment provisions recommended to be implemented initially for Geraldine with capital upgrade projects include:

(A) Riparian Buffers

The Waihi River does not receive any stormwater discharged directly to the low flow river channel, and any base flows are filtered through the existing riparian buffers prior to discharge to the receiving aquatic environs. It is proposed that these are retained as the existing riparian margins provide filtering of the discharges prior to treatment. The Serpentine Creek channel is a lot more confined and it is not always possible to avoid discharges directly to the aquatic environment. The Serpentine Creek channel is located on largely privately owned property, which restricts available space for riparian enhancement and provision of stormwater treatment prior to discharge to the receiving water.

(B) Litter

Geraldine has high-use recreational locations centred around both Serpentine Creek (Geraldine Domain) and the Waihi River. Litter traps are recommended on sump inlets at high profile discharge locations on the Waihi River and Serpentine Creek.

(C) Hydrocarbon Capture

Inspections of industrial and commercial premises and sediment sampling in Serpentine Creek indicate some evidence of spills and discharges of hydrocarbon contaminants to the stormwater network. Contaminant load modelling indicates that up to 80% of hydrocarbon contaminants are expected to be discharges from high traffic use roads (Talbot Street, Waihi Terrace, Cox Street and State Highway 79). Therefore, it is proposed that all collection sumps on these roads include submerged outlets to capture spills and leaks on these roads.

(D) Serpentine Creek Sediment Traps

It is proposed to investigate the effectiveness of utilising the existing flood detention storages on Serpentine Creek to trap sediment from the upstream rural catchment in order to limit sedimentation effects in Serpentine Creek.

(E) Rain Gardens and Proprietary Treatment Devices

Rain gardens and proprietary treatments may be able to be retrofitted into existing street landscapes and sites for source treatment. Space limitations in existing developed areas may limit treatment devices to the use of rain gardens and proprietary treatment devices to achieve the above standards of treatment.