Winton-Wastewater Treatment Plant

Resource Consent Application and Assessment of Environmental Effects

Southland District Council

01 June 2023

→ **The Power of Commitment**

Project name		Winton WWTP Upgrade and Consent Renewal					
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Form 9

APPLICATION FOR RESOURCE CONSENT
UNDER SECTION 88 OF THE
RESOURCE MANAGEMENT ACT 1991

TO: **Environment Southland**
Private Bag 90116
Invercargill
9840

From: **Southland District Council**
Po Box 903
Invercargill
9840

(Please note different address for service at the end of this form)

Southland District Council applies for the resource consents described below:

1. **THE NAMES AND ADDRESSES** of the owners and occupiers of any land to which the application relates are as follows:

   Owners/Occupiers Winton Wastewater Treatment Plant (WWTP):
   Southland District Council (SDC) owns and occupies the lots associated with the WWTP.

   Owners/Occupiers WWTP Discharge Location:
   The SDC owns and occupies the lots associated with the WWTP discharge location.

2. **THE LOCATION** to which this application relates is:

   Winton WWTP:
   Physical location: 3 Gap Road West, Winton 9781
   Legal description: Fee Simple, 1/1, Lot 1 Deposited Plan 5815

   Winton WWTP Discharge Location:
   Physical location: Winton Stream at or about NZTM 1239476E – 4877049N.
   Legal description: Fee Simple, 1/1, Lot 1 Deposited Plan 5815
   Certificate of Title attached as Appendix A

3. **THE TYPES** of resource consent sought from the consent authority:

   Regional Water Plan for Southland (RWPS):

   - Discharge permit for the discharge of contaminants into surface water from a community sewage scheme pursuant to Rule 2 of the RWPS as a non-complying activity.

4. **A DESCRIPTION** of the activity to which the application relates is:

   SDC is seeking resource consent to renew Consent:202026, which is due to expire on 8 December 2023. The resource consent application is for short-term duration while further investigation is undertaken to upgrade and convert the existing WWTP to a land-based disposal system. The existing consent relates to

the operation and maintenance of the WWTP for Winton. The existing WWTP treats wastewater from the Winton township which is then conveyed to an oxidation pond and subsequently discharged into the Winton stream via to six wetland cells. Treated wastewater is discharged into the Winton stream through a diffuser installed in the bed of the stream. A more detailed description of the WWTP is included in Section 3 of the report.

5. **AN ASSESSMENT OF ENVIRONMENTAL EFFECTS** in accordance with Schedule 4 of the RMA, is provided in Section 5 of the attached report in such detail that corresponds with the scale and significance of the effects that the works have on the environment.

SDC requests that the application be publicly notified pursuant to Section 95A(3)(a) of the RMA.

6. **AN ASSESSMENT OF THE ACTIVITY AGAINST ANY RELEVANT PROVISIONS** of a document referred to in section 104(1)(b) of the RMA including the information required by clause 2(2) of Schedule 4 of that Act is included in Section 6.

7. **OTHER CONSENTS OR PERMITS APPLIED FOR**

No other resource consents or permits are required from Environment Southland or Southland District Council.

Signed on behalf of SDC

Jan Steenkamp
Senior Environmental Planner
GHD Limited

Dated this 1st day of June 2023

ADDRESS FOR SERVICE of Applicant for consent processing matters and invoicing:

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1. Introduction

1.1 Purpose of this report

The Southland District Council (SDC) seeks resource consent from Environment Southland (ES) in accordance with Section 88 of the Resource Management Act, 1991 (RMA) to renew Consent:202026 relating to the exiting Winton Wastewater Treatment Plant (WWTP), which is due to expire on 8 December 2023.

The SDC furthermore seeks approval and confirmation from ES to lawfully continue operation under the existing resource consent in accordance with Section 124 of the RMA while the proposed short-term consent (5-year consent duration) is being processed and determined by ES.

The application to renew Consent: 202026 will be assessed as a new activity against the provisions of the Regional Water Plan Southland (RWPS) and the Proposed Southland Water and Land Plan (PSWLP) to determine the actual or potential adverse effects on the receiving environment.

The PSWLP became operative (in part) on 1 March 2021. As such, relevant objectives, policies and rules of the PSWLP as well as those in the RWPS, must be considered in all resource consent applications lodged with ES.

The Resource Consent Application provides the following information:

– Application details set out in Form 9
– Description of the site and receiving environment (Sections 2).
– Description of the proposed activity (Sections 3).
– Description of the resource consent required for the proposal (Section 4).
– An assessment of the effects of the proposal on the environment and the ways in which adverse effects will be avoided or mitigated (Section 5).
– Assessment against Part 2 and Section 104 of the RMA including (Section 6).
– Proposed conditions of consent to support the short term application (Section 7)
– Consultation with affected or interested parties (Section 8).
– Any other relevant matters necessary to determine the application.

The Assessment of Environmental Effects (AEE) has been prepared in accordance with Schedule 4 of the RMA. The level of detail provided within this report reflects the scale and significance of effects. Measures to avoid, remedy or mitigate potential adverse effects are also included.

SDC requests that the application be publicly notified pursuant to Section 95A(3)(a) of the RMA.

1.2 Background

1.2.1 Existing Winton WWTP

The original Winton WWTP was established in 1962 and services the township of Winton. The system is designed for a population of 2,350.

The Winton wastewater reticulation system discharges into a pump station at Dejoux Road where it passes through a flow meter before being pumped 500m to the 3mm screen at the primary aerated oxidation pond, comprising an area of approximately 1.96ha and an approximate depth of 1.5m.

The original system fed wastewater from the aerated oxidation ponds through two separate planted channels for land treatment prior to discharging into the Winton stream. The planted channels where later replaced in 2005 with a constructed 1.4ha wetland comprising of six parallel treatment cells. The wetland was constructed to address some of the water quality effects in the Winton Stream that were attributable to the discharge from the WWTP. Biological Oxygen Demand (BOD_5), Total Suspended Solids (TSS) and E.Coli levels were intended to reduce significantly while ammonia concentrations would reduce to a lesser degree during certain times of the year.

Based on the latest water quality results taken from the Winton Stream, significant elevations of BOD_5, TSS and E.Coli have been observed in Winton Stream. However, ammonia remains to be the main issue within the Winton

Stream, especially during the summer months when the flow in the stream reduces and decreases the ability to dilute the concentrations of ammonia to acceptable levels beyond the mixing zone. During the summer of 2021, a diffuser (Figure 1) was installed in the Winton Stream to enable more thorough mixing of the discharge in the stream with the purpose of reducing the impacts of the discharge plume.

Moreover, the infiltration and inflow issues within the township wastewater network has resulted in higher wastewater flows to be treated at the plant, above the consented average flow limit of 750m^3/day.

Section 3 provides a detailed description of the existing Winton WWTP in relation to the design data basis, operation and nature of the discharge. The existing Winton WWTP will form the basis of this resource consent application in relation to the description of the activity.

Figure 1 Diffuser in Winton Stream replacing six individual discharge pipes

1.2.2 Proposed Winton WWTP

SDC started the Winton WWTP consent renewal project in July 2020, with the purpose of investigating and consenting a preferred future treatment and discharge solution for the Winton WWTP.

1.2.2.1 Long term solution

The general direction of the wider project is to upgrade the Winton WWTP scheme and to find alternative land based disposal options to prevent any further discharge into the Winton Stream. The long-term solution can be split into three different phases as described below:

Optioneering Phase (Phase 1):

The initial stage of the project required the relevant parties involved to gain a better understanding of the receiving environment and explore possible wastewater treatment and disposal options. Workshops were held to identify potential constraints and risks which would then ultimately inform future decisions around the upgrading of the Winton WWTP and developing a long-term solution.

Long List Options and Initial MCA

A number of options were explored and assessed via a Multi-Criteria Analysis (MCA) to identify strengths, weaknesses and risks associated with each of these options. A total of 10 options were assessed at a high level (Refer to Table 1).

Table 1 Winton Scheme Long List Options

Long List Options / Themes	Brief Description
Option 1 Discharge to water - optimisation	*Enhanced existing WWTP through additional aeration, desludging, addition of chemicals or baffle curtain to oxidation pond, continue with existing stream disposal*
Option 2 Discharge to water - add-on treatment	*Additional treatment processes for ammonia and DRP removals via adding an activated sludge treatment or chemical dosing, continue with existing stream disposal*
Option 3 Discharge to water - tertiary treatment	*Additional disinfection process after existing wetland cells via installation of UV or membrane filtration, continue with existing stream disposal*
Option 4 Discharge to water - new WWTP current location	*Replace existing pond with a new activated sludge plant to significantly improve the discharge quality, continue with existing stream disposal*
Option 5 Discharge to land 90% - existing WWTP	*Minimal change to pond treatment process at Winton WWTP, effluent from wetland is pumped to a new irrigation system for land discharge, say 90% of time.*
Option 5a Discharge to land 100% - existing WWTP	*Similar to Option 5, except discharge to land all the time*
Option 6 Discharge to land 90% - Add-on treatment	*Install additional treatment for AmmN and DRP removals, then UV disinfection. Pump to a new irrigation system for land discharge, say 90% of time*
Option 6a Discharge to land 100% - Add-on treatment	*Similar to Option 6, except discharge to land all the time*
Option 7 - Plant relocation and discharge to land	*Existing Winton ponds will be decommissioned, relocate to a new site in close proximity to suitable land disposal fields*
Option 8 - Pump wastewater to Invercargill	*Wastewater from Winton is pumped to the Invercargill WWTP for treatment (approx. 35 km pipeline length).*

From the initial MCA assessment and workshop on 16th September 2020, six options were shortlisted and carried forward for further analysis (SDC later re-branded the six shortlisted options as Options A to F for consultation purposes to avoid confusion as to why the option numbers were not consecutive, these are shown in brackets below):

– Option 4 (Option A)
– Option 5a (Option B)
– Option 6 (Option C)
– Option 6a (Option D)
– Option 7 (Option E)
– Option 8 (Option F)

The above six shortlisted options were presented to the working group on 27th October 2020.

Subsequent investigations and technical evaluation

Between October 2020 and February 2021, further investigations were undertaken to further inform the short-listing of options. This work included development of a preliminary water balance model to inform the feasibility of disposal of treated effluent to land in the vicinity of Winton. This preliminary model was based on assumed soil parameters. Additional samples were also collected to improve data resolution of the plant discharge quality and the receiving environment, as the existing consent requires monitoring only 3 to 4 samples per year

Working group meetings were held in February and March 2021 to review the six shortlisted options, along with possible treatment improvement options. It was noted that complete disposal to land in all conditions could be limited or impractical due to significant wet weather events resulting in high flows being received at the treatment plant and soil conditions becoming saturated.

It was agreed in the March 2021 workshop that Option E (relocating the treatment plant to a new site with land discharge) was removed from the short list because this option was similar to the option of retaining the plant at the current location, with major upgrades. The cost and effort of finding new land, and designating it for treatment, as well as land for disposal, would likely make this option significantly more expensive than using the current

location. A decision was also made to defer public consultation as Option F (pumping to Invercargill for treatment and disposal) needed more consultation and additional investigations.

Further review of plant performance results indicated the quality of the existing treatment plant is unlikely to meet the future consented discharge limits. Hence Option B (discharge to land with existing WWTP) was removed from the short list during the working group meeting on 3rd August 2021.

The working group meeting on 17th November 2021 decided to undertake preliminary field testing to understand better the infiltration rates of various specific sites around Winton. The infiltration test results were then used to revise the water balance model for irrigation area estimation. In parallel, SDC commissioned GHD and Fulton Hogan to develop preliminary cost estimates of wastewater conveyance and pump stations from Winton to Invercargill.

Refinement of short-listed options

Following the findings of the soil testing and cost estimates of the conveyance infrastructure for Option F, SDC and GHD held risk workshops/meetings in April and May 2022. The following two options were removed from the short list:

– Option A (Discharge to Winton Stream with a new WWTP): the continuing discharge of treated effluent to water option was removed after receiving feedback from Te Ao Marama and ES that this option was highly unlikely to gain support.
– Option C (90% discharge to land without add-on treatment): a similar outcome to Option A, and SDC's desire to pursue an acceptable level of treatment prior to discharge to land.

This left two options on the shortlist: Option D (discharge to land with add-on treatment) and Option F (pumping to Invercargill for treatment and disposal).

Selection of preferred option

Further assessments were undertaken between May and July 2022. An internal paper was presented to SDC' Services and Assets (S&A) Committee meeting outlining the two options, and Option F was not selected to be pursued further based on the risks identified. These risks included cross region of wastewater conveyance and disposal of wastewater, concerns expressed by community members and iwi during consultations and lack of certainty of removal of treated effluent discharge into water at the Clifton WWTP in future.

Furthermore, Te Ao Marama also expressed their support for land discharge of treated effluent. Hence, Option D was recommended for SDC's council endorsement. When further information is available, Rūnanga would welcome the opportunity to receive this information. Consultation with Runanga is currently underway.

On 25th July 2022, the working group was presented with the recommendation from SDC's S&A meeting, and intention to seek Council's recommendation for Option D. The participants were also informed about the revised consent strategy and progress being made on the management of stormwater infiltration to the scheme. The updated consent strategy proposes a short-term consent application be lodged by June 2023 to continue discharge to Winton stream in the interim, followed by a separate long-term consent application for the new land disposal site. The reduction of stormwater infiltration into the network has been identified as key to the successful land disposal of treated effluent.

A community drop-in session was also held in Winton Memorial Hall on 25th July 2022. SDC received written feedback at the session, with positive support for the preferred option, and continued engagement sought once specific land parcels for treated effluent application are identified.

Land Discharge Investigations

Various desktop and field investigations of land suitable for treated effluent application have been undertaken in parallel to the optioneering work. Below is a brief chronology of these investigations.

Land Constraints Mapping (September 2020 and December 2021)

This GIS-based desktop investigation set out to identify potentially suitable land parcels for treated effluent irrigation within 10 km of the Winton WWTP. Various information sources were extracted to form a MCA to score

land parcel suitability based on criteria such as zoning, proximity to buildings and waterways, existing land uses, soil types, soil depth and flooding risks.

This investigation identified a number of potentially suitable areas in the vicinity of Winton (Figure 2).

A subsequent update was made in December 2021 to incorporate the following changes:

– Maximum distance from Winton WWTP increased from 20 km to 25 km
– Scoring based on distance to WWTP removed
– Maximum slope of land increased from 8.5 degrees to 15 degrees

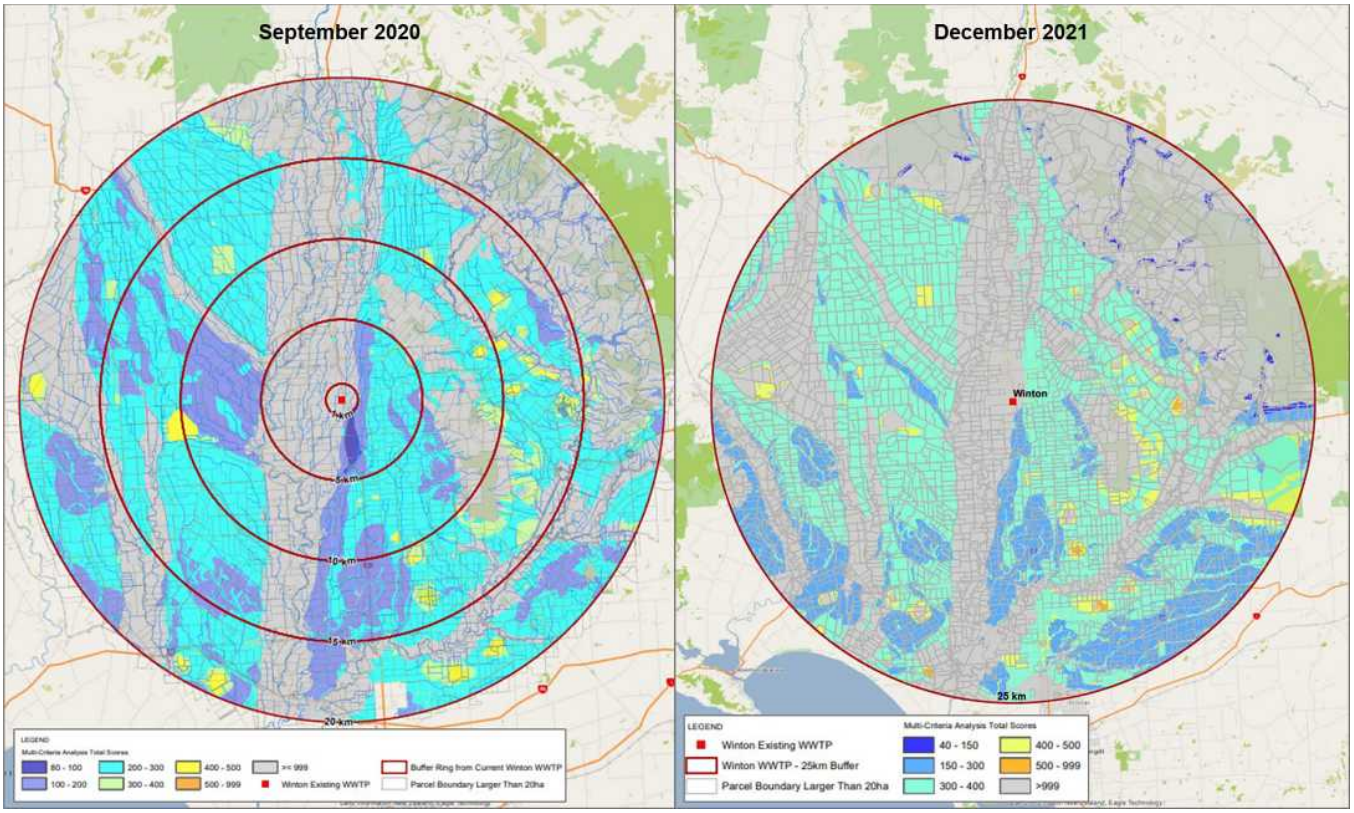


Figure 2 ***Land disposal constraints analysis from 2020 (left), and updated analysis from 2021 (right). Lower scoring indicates land parcel is more favourable for land disposal. Note different scaling between the two maps.***

Areas to the West, East and South of the current WWTP location score preferably in the updated constraints analysis (areas in blue), which is similar to the original analysis. Some areas close to the current WWTP location appear less preferable. This is primarily due to removing scoring related to distance from WWTP.

The key limiting factors for land disposal of treated effluent around Winton are low permeability of the sub-surface soil layer coupled with a high groundwater table which can lead to winter saturation and flooding, potentially resulting in limited application availability and potential overland flow.

Field Investigations

GHD conducted two rounds of field investigations in October 2021 and March 2022. The purpose of these investigations were to assess (at a high level) the suitability of land at locations surrounding Winton in terms of hydraulic loading capacity for the discharge of treated WWTP effluent. This data was then utilised to calculate the likely required disposal area based on current and future predicted hydraulic loading. The two separate field investigations undertaken targeted specific areas, and the field observations were recorded in corresponding technical memos.

October 2021 - The purpose of this first field investigation was to confirm some of the preliminary desktop findings of soil suitability in and around the current Winton WWTP site. Investigations were limited to sites owned by SDC and results suggested that the gley soils present over the flood plains surrounding Winton were unlikely to be

suitable for land disposal due to the high observed water table and low recorded infiltration rates. It was calculated that based on the observed infiltration rates and soil characteristics, a land area in excess of 100 Ha would be required if a full land disposal solution was progressed and was considered significant for the relative size of the community being serviced.

March 2022 - Following the October 2021 field testing, the constraints analysis was revisited to have a stronger focus on soil suitability (relative to other considerations). This was undertaken in order to identify land areas in which soil infiltration was likely higher, thus reducing the estimated land area for disposal. Potential disposal areas were highlighted in areas to the West, East and South of the current WWTP location from the revised GIS-based analysis (Figure 2). The predominately brown soils identified during these investigations suggested a general low-median overall infiltration rate, however the infiltration results showed significantly more promise (in terms of rate of application) than the earlier field investigations due to the observed higher infiltration rate (relative to the previous assessment) deeper groundwater and lower susceptibility to flooding.

Water Balance Models

To assess seasonal soil hydraulic loading a water balance was constructed in the modelling software Goldsim. Goldsim is a software package designed to run Monte Carlo simulations for probabilistic analysis of dynamic systems. It has been utilised to develop a Water Balance Model (WBM) that focusses on the total soil water holding capacity (based on empirical datasets for the identified soils of interest) and specific field observations and measurements. It also considers climate variability which has a large influence on soil saturation seasonally and annually and therefore is able to predict (within the confines of the input data accuracy) the estimated hydraulic loading available to apply to a specified area of land over an extended timeframe. Figure 3 illustrates the irrigation component of the Winton WWTP WBM.

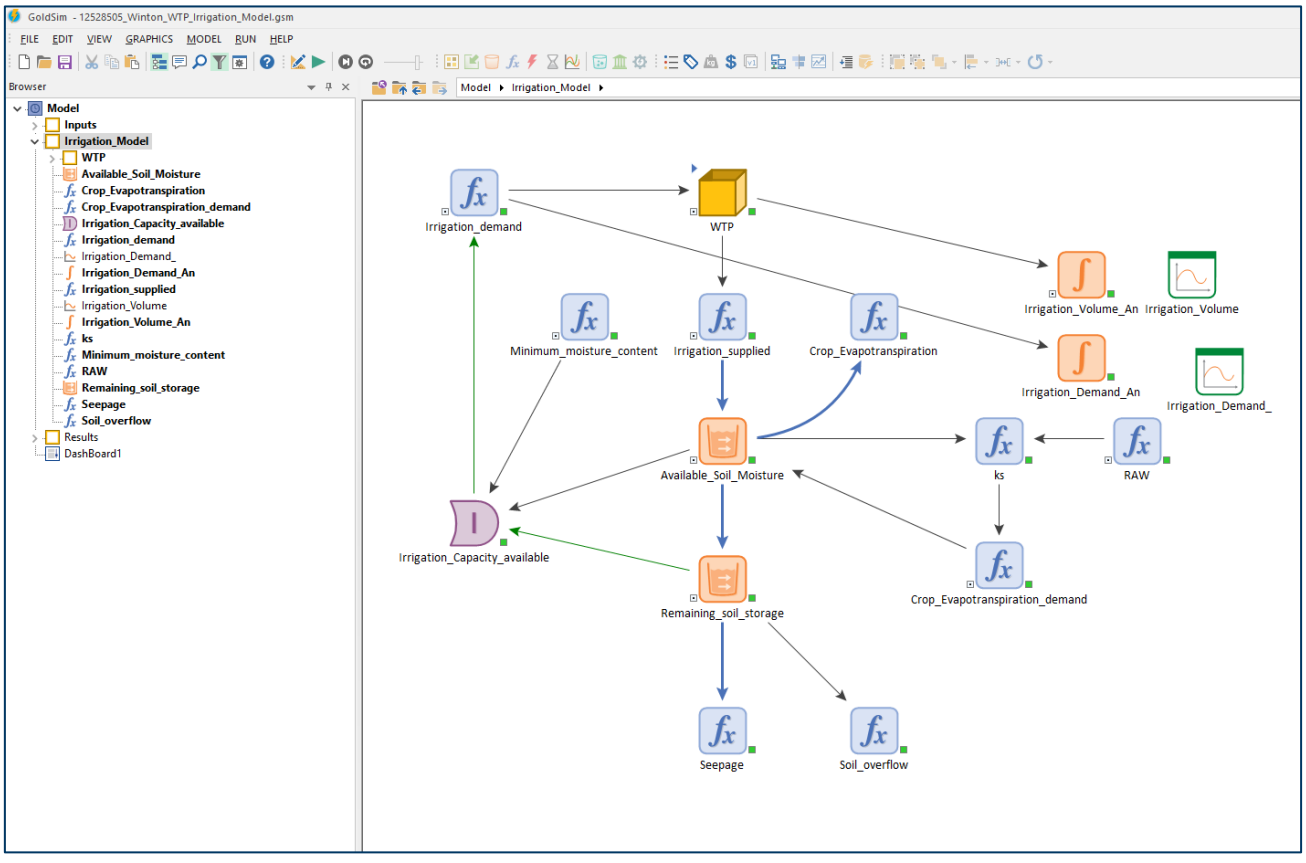


Figure 3 Goldsim Water Balance Model

The WBM assumed application of treated wastewater to land with assumed brown soil properties and confirmed as present within the area of interest during field testing outlined by GHD in March 2022 field investigations. The volume of wastewater (both incoming and outgoing from the WWTP) is driven by rainfall (likely due to infiltration into the collection and reticulation network) and is the key model element that provides statistical predictions within

a timeframe (eg. daily / annual) and enables the WBM to be used as a tool to define land area required and probability of capacity exceedance on a timestep basis.

The WBM was updated throughout the optioneering and selection process as various environmental parameters were updated and refined. The current assessment assumes that an average application rate of 5 mm/day is applicable based on field data thought to represent likely available and appropriate land parcels. In terms of the long term requirements, it has been estimated that a disposal area of approximately 70 Ha combined with storage of approximately 6,500 m^3, and maximum application rate of approximately 2,500 m^3/day, would be appropriate to dispose of the incoming wastewater all year around in all but the wettest years. These estimates will be revised following further targeted field investigations and development of the design.

Design Phase (Phase 2):

The second phase of the project, being the future scheme design is currently underway based on the requirement for approximately 70 ha of land to accommodate the proposed long-term disposal of treated wastewater from Winton onto land. This area will be revisited following additional field testing scheduled for mid-2023.

The biggest challenge is finding sufficient and suitable land to accommodate the proposed land application. SDC is currently investigating several locations on a case-by-case basis, which will determine if the proposed disposal area is suitable to attenuate and break down any remaining contaminants in the soils that may enter groundwater. The preferred application area must be at a suitable distance from any sensitive receptors (i.e. residential dwellings), waterbodies, groundwater wells used for domestic supply and wetlands.

As of March 2023, SDC is working with potential landowners and discussing potential land management and irrigation regimes in an attempt to secure a suitable piece of land for the establishment of a land-based discharge scheme. Detailed field investigations and purchase negotiation are yet to take place.

Treated wastewater will continue to be discharged into the Winton Stream during the initial stage of the conversion process, but the total volume of discharge will progressively reduce over time as additional sections of the land discharge area are developed. SDC proposes to remove low flow discharges to the Winton Stream as a priority once land is secured, the pipeline conveying wastewater has been installed, and initial irrigation fields are established. Based on our current assessment, the first stage will require approximately 35ha of land to effectively remove the majority of the current Winton Stream discharges.

Once there is adequate capacity in the scheme to discharge all the wastewater onto the land disposal area, the discharge into the Winton Stream will be cease in all but the wettest years.

The design phase will likely be finalised over the next two years.

Construction Phase (Phase 3)

The final phase of the project involves the construction of the proposed Winton WWTP upgrades and rising main pipeline to convey treated wastewater from the treatment plant to the selected area(s) for land discharge. The construction phase will likely start once the long-term consent has been granted and construction may take approximately two years following the completion of the design phase.

1.2.2.2 Staged Consenting Approach

The proposal for a “staged consenting approach” has been discussed with ES. The approach was agreed to be the most pragmatic solution to reconsent the existing Winton WWTP as it will continue to allow for the discharge in the short term, while design is underway to meet the long term desired outcome.

Once the design has been sufficiently developed for the Winton WWTP, SDC will apply for a new long-term consent to cover these activities. The future long-term consent application will provide more detail in respect of the upgraded scheme and management regime and is expected to be lodged in the first half of 2024.

1.2.2.3 Section 124 RMA

Section 124 of the RMA provides the ability for consent holders to exercise their existing resource consent while applying for a new resource consent application.

"***124 Exercise of resource consent while applying for new consent***

(1)Subsection (3) applies when—

(a) a resource consent is due to expire; and

(b) the holder of the consent applies for a new consent for the same activity; and

(c) the application is made to the appropriate consent authority; and

(d) the application is made at least 6 months before the expiry of the existing consent.

(2) Subsection (3) also applies when—

(a) a resource consent is due to expire; and

(b) the holder of the consent applies for a new consent for the same activity; and

(c) the application is made to the appropriate consent authority; and

(d) the application is made in the period that—

(i) begins 6 months before the expiry of the existing consent; and

(ii) ends 3 months before the expiry of the existing consent; and

(e) the authority, in its discretion, allows the holder to continue to operate.

(3) The holder may continue to operate under the existing consent until—

(a) a new consent is granted and all appeals are determined; or

(b) a new consent is declined and all appeals are determined.

(4) This section does not apply to an application to which section 165ZH applies".

The Winton WWTP discharge permit is due to expire on 8 December 2023 and the SDC is applying to ES for a new consent for the same activity. The application will be lodged at least 6 months before the expiry of the existing consent. Subsection (3) of Section 124 therefore applies which determine if the continuation rights can be applied.

The term "same activity" as stipulated in Section 124(1)(b) is not defined in the RMA. The expectation in the RMA is that the replacement resource consent application does not have to be for exactly the same activity as that authorised by an existing resource consent in order to obtain Section 124 continuation rights. Rather, the proposed activity should be substantially the same as the currently authorised activity.

Whether the activity is substantially the same must be considered on a case-by-case basis and the best approach to determine if the proposal is for the same activity, is to assess the actual scope of the original application in respect of what is being proposed by the new consent application. The following matters must be considered:

- Is the new application fundamentally for the same activity from what was originally applied for?
- Does the new application have materially similar adverse effects than what was originally applied for?
- Does the new application expand or extend the original activity as applied for?

The proposal is fundamentally to roll over the existing discharge permit for a maximum term of five years to continue discharging treated wastewater into the Winton stream. Minor changes are proposed as part of the new resource consent application to account for current volume non-compliance issues and to rectify the underestimated population growth projections as part of the original consent application. The new application proposes to slightly increase the average daily volume to what was originally applied for and consented to accommodate the actual performance of the WWTP reflected in the monitoring. In respect of the slight increase in discharge volumes, the potential adverse effects are materially no different to what was originally applied for and consented.

Based on the above assessment, it is considered that the slight changes are not substantially different from the original activity that what was applied for in the original consent application. As such, the new resource consent application is considered to meet the requirements to justify Section 124 continuation rights as it is for the same activity.

The SDC therefore seeks confirmation from ES that they can continue to operate under the existing consent operation under Section 124 of the RMA until a new consent is decided and any appeals have been determined.

1.3 Scope and limitations

This report: has been prepared by GHD for Southland District Council and may only be used and relied on by Southland District Council for the purpose agreed between GHD and Southland District Council as set out in section 1 of this report.

GHD otherwise disclaims responsibility to any person other than Southland District Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section(s) 1 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

2. Description of Site and Environment

2.1 Locality

The Winton WWTP site is located on the outskirts of the Winton township and is approximately 1km south of Dejoux Road (Figure 4). The Winton WWTP is located on the corner of Gap Road West and SH6. The physical address for the Winton WWTP is 3 Gap Road West, Winton.

The property (Lot 1 Deposited Plan 5815) containing the Winton WWTP, covers a legal area of approximately 8.017 ha. Wastewater is received from Winton township and pumped into an oxidation pond, which covers an area of approximately 1.96ha.

Wastewater is then conveyed into a constructed 1.4ha wetland, situated directly south of the oxidation ponds. The wetland coveys the treated wastewater via an instream diffuser pipe to the Winton Stream, which flows along the eastern boundary of the WWTP property(Figure 5).

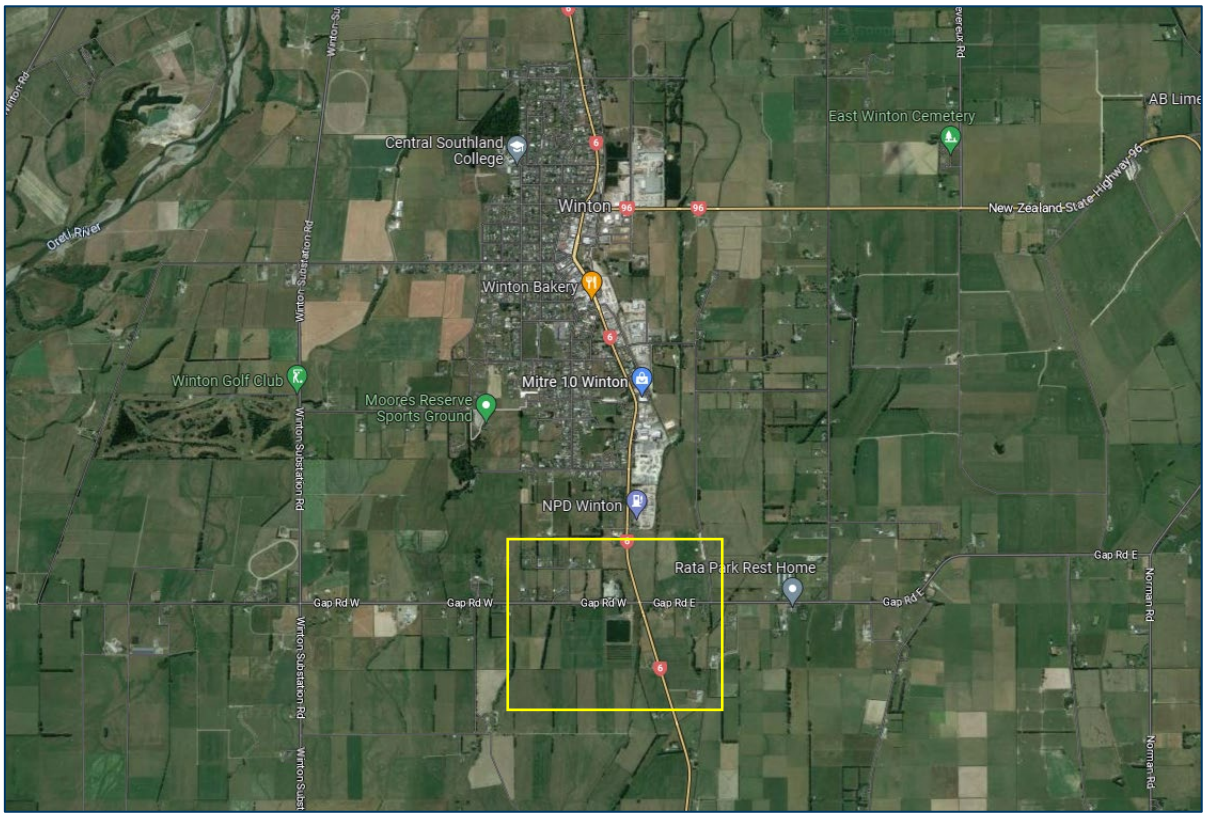


Figure 4 *Winton Township and Winton WWTP located south adjacent to SH6*

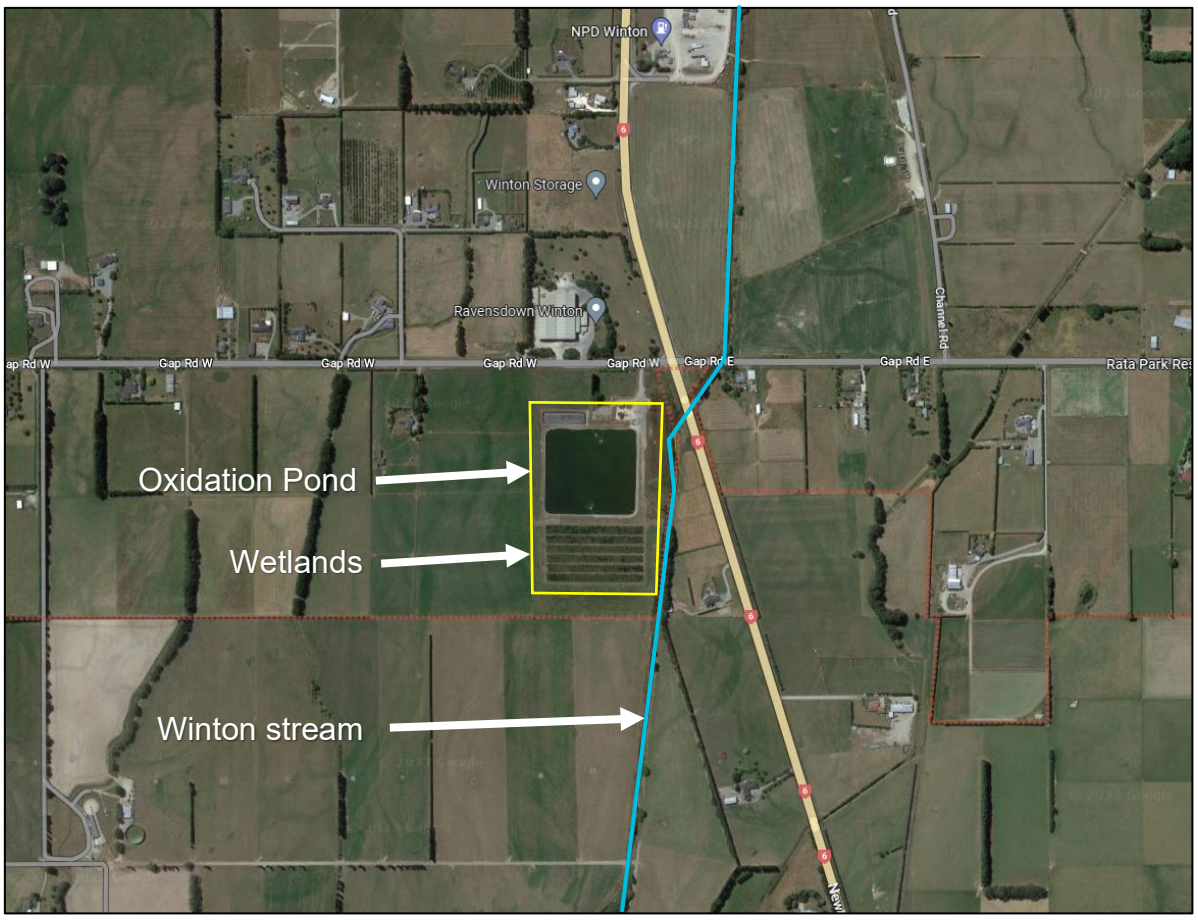


Figure 5 *Winton WWTP (yellow outline) and Winton Stream (blue line)*

2.2 Land use

2.2.1 Existing Site

The site is currently used for the Winton WWTP. The site comprises the following elements:

- Inlet screen
- Oxidation pond (Figure 6)
- Wetland consisting of six wetland cells (Figure 7)

Wastewater is pumped through the inlet screen and then into the oxidation pond. Wastewater then flows from the oxidation pond into the wetland cells through several outlet pipes. The wastewater flows through the wetland and is then captured at the bottom end of each wetland cell and conveyed to a single manhole prior to discharging into the Winton Stream. The SDC recently installed a diffuser in the bed of the stream to improve discharge mixing in the stream.

Figure 6 Oxidation Pond

Figure 7 Wetland cell drainage point

2.2.2 Surrounding Environment

The surrounding land uses are predominantly agricultural with several lifestyle blocks within the vicinity of the Winton WWTP (Figure 8). The nearest dwelling (118 Winton – Lorneville Highway) is approximately 86m to the southeast of the property. There is a second dwelling (45 Gap Road) approximately 200m west of the property. The Ravensdown Winton plant (Agricultural cooperative) is situated at 16 Gap Road and located across the road from the WWTP property. The Winton Wastewater Terminal Pumping Station (3 Dejoux Road, Winton) is approximately 800m north of the Winton WWTP.

Figure 8 *Surrounding land use activities.*

2.3 WWTP Designation

The WWTP is located within a Designation under the SDC District Plan (ID:D51) for the establishment, maintenance and repair works associated with a WWTP on the site (Figure 9). This designation has no conditions (Refer to **Section 5.3 of the SDP – Designations**).

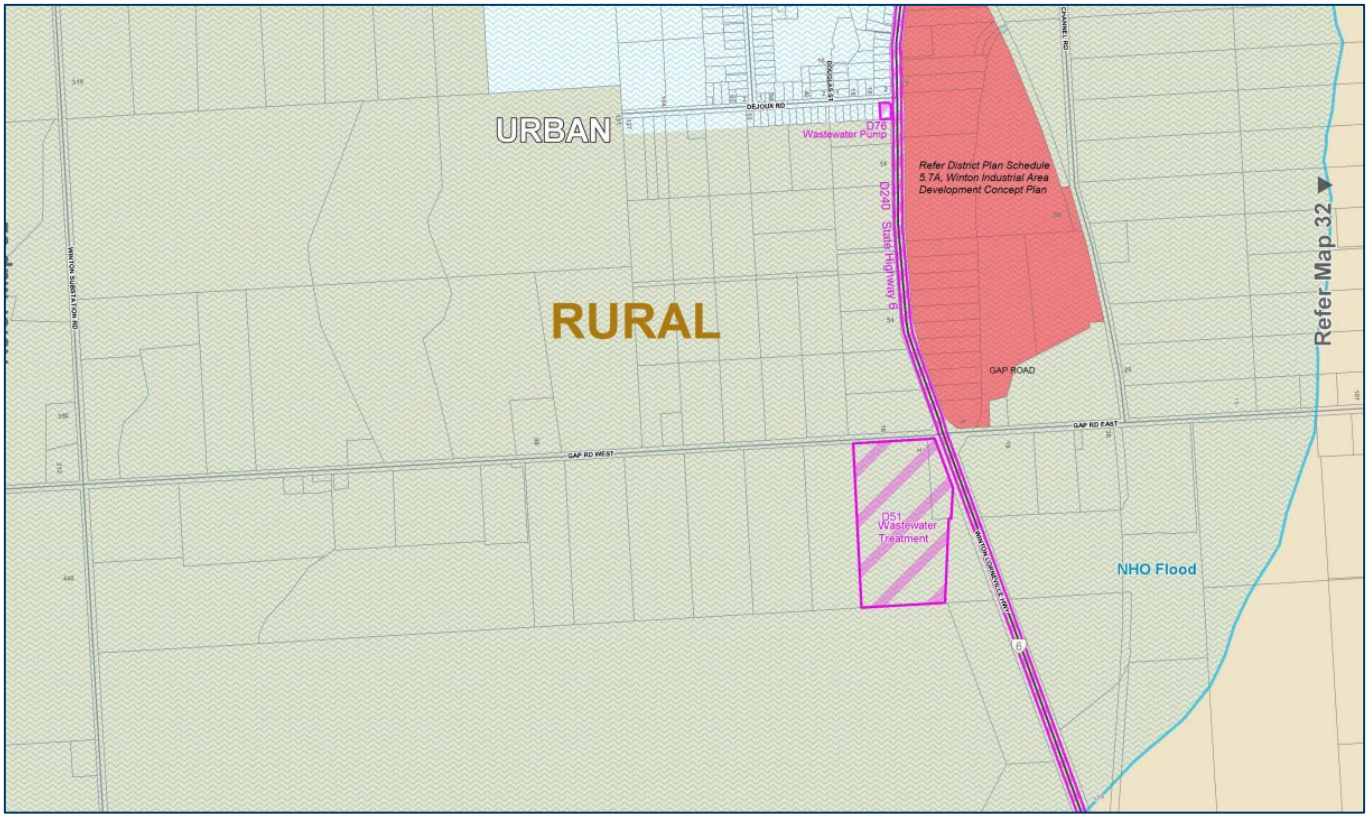


Figure 9 D51 Designation (Map 81 SDP)

2.4 Surface Water

Winton Stream arises amongst the Hokunui Hills some 26km north of Winton township. The stream then runs for most of its length across flat pastoral land, past the Winton township and for a further 8km to its confluence with the Oreti River (located approximately 5km southwest of the current discharge).

Winton Stream is modified, having been straightened in the past by the local authority, and then modified again to re-establish a natural meander pattern, which was accompanied by the planting of willows. The stream bed has a low gradient and a substrate consisting of sand, gravels and small cobbles.

Winton Stream is classed in the Environment Southland Water Regional Plan (2014) and in Environment Southland's Proposed Southland Water and Land Plan (3 June 2016), as a 'lowland hard bed' river.

The receiving surface water environment (Winton Stream) is currently impacted by a number of sources, and as a result the overall water quality is deemed as being poor on the basis that several water quality parameters fall under attributes D and E and/or exceed the national bottom line standards under the National Freshwater Policy Statement (NPS-FW).

Recent monitoring data (over past ca. 2 years) as described in Section 2.4.2 below, shows that in-stream concentrations of ammoniacal nitrogen, DRP, nitrate nitrogen, Total Nitrogen and *E.Coli* are all elevated with respect to expected background (limited / no impact) concentrations.

2.4.1 Water Flow

The stream flow in Winton Stream was measured during associated water quality sampling events conducted in 2020 and 2021 with additional measurements undertaken during a low flow period in March 2022. Upstream of the WWTP discharge and sampling locations the stream flow is partially constrained by the presence of the Winton Dam which is located approximately 25 km north of the site. ES continuously measure the water level in Winton Stream at the Winton Dam location and this data has been used to develop an estimate of stream flow (at the point of WWTP discharge) to coincide with all water quality sampling events. This developed relationship is provided in Figure 10.

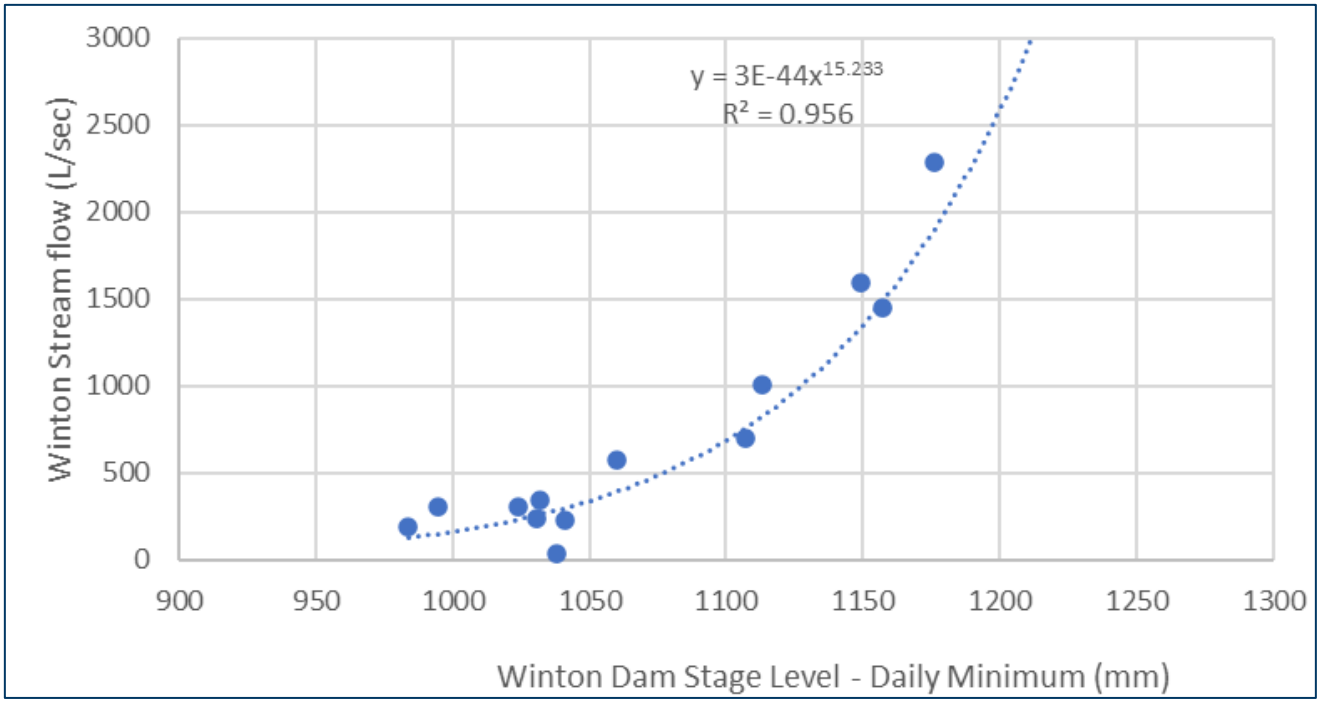


Figure 10 *Winton Stream Flow versus Winton Stream Depth at Winton Dam*

Where Winton Stream flow data is presented in Section 2.4.2, actual flow measurements from Winton Stream at the point of WWTP discharge are utilised where they coincide with water quality sampling events. Where no concurrent flow measurements exist (associated with a water quality sampling event), the stream flow is estimated based on the relationship presented in Figure 10.

2.4.2 Water quality monitoring

Winton Stream water quality sampling has been undertaken and samples have been collected upstream and downstream of the existing WWTP discharge between September 2020 and November 2022. These samples have been measured in-situ for temperature, pH, electrical conductivity and dissolved oxygen and analysed for TSS and other key contaminants. Selected results are summarised in Figure 11 to Figure 20.

2.4.2.1 Total Suspended Solids (TSS)

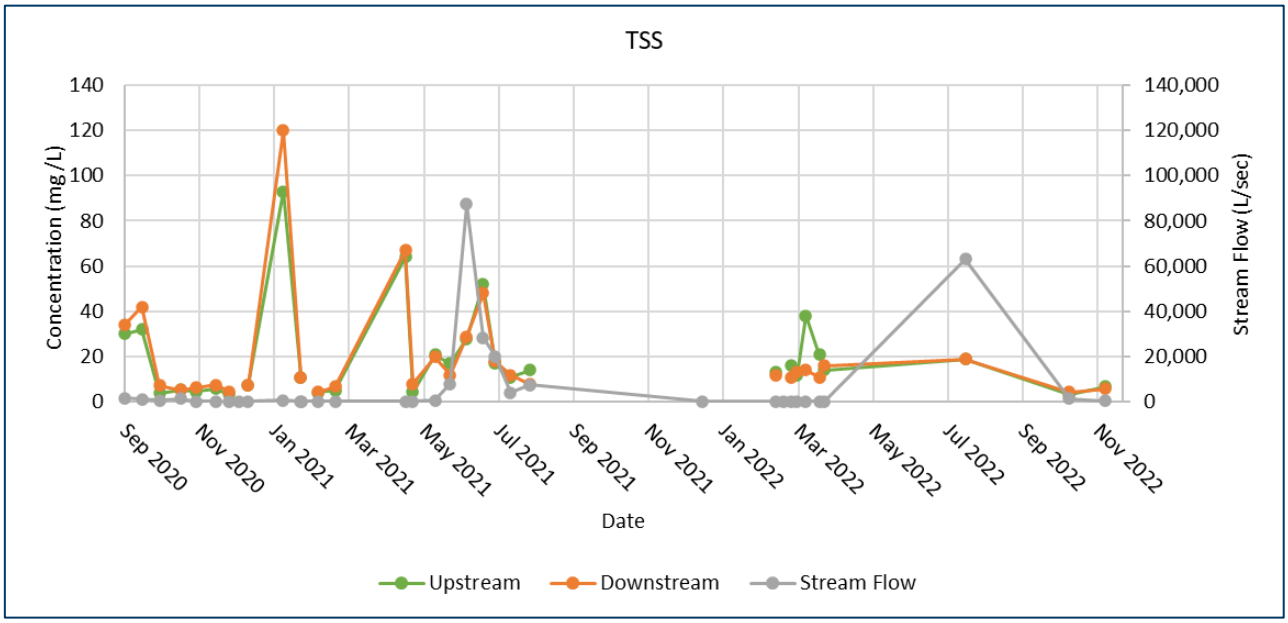


Figure 11 *Upstream-Downstream TSS*

Total Suspended Solid concentrations upstream and downstream of the discharge location are variable (between 3 mg/L and 120 mg/L) over the monitoring period presented (Figure 11). Upstream and downstream concentrations exhibit similar concentrations suggesting that the discharge is not a significant contributor to instream TSS concentrations. No relationship between TSS concentration and stream flow is evident.

2.4.2.2 Ammoniacal-N

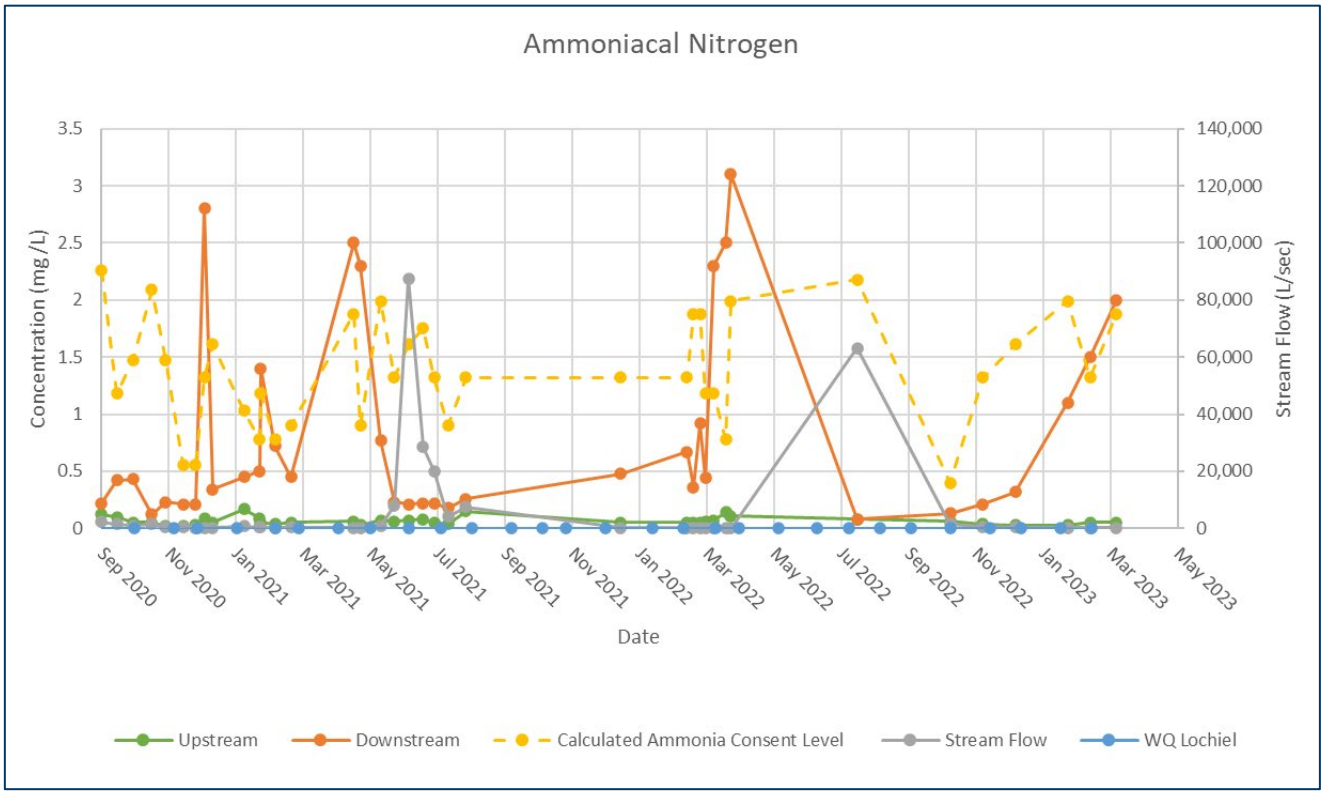


Figure 12 Upstream-Downstream Ammoniacal-N

Total measured ammoniacal N concentration upstream and downstream of the discharge location together with stream flow and the current consented ammoniacal N concentration (adjusted for pH equivalence) over the monitoring period are presented in Figure 12. There is an obvious pattern of elevated concentrations of ammoniacal N downstream of the discharge relative to upstream suggesting the current discharge is a contributor to the instream ammoniacal N load. There are several sampling events in which the consented ammoniacal N concentration (0.9 @ pH 8 equiv.) are exceeded in the downstream location.

It should be noted that during the summer of 2021/22, a diffuser was installed in the Winton Stream to enable more thorough mixing of the discharge with the stream water and to remedy noted water quality compliance issues potentially associated with poor mixing of the discharge between the point of discharge and the downstream sampling point. No exceedances of the consented ammoniacal N concentration have been noted since the diffusor was installed during high flow conditions in the Winton Stream. During low flow conditions in the stream sampling shows the concentrations are still (at times) exceeding stream limits.

The ammoniacal N concentrations upstream and downstream of the discharge are compared with available water data within the Winton Stream downstream at Lochiel - located approximately 5 km downstream of the WWTP discharge (Figure 12) . Data points do not necessarily coincide (ie. sample collection is usually on different days), but it is useful to assess overall potential effects of the WWTP discharge on water quality further down the catchment. The increases in ammoniacal-N associated with low flow events are still evident in this data set, albeit at much lower concentrations. This suggests that the elevated ammoniacal-N concentrations at the point of discharge are decreasing via either dilution (via increasing stream flow) or geochemical changes within the stream.

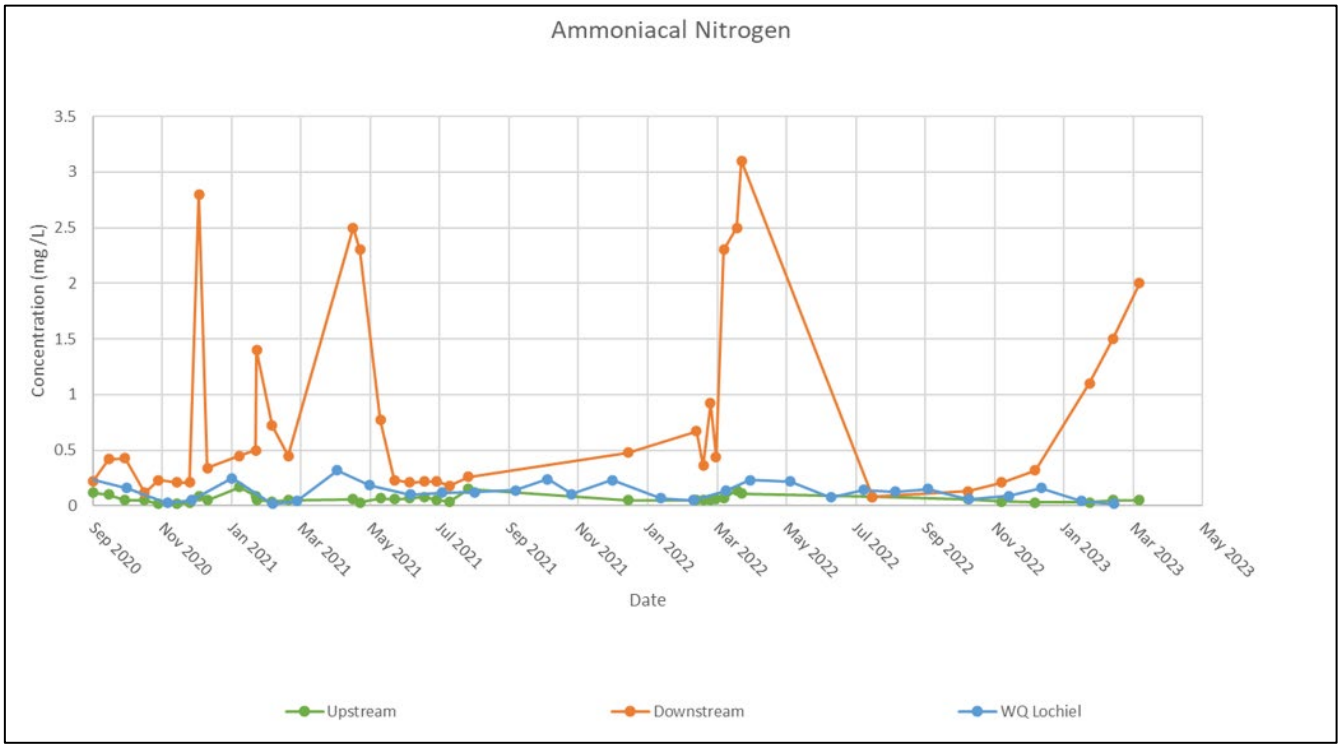


Figure 13 Upstream-Downstream-Lochiel Ammoniacal-N

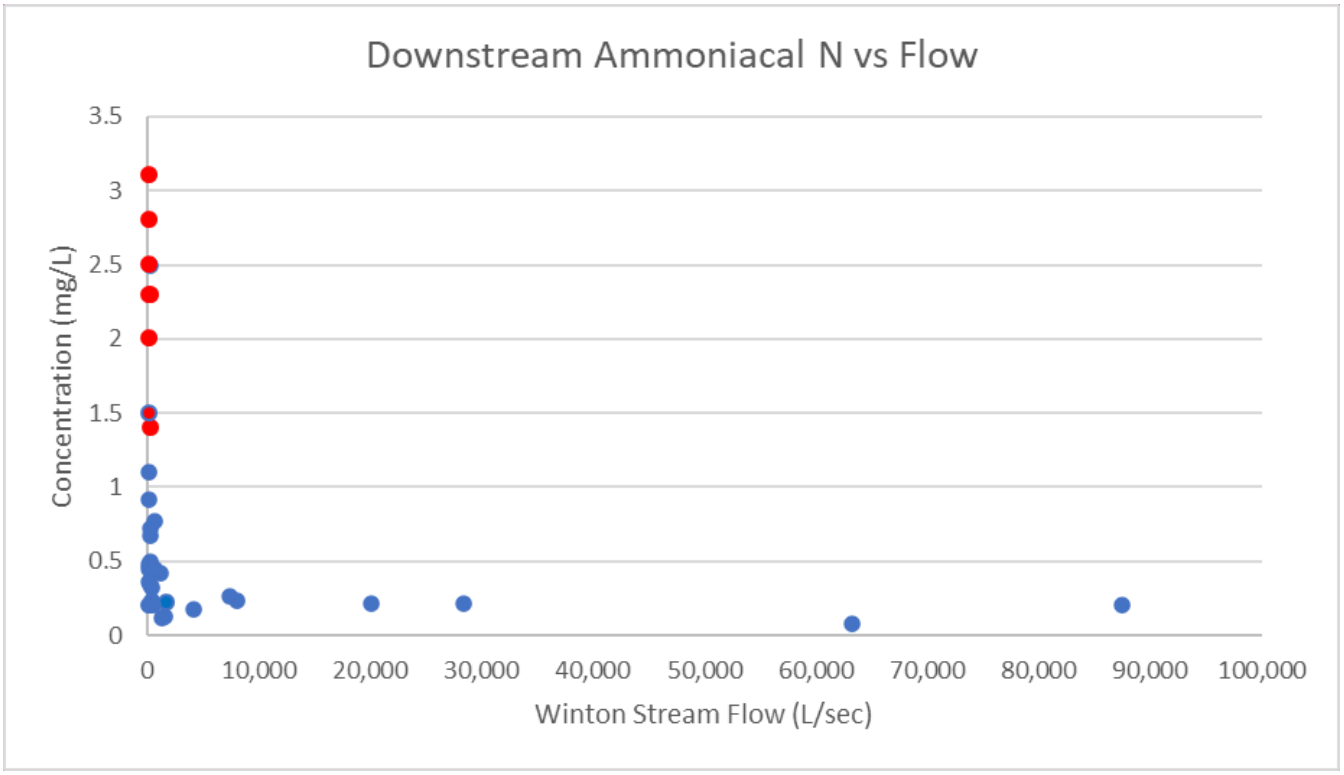


Figure 14 Upstream Ammoniacal-N versus stream flow (red indicates exceedance of compliance limit)

Figure 14 shows the ammoniacal N concentration plotted against the derived Winton Stream flow. It is clear that elevated levels of ammoniacal N occur only during low flow events (defined as <310 L/sec) which typically occur between the months of December and May.

2.4.2.3 Nitrate - N

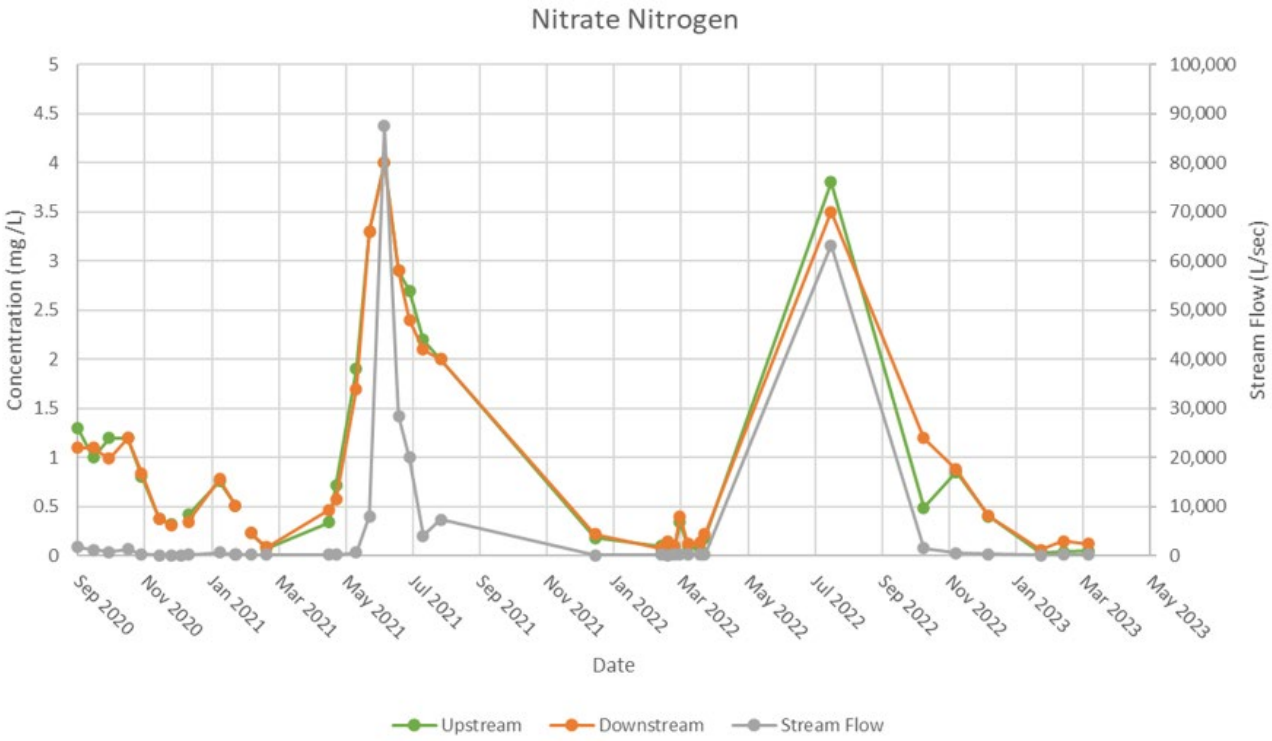


Figure 15 Upstream-Downstream Nitrate-N

Nitrate N concentrations upstream and downstream of the discharge location are variable (between <0.1 mg/L and 4 mg/L) over the monitoring period presented in Figure 15. Upstream and downstream concentrations exhibit similar concentrations suggesting that the discharge is not a significant contributor to instream nitrate N concentration. The nitrate N concentration appears significantly influenced by the stream flow with elevated concentrations associated with high stream flows.

2.4.2.4 Total Nitrogen (TN)

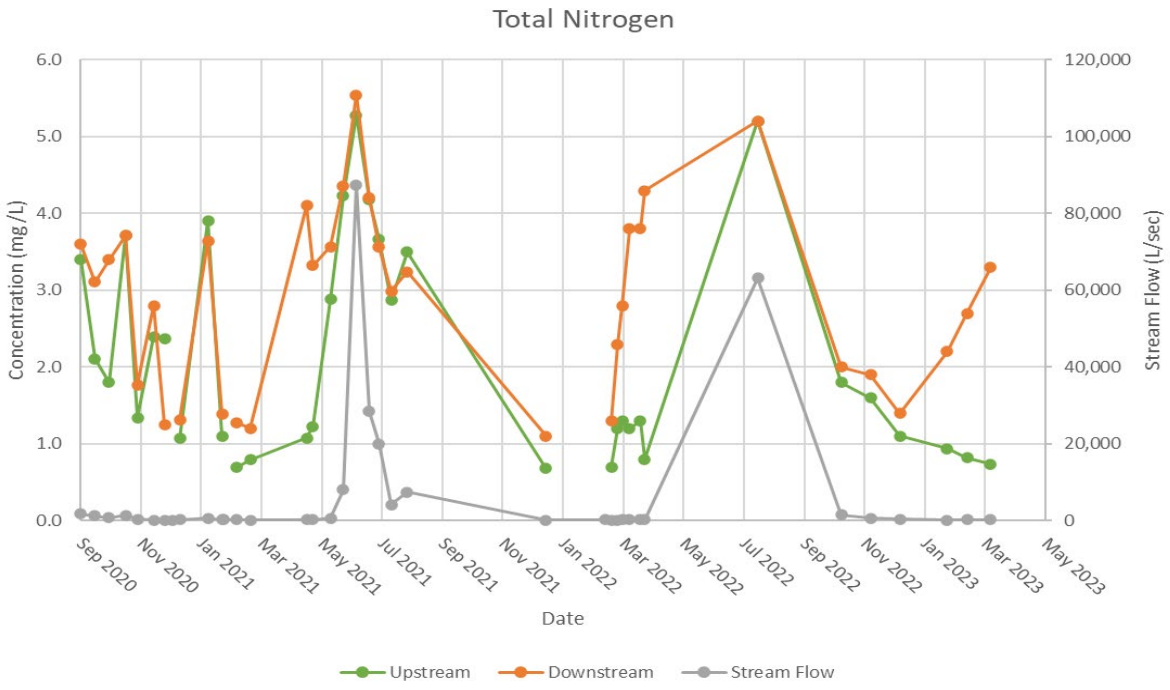


Figure 16 Upstream-Downstream TN

TN concentrations upstream and downstream of the discharge location are variable (between <1.0 mg/L and 5.5 mg/L) over the monitoring period presented in Figure 16. Upstream concentrations are generally lower than downstream concentrations during low flow events where the ammoniacal N component is one of the key drivers of the TN concentration. This is primarily driven by the ammoniacal N within the discharge. This effect is not evident during high flow events (e.g. June 2021 and July 2022) where elevated TN concentrations (both upstream and downstream) are dominated by elevated concentrations of nitrate nitrogen.

2.4.2.5 Dissolved Reactive Phosphorus (DRP)

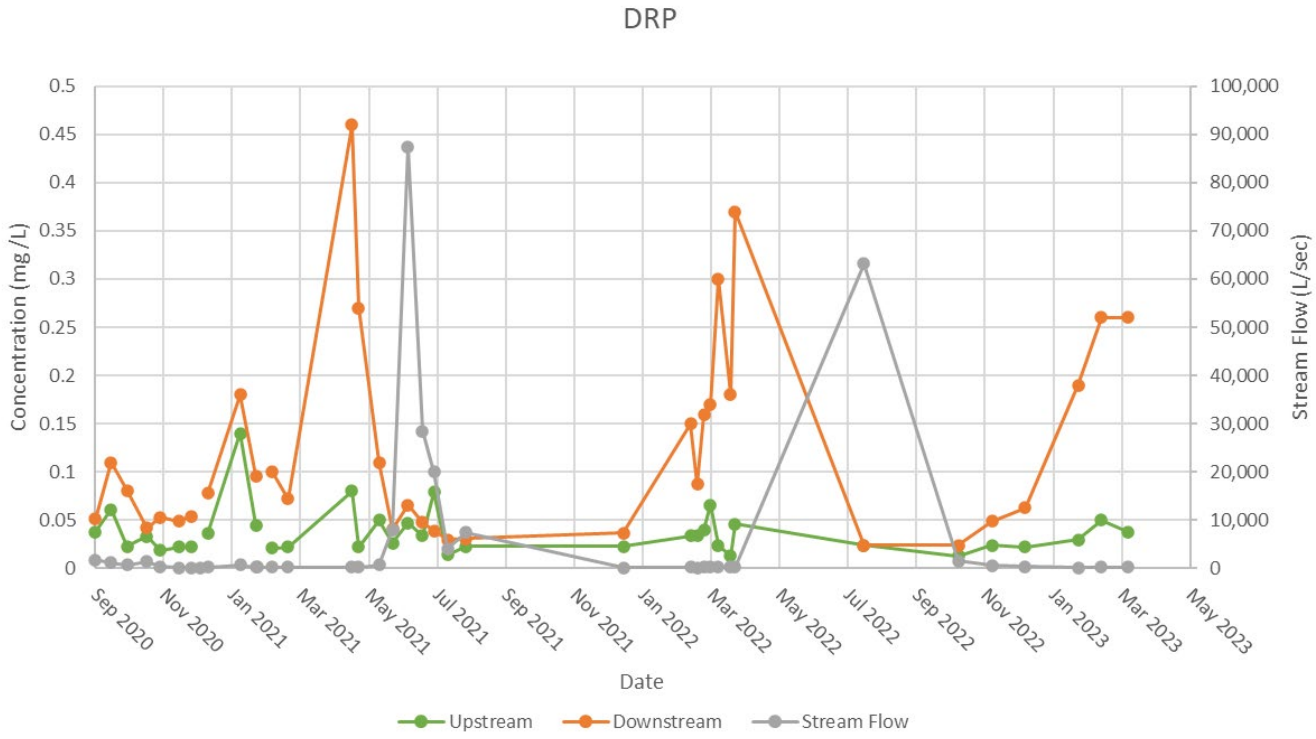


Figure 17 Upstream-Downstream DRP

Measured DRP concentrations upstream and downstream of the discharge location together with stream flow over the monitoring period are presented in Figure 17. There is an obvious pattern of elevated concentrations of DRP downstream of the discharge relative to upstream suggesting the current discharge is a contributor to the instream DRP load. Peak concentrations have occurred during low flow summer periods suggesting the discharge is significantly affecting the instream water quality at these times.

2.4.2.6 Total Phosphorus (TP)

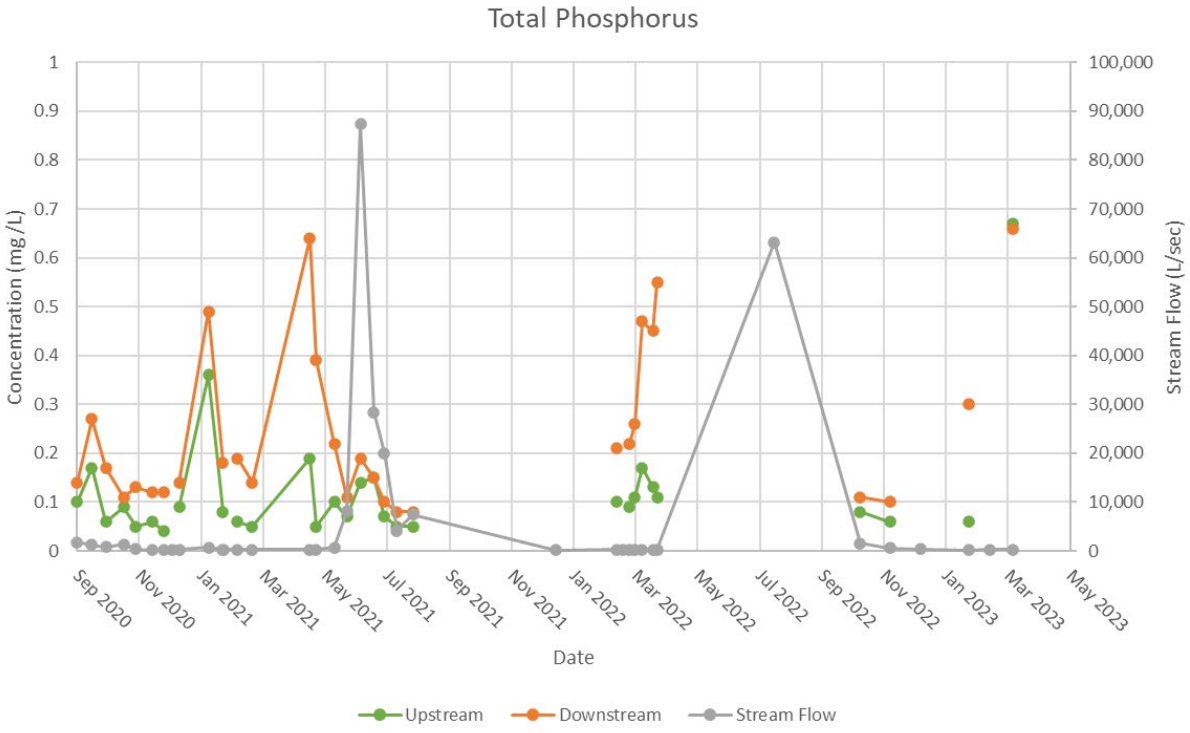


Figure 18 Upstream-Downstream TP

Measured TP concentrations upstream and downstream of the discharge location together with stream flow over the monitoring period are presented in Figure 18. As per the DRP relationship, there is an obvious pattern of elevated concentrations of TP concentrations downstream of the discharge relative to upstream suggesting the current discharge is a contributor to the instream TP load. Peak concentrations have occurred during low flow summer periods suggesting the discharge is significantly affecting the instream water quality at these times.

2.4.2.7 Escherichia coli (E.coli)

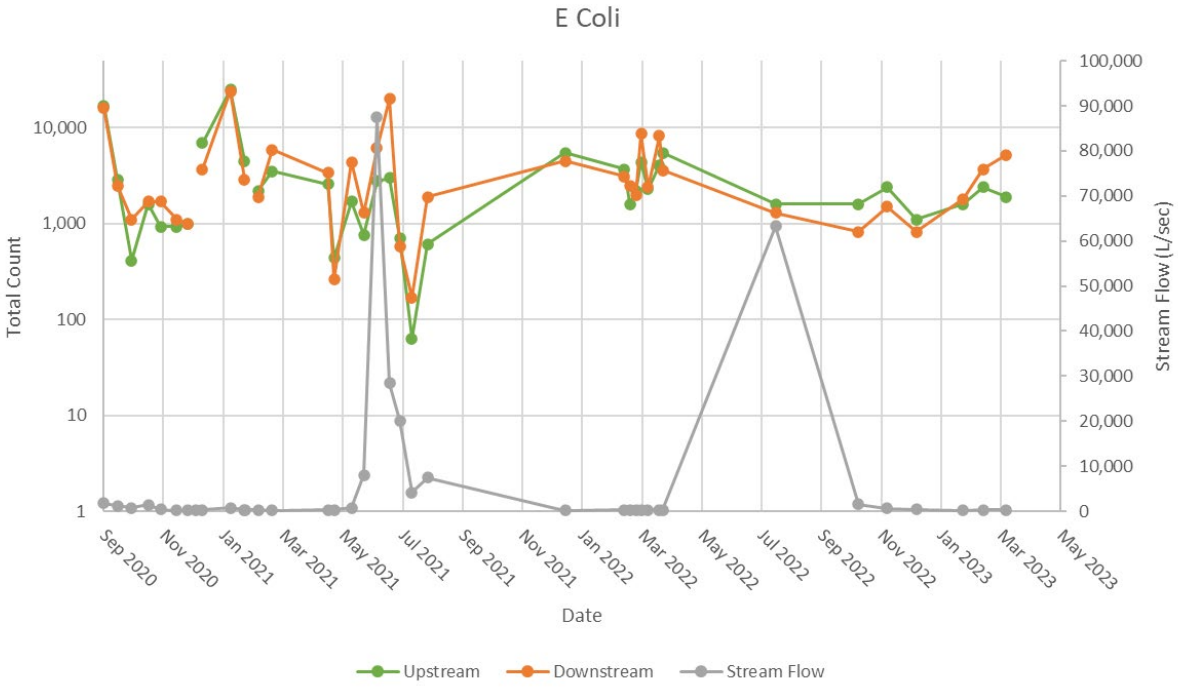


Figure 19 Upstream-Downstream E. coli

E.coli counts are generally measured at similar levels upstream and downstream of the discharge (Figure 19). No relationship between E.coli and stream flow is evident. The sampling suggests the discharge is not contributing to the instream E.coli levels.

2.4.2.8 Dissolved Oxygen (DO)

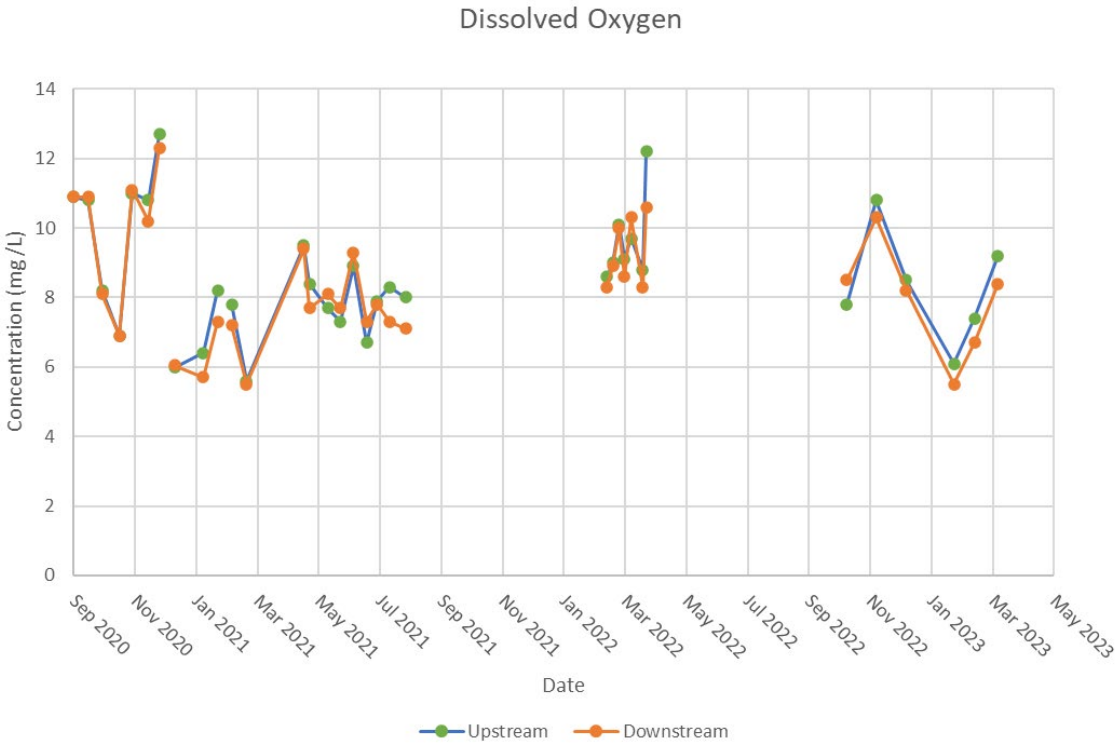


Figure 20 Upstream-Downstream DO

Measured DO concentrations upstream and downstream of the discharge point are typically similar (Figure 20). The field data suggests the discharge is not contributing to the instream DO levels.

2.4.2.9 Temperature

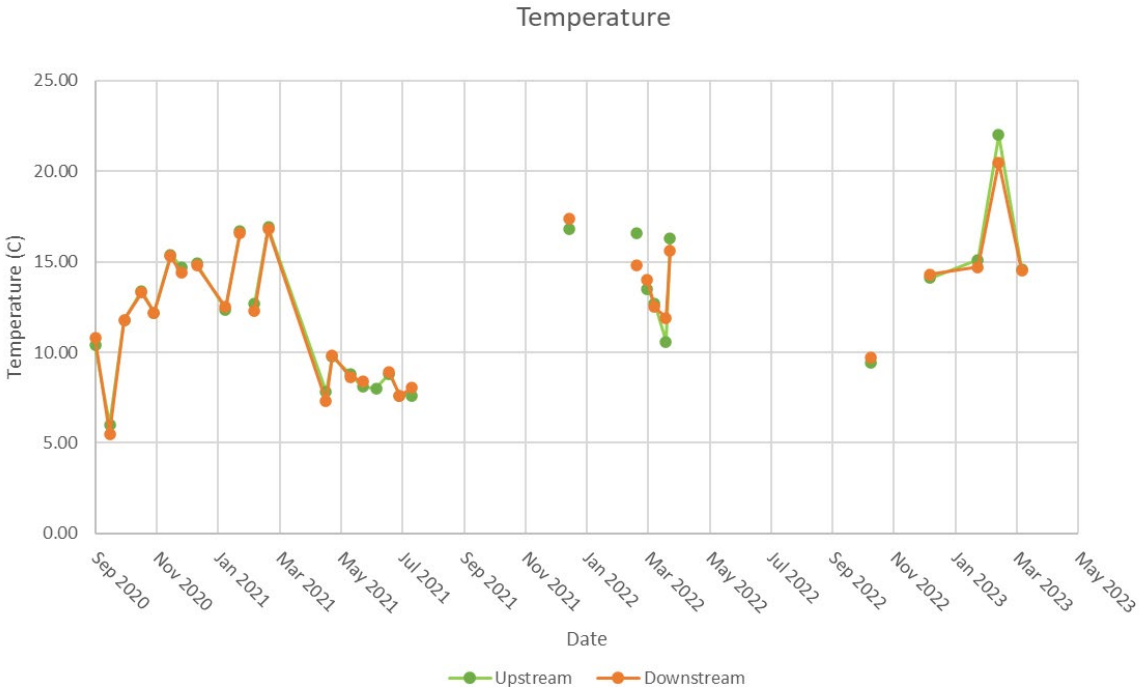


Figure 21 Upstream-Downstream Temperature

Measured temperature upstream and downstream of the discharge point are typically similar (Figure 21). The field data suggests the discharge is not having a significant impact on instream temperature.

2.4.2.10 Comparison of instream water quality with the desired NPS attribute states

The water quality data for Winton Stream (upstream and downstream of the WWTP discharge) has been utilised to indicate the attribute state of the receiving water against the Environment Southlands minimum desired Attribute State[1] applied in line with the NPS-FM[2] numerical values shown in Table 2. The receiving environment within the vicinity of the discharge is classified as Lowland Hard bed in accordance with the relevant planning framework. Monitoring data from the most recent record has been used to indicate the attribute state (ie. latest 12 months of data from the 14 March 2022 to 08 March 2023) unless otherwise specified.

Table 2 Receiving Environment Water Quality in Relation to Draft Freshwater Objectives and Southland Attributes[3]

Parameter	Desired Attribute State	Units	Statistic	Number of Data Points used in Calculation	Maximum Limit to Achieve Attribute State[1/2]	Upstream	Downstream
Temperature*	C	℃	5-day CRI	4	≤23	16.5	16.0
Temperature^	C	℃	Max	1	≤11	9.4	9.7
Ammoniacal N (eq. pH 8)	B	g/m^3	Annual Median	10	≤0.24	0.03	0.69
Ammoniacal N	B	g/m^3	Annual Maximum	10	≤0.40	0.11	2.50
Nitrate N	B	g/m^3	Annual Median	10	≤2.4	0.14	0.19
Nitrate N	B	g/m^3	Annual 95%ile	10	≤3.5	2.47	2.47
E. Coli**	B	cfu/100 mL	Median (5 years)	36	≤130	2,200	2,450
E. Coli**	B	cfu/100 mL	95th Percentile (5 years)	36	≤1000	9,425	17,000
DO#	A	mg/L	7 day mean minimum (1 Nov – 30th April)	N/A	>=8.0	N/A	N/A
DO##	A	mg/L	1 day mean minimum (1 Nov – 30th April)[4]	5	>=7.5	6.1	5.5

*The statistic is to be measured over the summer period (1 December to 30 March) and is an average over the five hottest days during this period. Calculated values are based on the four data points during this latest period.
^ The statistic is to be measured over the winter period (May - Sept) and is the maximum value over this time. Calculated value is based on a single data point.
**Attribute state should be determined by using a minimum of 60 samples over a maximum of 5 years (the calculated valued is based on only 36 data points between September 2020 and March 2023.
#Requires continuous data to calculate.
Requires continuous data to calculate, data presented based on limited spot measurements
Shaded cells indicate non compliance with required attribute state
Calculated Actual data is based on previous 12 months of data (unless otherwise specified)

[1] **Environment Southland. Draft Murihiku Southland Freshwater Objectives. Technical Report November 2020**
[2] **National Policy Statement for Freshwater Management 2020**

The Winton Stream upstream and downstream from the WWTP does not meet the desired attribute state for E.Coli and DO. The downstream location also exceeds the desired attribute state in terms of ammoniacal N concentrations. There is insufficient data to calculate some of the desired attribute states accurately.

2.4.2.11 Overall Water Quality

In summary, the recent monitoring data (ca. last 12 months) suggests that the Winton WWTP is responsible for a significant proportion of the ammoniacal N and DRP present at the downstream sampling location during low flow summer periods (below the zone of reasonable mixing). It is also evident that DRP is also significantly elevated both upstream of the current WWTP discharge point and within the WWTP discharge itself. Other analytes (nitrate and *E.Coli*.) show significant elevated concentrations upstream of the site that are comparable to downstream concentrations (after WWTP discharge and mixing). The results suggest that the Winton WWTP is not the key driver for elevated in-stream concentrations of these parameters.

In terms of overall river water quality, Environment Southland's State of the Environment Report[5], classifies the water quality within the Winton Stream in the vicinity of the current WWTP discharge (Water quality sampling site at Lochiel downstream from current discharge location) as 'very poor' in terms of E.*coli,* 'poor' in terms of suspended sediment and 'fair in terms of nitrate and ammonia. When compared to the desired water quality attributes of the ES freshwater standard for lowland hard bed area, the Winton Stream in its current state is considered to not comply with the standards as outlined in terms of oxygen saturation, total ammonia and faecal coliforms. Oxygen saturation and faecal coliform levels exceed these standards upstream of the WWTP discharge.

The overall water quality in the receiving surface water environment at Winton Stream is considered poor and the current wastewater discharge is considered to contribute to the poor water quality in the Winton Stream.

2.4.3 Aquatic and terrestrial environment

The Winton Stream catchment is highly modified and contains only a few scattered remnants of native vegetation. Riparian vegetation beside Winton Stream is limited and, in most cases, consists of grasses and scattered shrubs.

The land around the oxidation pond and wetland cells along with much of the land in the vicinity of the stream is vegetated in pastoral grasses, with a row of willow trees to the east of the WWTP site.

The stream supports brown trout and native fish populations however there are no sites of conservation interest within or adjacent to the existing site.

The March 2022 biological survey of Winton Stream (Appendix C) in the vicinity of the Winton WWTP revealed generally poor-quality communities throughout the study area reflected by low MCI and SQMCI scores. The latest survey suggests that the WWTP discharge may be having effects on water clarity and aspects of the biological communities of Winton Stream.The survey report includes assessments of water quality, sediment, periphyton, and benthic macroinvertebrates.

Downstream of the discharge is depicted in Figure 22, while the upstream is depicted in Figure 23.

[5] Environment Southland. Current Environment State and the "gap" to draft freshwater objectives for Southland. Dec 2019.

Figure 22 Downstream of diffuser

Figure 23 Upstream of diffuser

2.4.4 Recreational values

The Oreti River itself is used extensively for recreational pursuits, particularly fishing, swimming, rowing and other water activities. However, the Winton Stream, principally given its size and limited public access, is not used extensively for such pursuits.

2.4.5 Cultural and heritage values

Winton Stream has not been identified as having significant cultural or heritage values based on the information available in the SDP and PSWLP. However, Winton Stream is a tributary of the Oreti River, which has been identified under a Statutory Acknowledgement. Under section 206 of the Ngai Tahu Claims Settlement Act 1998, the Crown acknowledges Te Runanga o Ngai Tahu's statement of Ngai Tahu's cultural, spiritual, historic, and traditional association to the Oreti River.

2.4.6 Soils

The existing site is underlain by Gley Recent Soils of the Makarewa soil set, overlying outwash gravels. Generally, the Makarewa soil set comprise sandy loams to clay loams, around 0.30m thick, derived from underlying gravel. The gravel comprises poorly sorted, sub-rounded top rounded clasts, up to 0.25m across, in a rather tight silty, locally sandy, matrix. The gravel clasts are generally hard but towards the surface they become progressively weathered so that within the upper 1m they have largely disintegrated into a sandy clay. Permeability of the gravels is generally low but layers of free draining gravel form minor aquifers.

2.4.7 Other consents in the area

There are no other water permits authorised by ES downstream of the discharge point in the Winton Stream. AUTH-99139-V1 allows Invercargill City Council to take up to 47,200 cubic metres of water per day from the Oreti River at Branxholme for Invercargill town supply. The surface water abstraction point in the Oreti River (SW/0030) is approximately 20km downstream of the Winton WWTP point of discharge.

3. Description of the activity

The SDC is seeking to renew Consent:202026, which is due to expire on 8 December 2023 (Attached as Appendix B). The proposal is to obtain a short-term consent, while further investigation is undertaken to upgrade the Winton WWTP and convert the discharge method to a predominantly land-disposal system. The future stages associated with the upgrade and conversion of the Winton WWTP has been discussed in Section 1.2.2.

Discharges from the existing Winton WWTP in two instances have exceeded the levels of ammoniacal nitrogen in the Winton Stream prescribed in Discharge Consent: 202026. The SDC installed a diffuser in Winton Stream to improve mixing of the discharge plume in the stream. Based on recent monitoring results the ammoniacal nitrogen limits have been exceeded in Winton Stream following the installation of the diffuser. No other recent improvements have been made to the Winton WWTP treatment process or disposal into Winton Stream.

Based on GHD's review of the current operation and performance of the Winton WWTP, it appears that the average daily volumes treated by the treatment plant, were previously underestimated. This is shown in the monitoring results which indicate that the consented average daily flow volume has been exceeded on a number of occasions. This is likely because of the inflow and infiltration issue observed in the wastewater network. Other sources may include stormwater and groundwater infiltration entering the Winton WWTP resulting in higher discharge volumes than anticipated.

Estimated population growth has been updated to reflect more recent census data and SDC projections, which supersedes the previous projected population numbers used in the original consent application. In addition, there is an expectation that projected population growth will cause more pressure on the existing wastewater system, which means the discharge into the Winton stream going forward, will increasingly not meet the volume restrictions authorised by the existing resource consent.

As part of the proposal and to address the issues above, it is proposed to increase the consent limit from 750 m^3/d to an average flow of 1,300m^3/ day, to accommodate the more recent projected population growth numbers.

In addition, the new short-term consent proposes to update the existing conditions of consent as they are outdated. Monitoring and reporting requirements have also been updated to gather more accurate information to support the long term consent application. The operation and performance of the WWTP will be reported on an annual basis, while a more intensive monitoring regime will occur three years following grant of consent.

Work is currently underway to investigate the long-term solution of providing wastewater and land-based application of treated effluent, as summarised in Section 1.2.2. While the technical investigations for the long-term solution are underway, the existing WWTP will continue to be operated and maintained by SDC until the future upgrade and improvements have been confirmed and installed to treat wastewater with offsite disposal to land. The discharge into the Winton Stream will completely cease once the overall wastewater system has been upgraded, apart from in the wettest years.

3.1 Winton Wastewater Treatment Plant

3.1.1 Basis of Design

GHD have developed the basis for design for Winton's short-term (2028) and long term (2043) wastewater management solution as follows:

- the existing operational flow and capacity demand of the WWTP has been based on the July 2016 and November 2022 flow record period.
- the population growth has been updated and is based on 2013 census data and SDC projections. The updated data is used to ensure the existing WWTP provides sufficient flow and capacity to maintain the operation to a design horizon of 2043.
- the influent wastewater characteristics have been amended based on assumed per capita generation rates.

The following sections provide an updated data basis in relation to the operation of the existing WWTP.

3.1.1.1 Population

Table 3 presents the population data from the NZ Census 2013, as well as the estimate for 2028 and 2043. SDC has requested to include two nearby settlements, Browns and Centre Bush in the long-term planning of the Winton WWTP scheme. However, the timeframe of connecting these two communities to the Winton scheme is yet to be confirmed and unlikely to take place before 2028.

Table 3 Population Growth

	Winton Population
2013 Census	2,250
% growth per annum	0.64%
Expected population in 2028 (this consent application)	2,465
Expected population in 2043	2,680
Expected additional population by 2043 (Browns and Centrebush)	500
Total population to be serviced by Winton WWTP (future consent application for the long term scheme)	3,180

3.1.1.2 Wastewater Flows

The Winton WWTP does not have a flowmeter at the inlet or outlet of the plant. However, the Dejoux Road pump station discharge flowmeter is used to estimate influent flows to the treatment plant.

The daily wastewater inflow to Winton WWTP from July 2016 to February 2020 is shown in Figure 24 below. Peaks in the wastewater inflow to the plant correlate with peaks in daily rainfall, shown in Figure 25 below.

The inlet flow percentiles to the WWTP are shown in Figure 26. The majority of wet weather events appear to occur during the 90th percentile of wastewater inflows, ranging from 1,538 m^3/day to 6,393 m^3/day. SDC has advised that the extreme peak flow observed on 4th February 2020 is not representative of peak flows observed at the plant, as the region was subjected to wide-spread flooding on that particular day.

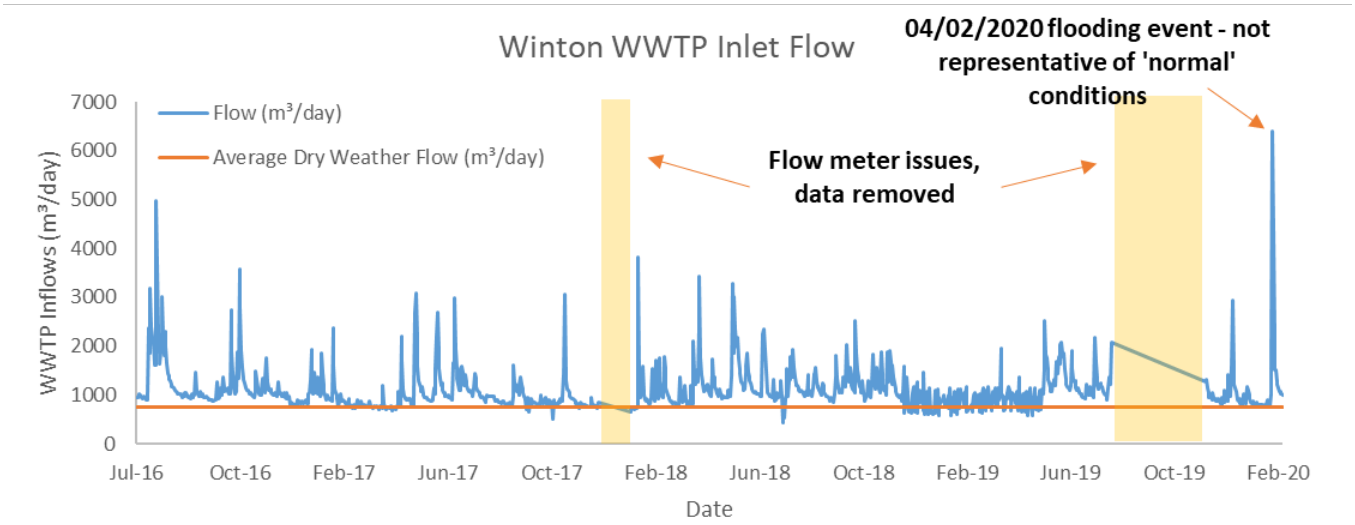


Figure 24 Winton WWTP Inlet Flow (July 2016 to February 2020)

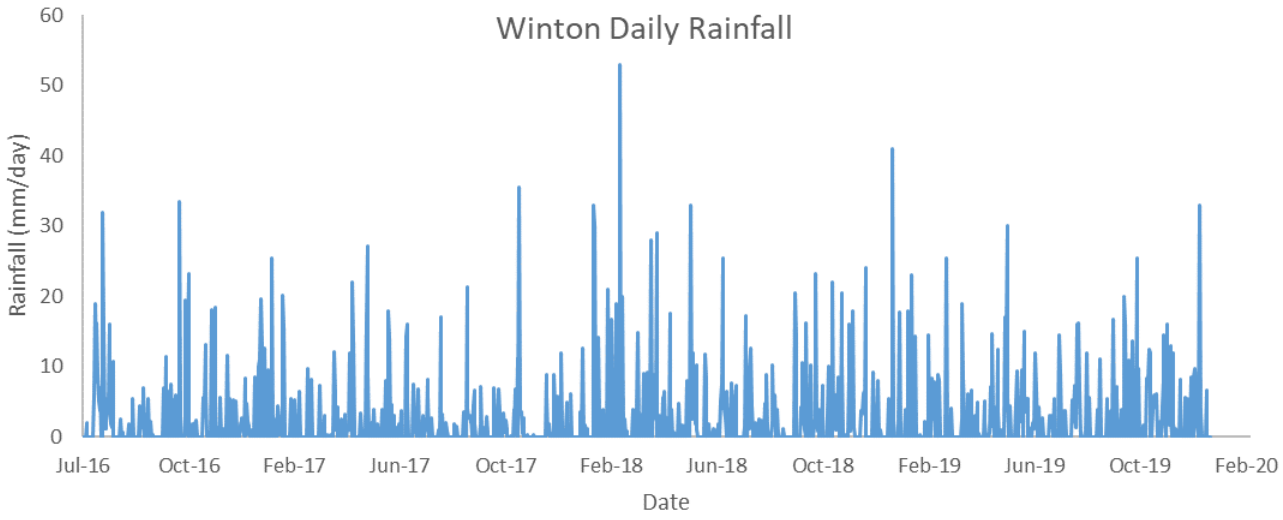


Figure 25 ***Winton Daily Rainfall (July 2016 to December 2019), sourced from the NIWA CliFlo system***

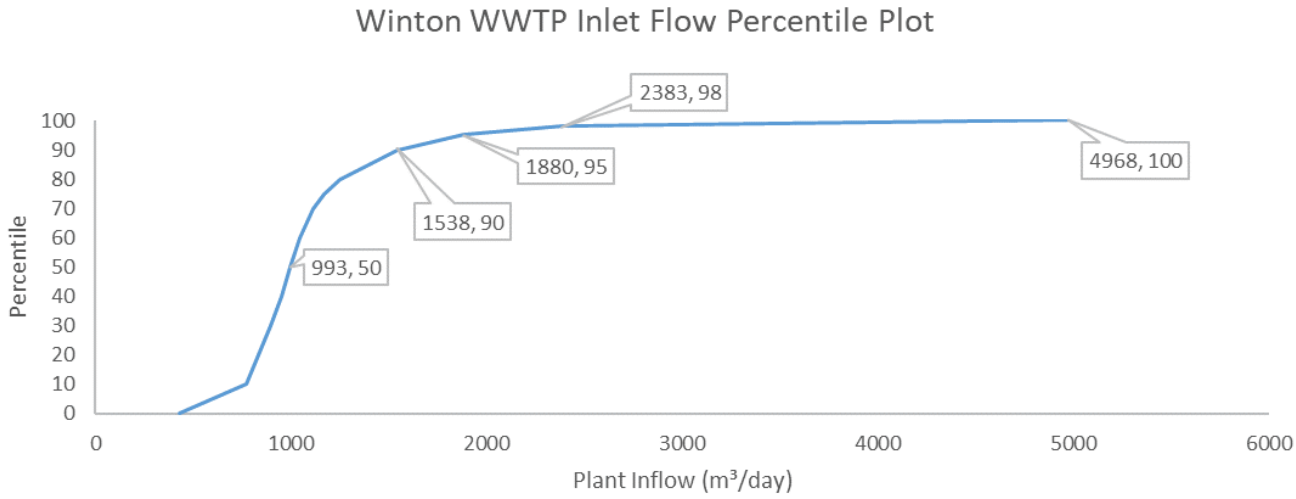


Figure 26 ***Winton WWTP Inlet Flow Percentiles***

More recent daily wastewater inflow data was recorded between February 2021 and November 2022 and it is shown in Figure 27 below.

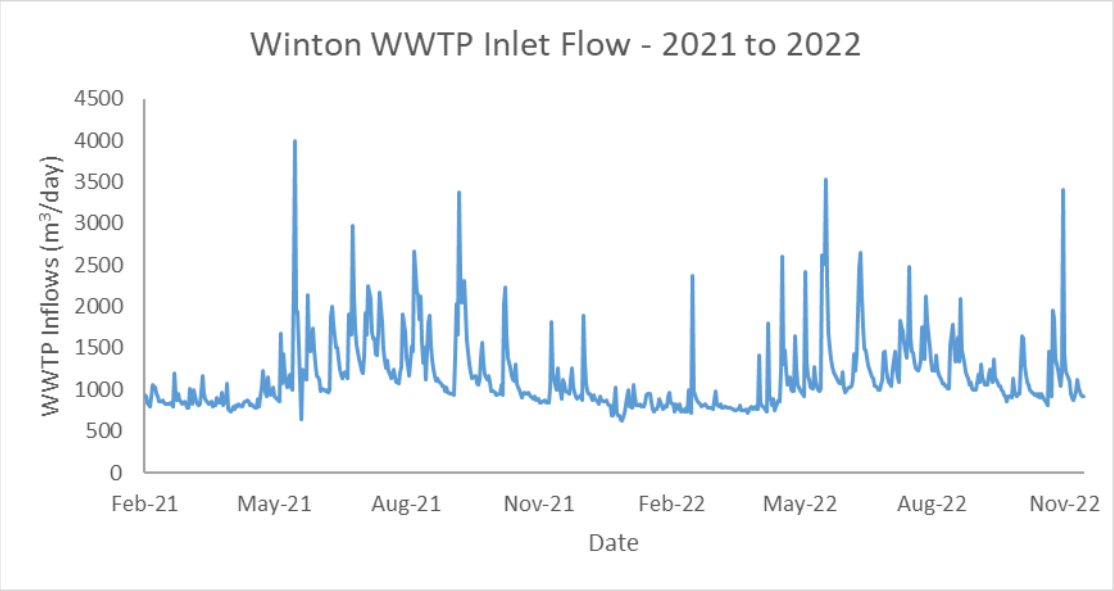


Figure 27 *Winton WWTP Inlet Flow (February 2021 to November 2022)*

The following assumptions were made when developing the design basis:

- Wastewater flows between July 2016 and February 2020 is representative of the current WWTP receiving environment, given that there is no major difference with the 2021-2022 flow data.
- Average Dry Weather Flow (ADWF), Average Daily Flow (ADF) and Maximum Daily Flow (MDF) were extracted from the Jul 2016 – Feb 2020 data set.
- The 2028 flow estimates were calculated assuming existing peaking factors retained.

Table 4 below displays the current estimated wastewater flows and the flow estimates in 2028.

Table 4 *Wastewater Flow Estimation (for this consent application)*

	Units	Current	2028
Population		2250	2465
ADWF	m^3/day	750	822
ADF	m^3/day	1102	1208
MDF	m^3/day	4968*	5443

** Largest inflow recorded was 6393 m³/day on 04/02/2020, however this was recorded during a time of significant flooding in Southland, and is not representative of 'normal' peak events, so has been removed from the data analysis.*

As seen from the table above, the wastewater flow is expected to increase by approximately 10% between now and 2028, on the basis of linear population growth. It is envisaged that the 10% increase of wastewater flows and loads could be accommodated within the existing plant with minor augmentation.

3.1.1.3 Influent wastewater characteristics

The wastewater from Winton domestic discharge is assumed to have similar characteristics to typical municipal domestic wastewater, with correspondingly low levels of metals and other industrial contaminants. No significant industrial wastewater is intended to be treated at the WWTP, and this is not expected to change in the future.

In the absence of wastewater data, typical per capita (EP) generation rates (as Water Environment Federation MOP8) have been used to estimate the approximate wastewater contaminant loads. The following per capita values were used in the calculation:

- Biochemical Oxygen Demand (BOD_5): 70 g/day
- Total Suspended Solids (TSS): 70 g/day

- Total Kjeldahl Nitrogen (TKN): 18 g/day
- Total Phosphorus (TP): 3 g/day

Table 5 shows the estimated influent contaminant loads in the wastewater for the projected population growth of this consent application.

Table 5 Wastewater Contaminant Loads (for this consent application)

	Units	Current	2028
Population		2250	2465
Average Daily Flows	m^3/day	1102	1208
BOD_5	kg/d	158	173
TSS	kg/d	158	173
TKN	kg/d as N	41	44
TP	kg/d as P	7	7

3.1.2 Operation of existing WWTP

Winton WWTP is located on the outskirts of the Winton township. Wastewater from the primarily gravity network drains to a pump station in Dejoux Road, where it passes through a bar screen, before being pumped to the WWTP. The existing treatment processes at the plant includes:

– Inlet screen and screenings compactor
– Oxidation pond, with two 3kW Reliant Lagoon Masters mechanical aerators
– Wetland with 6 cells
– Buried discharge pipes from each wetland cell to the Winton Stream

There is also a decommissioned clarifier and drying beds on site. The layout of the Winton WWTP is shown in Figure 28.

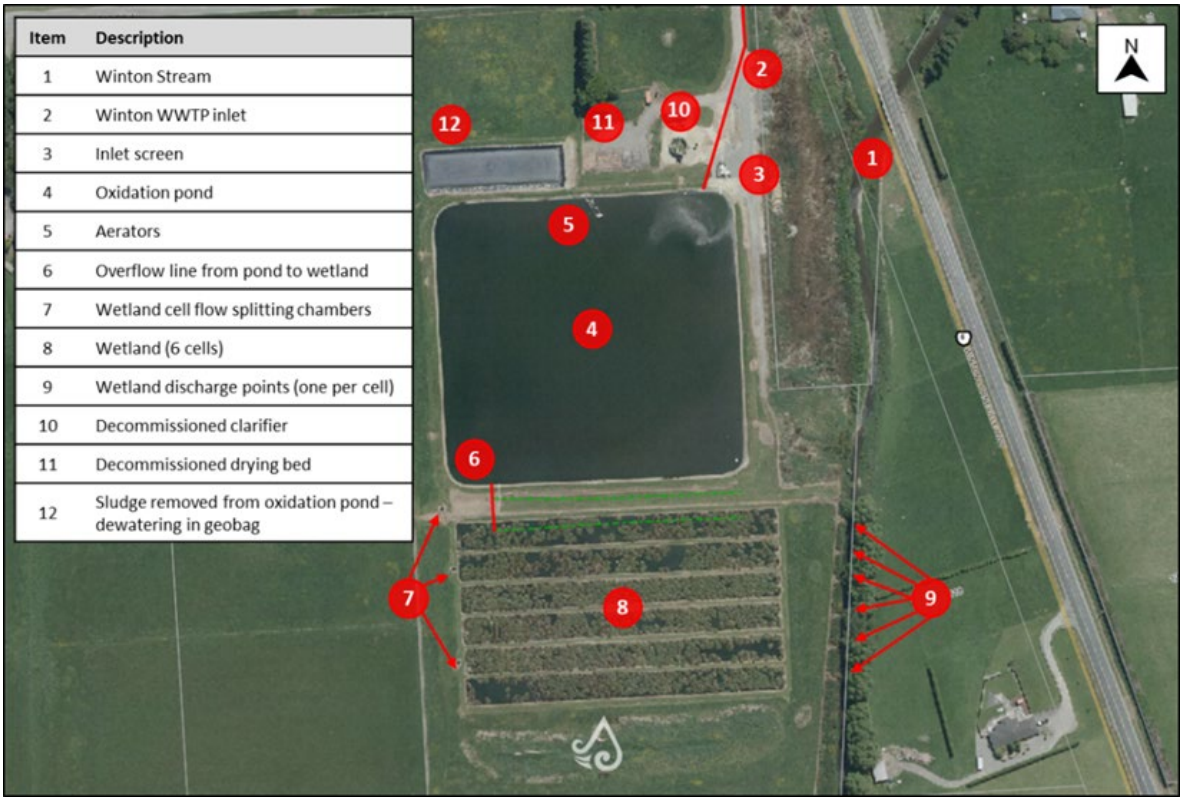


Figure 28 Winton WWTP Layout[6]

Influent to the Winton WWTP is screened through a Johnson Screens SC7T Screen Compactor, where large solids are captured and build up on the screen. Solids removed by the inlet screen are further dewatered using a Noggerath screw wash press. Screenings are disposed offsite.

Following screening, wastewater enters the oxidation pond, through an inlet pipe in the northeastern corner of the pond, as shown in Figure 28. The pond is a conventional clay-lined aerobic pond, fitted with a concrete wave band. Surface area is 1.96 ha, and depth is approximately 1.15 m. Two Reliant Lagoon Master mechanical aerators are installed in the pond to assist with pond treatment. The oxidation pond was last desludged in 2016.

The final treatment process at Winton WWTP is a constructed wetland, comprising of 6 cells in parallel. Effluent from the oxidation pond is drained to the wetland through a submerged outlet. There are three flow splitting chambers to divide wetland inflows equally between the cells. Each cell outlet discharges to a diffuser structure (installed in 2021) prior to discharging into the Winton Stream.

The existing consent requires that the discharge of treated wastewater to the Winton Stream does not exceed the average wastewater flow limit of 750 m^3/day.

Figure 29 presents a schematic of the process.

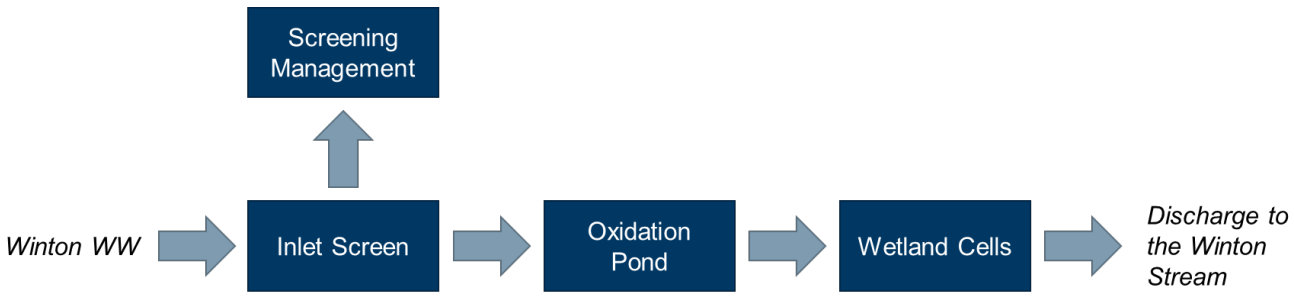


Figure 29 Winton WWTP Process Schematic

[6] The wetland discharge points (no9 in Figure 28) have been replaced with a single diffuser pipe installed in the bed of Winton Stream in December 2022.

3.1.3 Nature of the Discharge

The influent wastewater is primarily domestic in nature, and therefore the contaminants of concern will be microbial pathogens, BOD, suspended solids, nitrogen and phosphorus.

3.1.3.1 Quantity from WWTP

As described in Section 3.1.1.2, the Winton WWTP does not have a flowmeter at the outlet of the plant. However, wastewater inlet flow between July 2016 and February 2020 was adopted as representative of the current WWTP discharge flow. It is noted that this approach does not account for precipitation and evaporation onto the ponds and wetland cells.

The estimated flows associated with the existing WWTP are summarised in Table 6 below:

Table 6 WWTP Discharge Flows - Current Flows, Estimated Flows in 2028 (for this consent application) and Current Consented Limits

	Units	Current flows	Estimated flows in 2028	Current consented limits
Average Daily volume	m^3/day	1102	1208	750
Maximum Daily volume	m^3/day	4968	5443	

As seen from above, the estimated average and maximum treated wastewater discharge volume from the Winton WWTP in 2028 would be approximately 1300 and 5500 m^3/day respectively.

3.1.3.2 Quality from WWTP

The existing discharge permit does not stipulate consent limits on wastewater discharge quality parameters. However, the consent requires that minimum standards for Class D waters, as per Southland Regional Council's Transitional Southland Regional Plan (October 1991), are maintained beyond 100 metres downstream of the discharge point.

The permit also requires the total ammonia nitrogen in the Winton Stream, beyond the zone of the reasonable mixing, to be within Australian and New Zealand Environment and Conservation Council (ANZECC) Guidelines for Fresh and Marine Water Quality (October 2000).

The discharge permit requires monitoring of the treated effluent by taking a representative sample of the discharge at the outfall to the receiving waters, and also of the receiving waters, 5 m upstream and 100 m downstream of the discharge point. Monitoring is required to be completed at least twice during 1st November – 31st March, and once during 1st June to 31st August each year.

Table 6 below presents the recent plant effluent results recorded between July 2012 to November 2022.

Table 7 Recent Plant Performance Results and Discharge Consent Limits

Parameter	Unit	Jul 2012 – Nov 2022 data	
		Mean	95%ile
BOD_5	mg/L	27	55
TSS	mg/L	50	147
DRP	mg/L	2.2	3.5
TP	mg/L	3.7	5.3
AmmN	mg/L	17	27
TN	mg/L	25	37
E. Coli	MPN/100mL	17,507	82,800

WWTP discharge samples collected between July 2012 and November 2022 are shown in graphs below.

3.1.3.2.1 Five-day Biochemical Oxygen Demand (BOD_5)

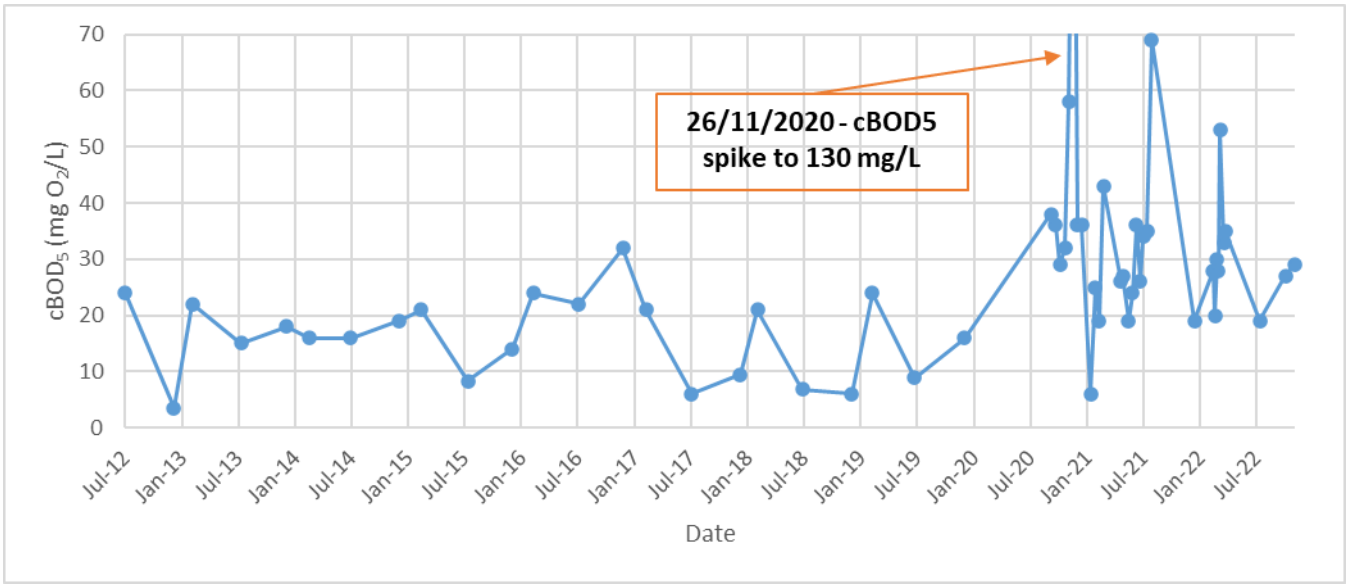


Figure 30 Discharge Biochemical Oxygen Demand

Observation: The above graph (Figure 30) shows that $cBOD_5$ generally fluctuates between 10 mg/L and 40 mg/L, while there were a few noted elevated spikes in Nov 2020 and Aug 2021, respectively.

3.1.3.2.2 Total Suspended Solids (TSS)

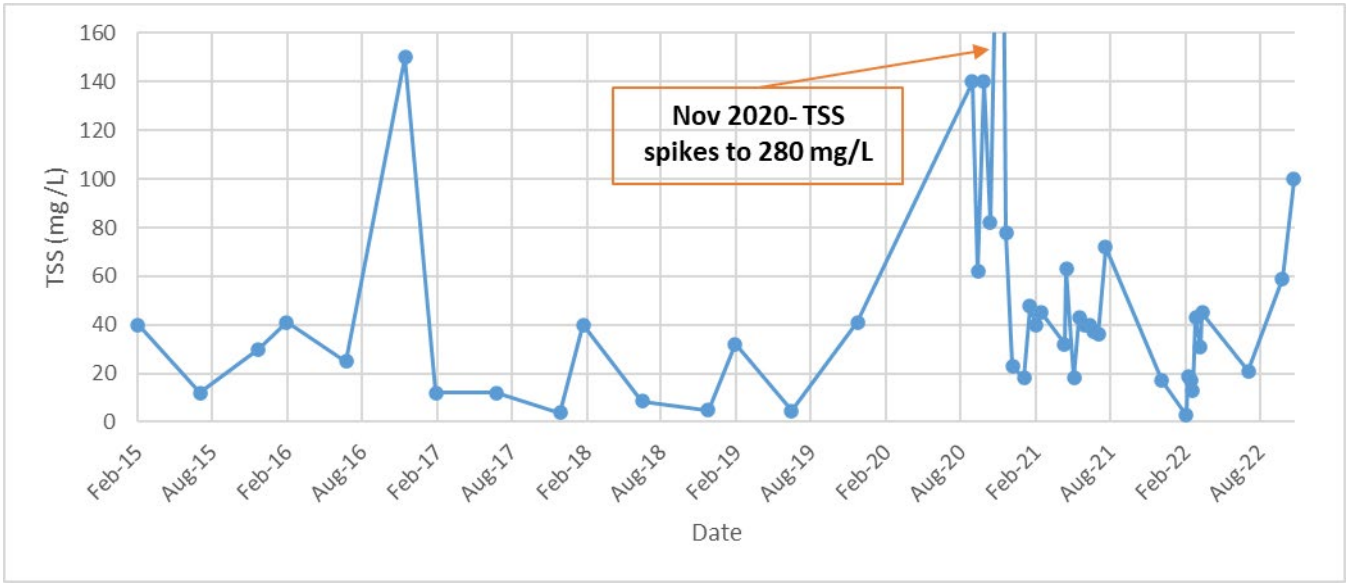


Figure 31 Discharge Total Suspended Solids

Observation: Total Suspended Solids (TSS) fluctuates generally between 10 mg/L and 60 mg/L. There were some significant spikes in TSS concentration to over 100 mg/L (Dec 2016 and Sep-Oct 2020), and in particular, one sample reached to 280 mg/L in Nov 2020 (Figure 31).

3.1.3.2.3 Dissolved Reactive Phosphorus (DRP)

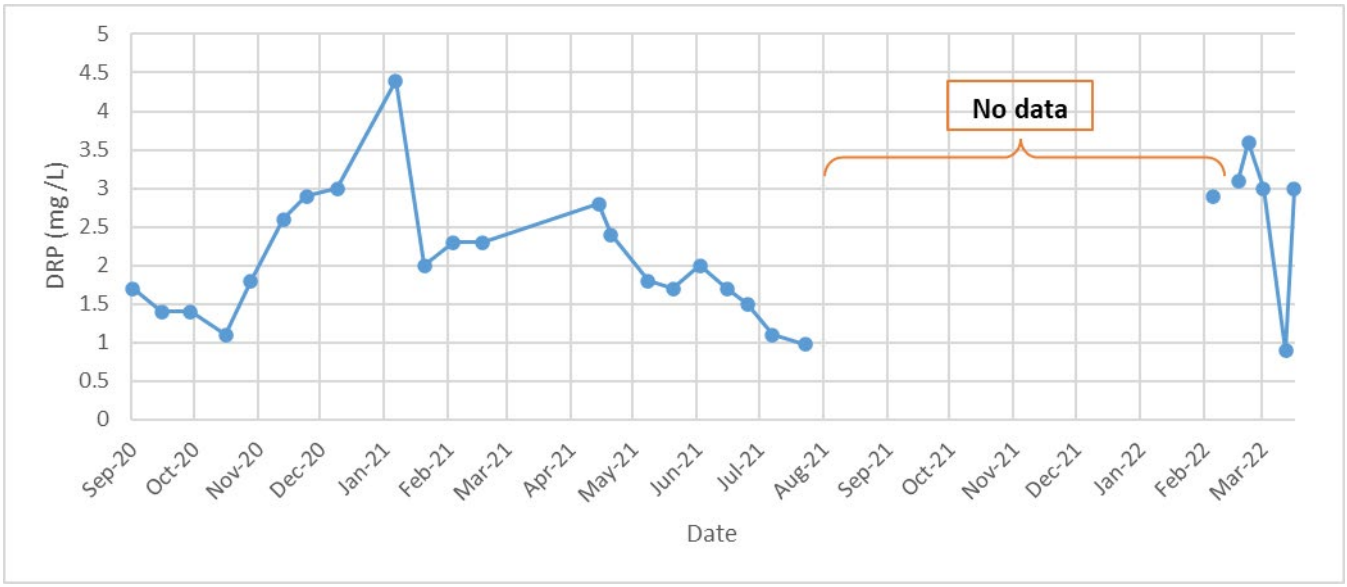


Figure 32 Discharge Dissolved Reactive Phosphorus

Observation: Dissolved Reactive Phosphorus (DRP) concentration is generally stable, fluctuating between 1 mg/L to 4 mg/L (Figure 32).

3.1.3.2.4 Total Phosphorus (TP)

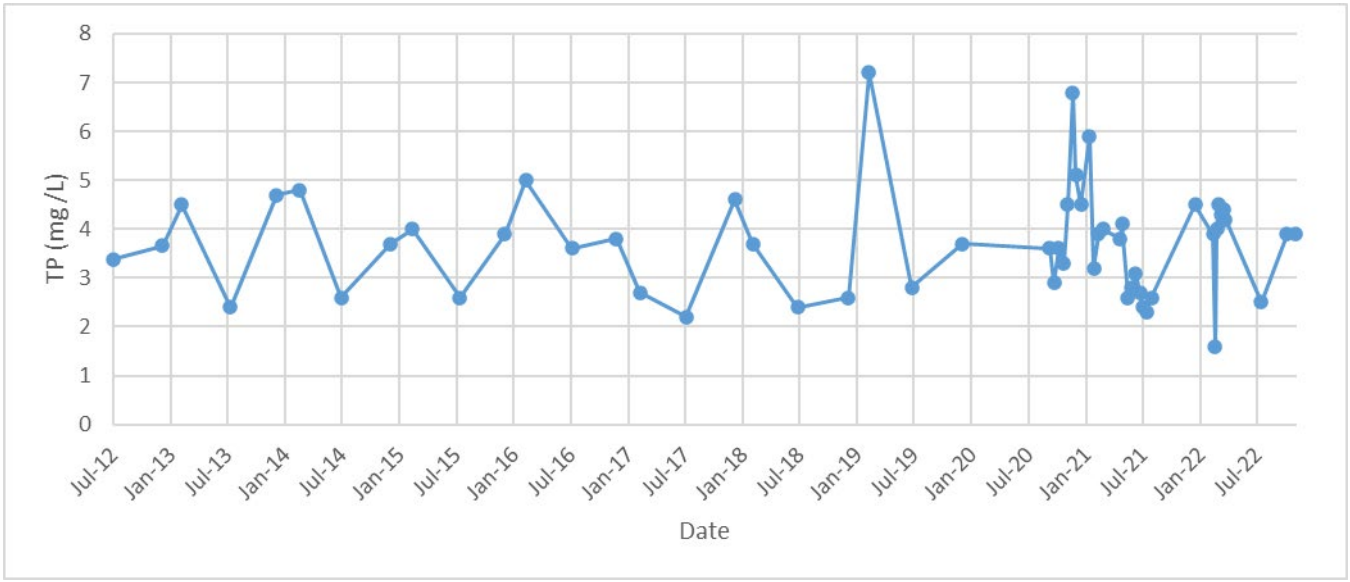


Figure 33 Discharge Total Phosphorus

Observation: Total Phosphorus (TP) is generally stable around 4 mg/L, with a few occasional spikes noted in Feb 2019 and Nov 2020 (Figure 33).

3.1.3.2.5 Ammoniacal Nitrogen

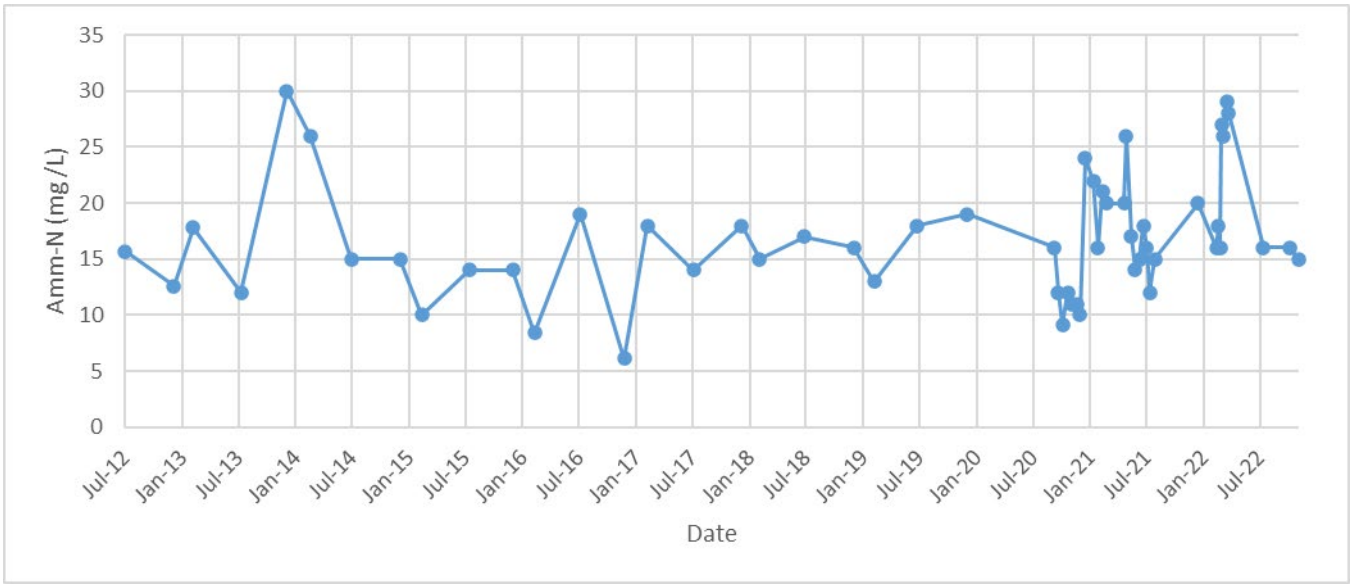


Figure 34 Discharge Ammoniacal Nitrogen

Observation: Ammoniacal Nitrogen has been generally stable, fluctuating between 10 mg/L to 20 mg/L (Figure 34). The effluent ammoniacal nitrogen could reach 25 to 30 mg/L during summer months, as observed in Jan 2014, December 2020, January 2021 and March 2022.

3.1.3.2.6 Total Nitrogen (TN)

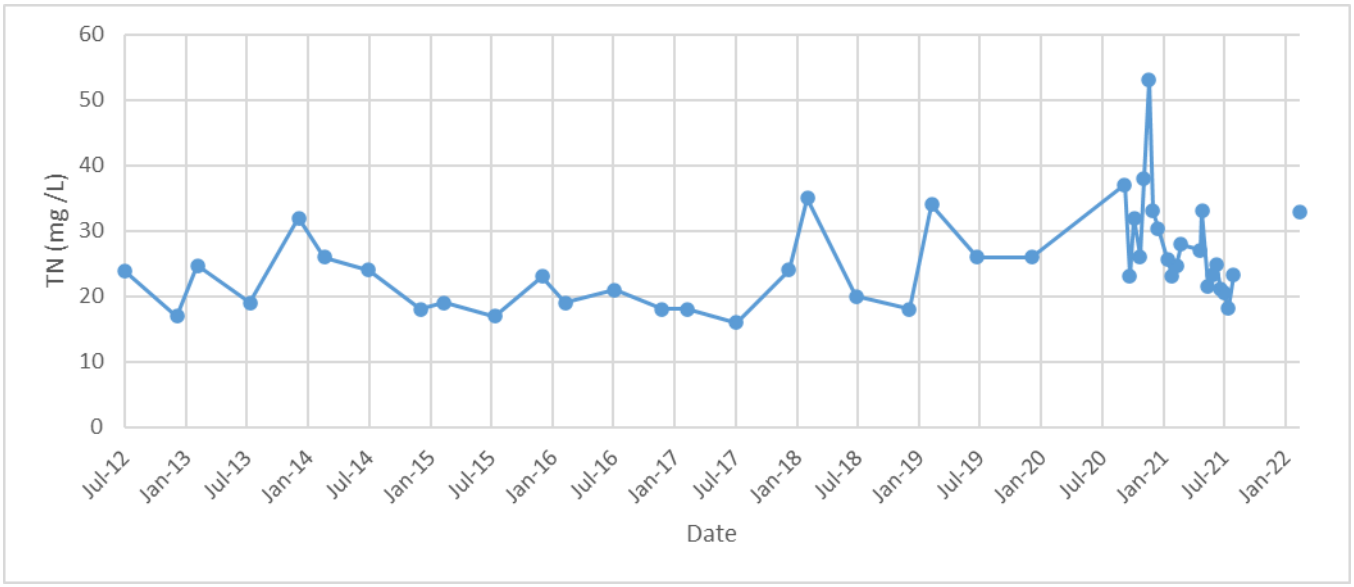


Figure 35 Discharge Total Nitrogen

Observation: Total Nitrogen (TN) has been generally stable, fluctuating between 20 mg/L to 35 mg/L. It is noted a sample with a spike to 53 mg/L in Nov 2020 (Figure 35). In that particular sample, TSS and Total Kjeldahl nitrogen were elevated (280 mg/L and 53 mg/L respectively), and the unusually high organic nitrogen (42 mg/L) could be attributed to the suspended solids in the effluent sample.

3.1.3.2.7 Escherichia coli (E. coli)

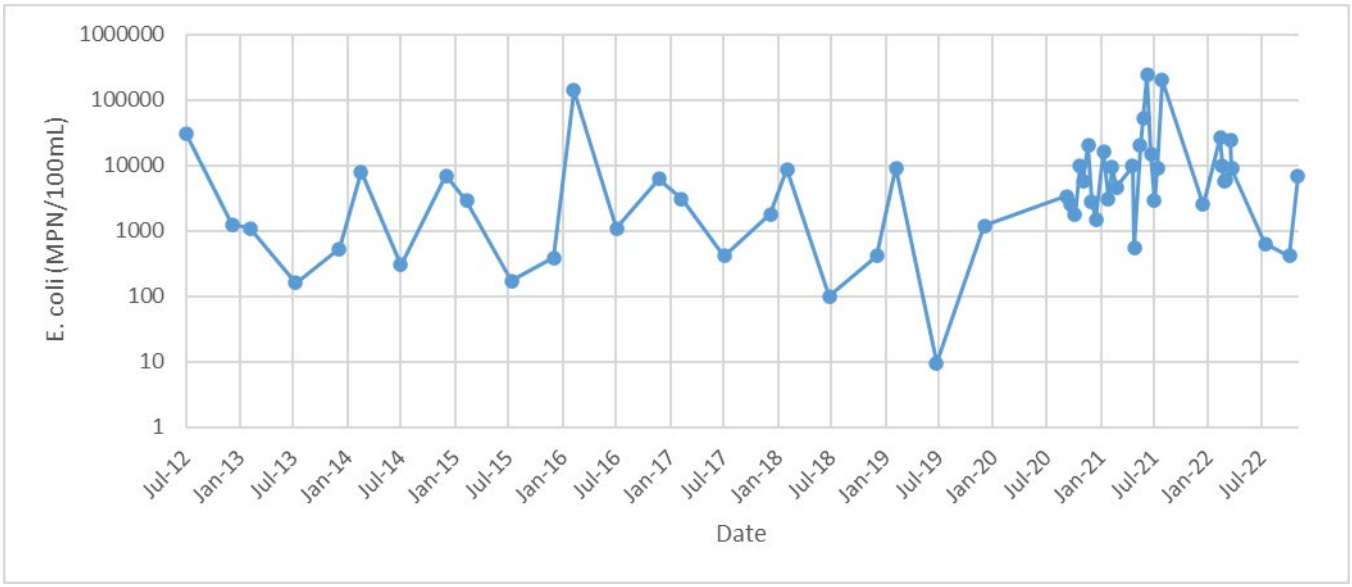


Figure 36 Discharge E. Coli

Observation: E. coli concentrations are highly variable fluctuating between 100 MPN/100 mL and 30,000 MPN/100 mL. There were a few significant spikes over 100,000 MPN/100 mL in Feb 2016, Jun 2021 and Aug 2021, respectively (Figure 36)

3.2 Discharge triggers and water quality standards

3.2.1 Current in-stream water quality standards

The Winton Stream is classified as a “lowland hard bed” surface water body under the Regional Water Plan for Southland as well as the proposed Southland Water and Land Plan. These standards apply to the effects of discharges following reasonable mixing with the receiving waters, unless otherwise stated.

The effects of the discharge have been assessed against the water quality standards for lowland hard bed surface water bodies (Winton Stream’s classification under the relevant regional plans as stated in Section 2.4). The water quality sampling undertaken upstream and downstream of the discharge point in Winton Stream, in its current state, does not comply with all the required water quality standards beyond the reasonable mixing zone.

The PSWLP requires that water quality must be improved where these standards are not met. In order to achieve the plan objective, the replacement of an existing discharge permit must demonstrate how and by when adverse effects will be avoided where practicable and otherwise remedied or mitigated, so that beyond the zone of reasonable mixing water quality will be improved to assist with meeting those water quality standards.

As previously mentioned, the SDC is currently working towards the desired outcome of disposing treated wastewater onto land with upgrades made to the existing Winton WWTP to improve overall plant performance as well. The overall water quality within the Winton Stream is degraded but will likely improve once the wastewater is being applied to land.

The SDC is currently in discussion with prospective landowners to secure suitable land to accommodate the discharge. The next step is to conduct detailed land investigations as discussed in Section 1.2.2.1. The construction phase is discussed in Section 1.2.2.2..

3.2.2 Reasonable mixing zone

The PSWLP requires that no discharges to surface water bodies should be allowed that will result in an exceedance of the water quality standards beyond the zone of reasonable mixing, unless it is consistent with the

promotion of the sustainable management of natural and physical resources, as set out in Part 2 of the Resource Management Act 1991, to do so. The reasonable mixing zone is defined as follows in terms of the pSWLP:

> ***Reasonable mixing zone***
>
> *A zone within which relevant water quality standards may be exceeded but which shall not be larger than:*
>
> *(a) for river, artificial watercourse and modified watercourse locations with flowing water present at all times:*
>
> > *(i) no longer than 10 times the width of the wetted channel or 200 metres along the longest axis of the zone (whichever is the lesser), and*
> >
> > *(ii) occupies no greater than two-thirds of the wetted channel width at the estimated Q95 for that location;*
>
> *(b) for river, artificial watercourse and modified watercourse locations with intermittent flows, no longer than 20 metres at times of flow and 0 metres at no flow;*
>
> *(c) when within a drinking water supply zone, or within 250 metres upstream of a drinking water supply site sourced from surface water, identified in Appendix J, 0 metres; or*
>
> *(d) a distance determined through a resource consent process, having regard to (a) to (c) of this definition.*

The existing reasonable mixing zone associated with Consent:202026 extends 100m downstream of the discharge point in the Winton Stream. The zone was determined through the original resource consent process that was subject to the planning framework relevant when the consent was decided. The original resource consent applications do not provide any relevant details as to how the reasonable mixing zone was calculated.

As part of this resource consent application to reconsent the discharge, the reasonable mixing zone has been recalculated in accordance with the guidelines set out in the pSWLP as per the above definition. The width of the wetted channel associated with the discharge point is approximately 7m wide on average. The reasonable mixing zone for rivers and modified watercourses with a consistent flow must be 10 times the width of the wetted channel and occupy no greater than two-thirds of the wetted channel width at the estimated Q95 for that location. As such, the reasonable mixing zone must extend 70m downstream of the discharge point in the Winton Stream. The reasonable mixing zone is therefore 30m less under the pSWLP than what is currently consented.

The current monitoring data supporting the resource consent application (Ca 12 months) was taken 5m upstream and 100m downstream of the discharge point as per the existing consent requirements to assess concentrations beyond the reasonable mixing zone (Refer to Section 2.4.2 for results). The monitoring demonstrates that the discharge is contributing to the overall degradation of the Winton Stream and does not meet all the water quality standards, in particular oxygen saturation, total ammonia and faecal coliforms. Although oxygen saturation and faecal coliform levels exceed these standards upstream of the WWTP discharge as well indicating wider catchment influences on the water quality in the stream.

The intention of the short-term consent is to maintain the scope of the existing resource consent with minor changes to accommodate the existing discharge volumes into the Winton Stream. The discharge is already causing non compliances with the lowland hard bed water quality standards at the downstream extent of the existing reasonable mixing zone and reducing the mixing zone by 30m will not change the outcomes of the monitoring and overall performance of the WWTP. Based on the current monitoring data and biological surveys carried out to date there is a good understanding of the overall health of Winton Stream and the expectation is that significant changes are required to improve overall water quality in order to achieve the water quality standard beyond the reasonable mixing zone. The solution is to convert the system to land disposal and avoid discharges to the stream as far as possible.

The short-term resource consent application proposes to retain a 100m reasonable mixing zone, as opposed to adopting a 70m reasonable mixing zone, for the duration of consent. Policy 9 of the pSWLP provides the following guidance in terms of determining the size of reasonable mixing which is appropriate for consideration in support of this application:

> *“Policy 9:*
> *When determining the size of the zone of reasonable mixing, minimise the size of the area where the*

relevant water quality standards are breached. Consideration should be given to, but not be limited to, the following matters:

(a) the aquatic ecosystem values in the affected reach;

(b) the need for fish passage;

(c) the uses of the water body adjacent to and downstream of the point of discharge"

The 2022 biological survey concluded that the discharge from the Winton wastewater treatment system was adversely affecting aspects of the biological communities of Winton Stream with MCI and QMCI scores reducing when moving further downstream. Based on the biological survey the upstream location was classified as being moderately polluted and downstream sites (Downstream 1 - 130 and Downstream 2 – 500m) as severely polluted.

The section of the Winton Stream downstream of the discharge point does not provide any access to the wider public unless accessed through private land. The stretch of the Winton Stream does furthermore not provide any recreational opportunities and does not provide significant amenity values. The Winton Stream mainly runs through farmland and there are no identified bathing points downstream of the discharge point. Signage must furthermore be maintained in a prominent place near the outfall to Winton Stream informing the public of the discharge of treated wastewater.

As such, there is no need to minimise the size of the reasonable mixing zone to accommodate the definition of the pSWLP. The assessment demonstrated that ecological values are poor and recreational activities downstream of the discharge is very limited. Minimising the reasonable mixing zone will therefore make no beneficial contribution to the status quo of the receiving environment. The solution is to convert the system to land disposal system in time and avoid discharges to the stream as far as possible.

3.2.3 Discharge quality triggers

In addition to the water quality standards proposed to maintain water quality beyond the mixing zone, the following discharge quality triggers have been proposed to maintain wastewater quality of the discharge itself, and prevent any further degradation of the Winton Stream over the next five years while SDC is working towards the long-term solution to dispose of wastewater onto land. The discharge parameters and concentration triggers below have been specified based on the performance of the existing WWTP, with the expectation that the system is operating as intended within the consented limits and managed in accordance with the O & M Plan to achieve best environmental practices and outcomes.

The treated wastewater will be monitored prior to discharging into the Winton Stream. There is a manhole at the bottom of the wetland cells where the flow is combined prior to discharging, which would be the most appropriate location for monitoring. The proposed monitoring regime will require the consent holder to undertake monthly samples during the period 1 November to 31 March each year, and at least once during the period 1 June to 31 August each year. The treated wastewater discharge, when measured at the wetland manhole, will be managed in such a way to maintain the following mean concentration trigger levels set out in Table 8.

Where the trigger levels have been exceeded, ES will be notified and additional monitoring will be required to determine if there is a trend in the higher concentration levels or whether the spike was a one off occurrence and there is no actual issue with the overall WWTP performance. The notification shall be in writing and the SDC must report the sampling date and method, results and analysis, potential reason for concentration trigger exceedance and any actions required or taken to restore concentration levels. The actions will be developed following monitoring to establish the appropriate response needed to restore concentrations below the trigger levels.

Table 8 Proposed Discharge quality triggers

Parameter	Mean Concentration trigger*
BOD_5 (g/m^3)	50
Suspended Solids (g/m^3)	100
Dissolved Reactive Phosphorus (g/m^3)	5
Ammoniacal Nitrogen – N (g/m^3)	30
E.Coli (cfu/100mL)	10,000

* For the purposes of this consent, the mean shall be from the last four rolling samples taken at the wetland manhole (bottom of wetland cells) prior to discharging into the Winton Stream.

3.3 Good environmental practices

The pSWLP provides policy direction for the operation of wastewater schemes to ensure that good environmental practices are implemented to avoid, remedy and mitigate effects on waterbodies as a result of the discharge of treated wastewater. Policy 17A sets out the following requirements in relation to the design and management of wastewater schemes:

> *Policy 17A*
>
> *Minimise adverse effects on water quality, and avoid, remedy, or mitigate other adverse effects of the operation of, and discharges from, community sewerage schemes by:*
>
> *(a) designing, operating and maintaining community sewerage schemes in accordance with recognised industry standards;*
>
> *(b) implementing measures to progressively reduce the frequency and volume of wet weather overflows from community sewerage schemes; and*
>
> *(c)nsuring community sewerage schemes are operated and maintained to minimise the likelihood of dry weather overflows occurring.*

The WWTP was originally designed in accordance with recognised industry standards and has been maintained and will continue to be maintained in accordance with the site's Operations and Management Plan (O & M Plan) to ensure the desired performance is achieved. The O & M Plan sets out specific guidance in terms of describing the various treatment process steps, how the wastewater treatment system will be operated and maintained and outline contingency measures to handle emergency events. In addition, a log providing details around any inspections and works carried out on the treatment system must be maintained.

The existing Winton WWTP is a relatively straight forward process and likelihood of dry weather overflows are slim. Provided the WWTP is managed in accordance with the consent and O & M Plan, the plant will meet current best practices and minimise the risk of dry and wet weather overflows. However, with the recent introduction of more stringent freshwater management policies, the performance capabilities of the Winton WWTP are no longer achieving national direction and contributing to the exceedance of national bottom lines in the Winton Stream..

The Winton WWTP struggles to comply with the consented discharge volumes given the challenges of inflow and infiltration (I/I) into the wastewater scheme. The SDC have implemented a Stormwater Infiltration Program to identify and reduce I/I which is expected to restore capacity in the WWTP and reduce the discharge volume thus benefiting overall downstream water quality. SDC have identified a range of different sources of infiltration into the wastewater scheme and thus are making good progress with their Stormwater Infiltration Program. This resource consent does however seek to slightly increase the average discharge volume to 1,300m^3 to accommodate the existing challenges with the operation of the WWTP.

3.4 Alternative discharge methods

During the optioneering phase of the project (Refer to Section 1.2.2.1) to determine the desired outcome for Winton WWTP over the short and long term, there was an approach agreed with ES to apply for a short term and long term resource consent. The short term consent would be to maintain the existing Winton WWTP for a maximum term of five years while detailed investigations were undertaken to support the future land application proposal. The long term consent would be submitted to ES once the detailed land investigation and design of the future WWTP upgrade, proposed pipeline and land application infrastructure have been completed. The long term consent is expected to be submitted to ES in the first half of 2024.

The short term consent is mainly focussed on maintaining the status quo and to continue the discharge of treated wastewater into the Winton Stream over the course of the next five years. In addition, SDC is trying to avoid sunk costs with upgrades to the treatment system now which may become redundant once the land disposal system is commissioned The pSWLP provides policy direction around the management of point discharges into surface waterbodies. . Policy 8 of the pSWLP requires that point source discharges of contaminants to water is preferred

at times of high flow over discharges at normal or low flows, and ensures that where discharging does take place at low flows, the effects that could not be practically avoided are minimised.

Water quality sampling taken downstream of the discharge point has shown that contaminant concentrations are generally exceeding water quality standards for lowland hard bed streams beyond the mixing zone during times when the Winton Stream is experiencing low flows. Given the design of the Winton WWTP where wastewater discharges from an artificial wetland into the stream, methods to control or regulate the flow of discharge may comprise of food gates, weirs or other instream barriers. The main issue is not to install methods to control the flow of the discharge high flow preferences, but accommodating the storage capacity and the overall performance of treatment in the oxidation ponds and wetland. The Winton Stream experiences prolonged periods of low flows during the summer months and only discharging during high flows is not realistic.

Alternative options that were considered to reduce the discharge volume during low flows and improve the quality of the discharge into Winton Stream overall, included additional storage facilities, expanding the wetlands or introducing chemical treatment to the wastewater system. The site provides the opportunity to expand storage capacity, however this will be very costly to build in the short term and will not provide any benefit as the oxidation ponds and wetland cells capacity is limited. Expanding the wetlands was also considered but this will not provide for additional treatment capacity and overloading the system will reduce treatment efficiency overall. As previously mentioned, the optioneering did consider treatment of ammoniacal nitrogen concentrations prior to discharging to the stream, but the associated costs were prohibitive.

The assessment demonstrated that all reasonable and practical options have been considered as part of the proposal to reconsent the Winton WWTP. The most pragmatic approach is to allow the discharge to continue in the interim period while further investigations and designs are carried out to support the future land disposal system and long term consent.

4. Resource Consent Requirements

4.1 Regional Water Plan for Southland (RWPS)

The purpose of this Plan is to promote the sustainable management of Southland's rivers, lakes, groundwater, surface water, and wetland resources. The plan is aimed at enabling the use and development of fresh water where this can be undertaken in a sustainable way, providing a framework for activities, such as discharges to water, taking and using water, and structures and bed disturbance activities in riverbeds.

An assessment of the proposal against the relevant rules of the RWPS is provided below. Overall, the following consent is required under the RWPS:

- Discharge permit for the discharge of contaminants into surface water from a community sewage scheme pursuant to Rule 2 of the RWPS as a **non-complying activity**.

4.2 Proposed Southland Water and Land Plan (PSWLP)

The PSWLP seeks to address activities that are known to have a significant effect on water quality.

ES's PSWLP was made partially operative following a council meeting in January 2021.

Appeals to the objectives of the proposed plan have been resolved through the Environment Court, with the Court directing council to make changes to this section of the plan. The proposed plan became operative (in part) on 1 March 2021. There are still appeals to the Environment Court regarding some of the rules that have not been resolved.

An assessment of the proposal against the relevant rules of the PSWLP - Part A - Decisions version 4 April 2018, is provided below. Overall, the following consent is required under the PSWLP:

- Discharge permit for the discharge of contaminants into surface water from a community sewage scheme pursuant to Rule 33A of the PSWSP as **a non-complying activity.**

Rule 33A of the PSWSP is currently under appeal and the rule can therefore not be treated as operative as the Environment Court has not resolved the points of appeal.

Note: The diffuser installed in the bed of the Winton Stream was installed as a permitted activity pursuant to Rule 58 of the PSWLP.

4.3 Summary

Applications lodged after the notification date of a proposed plan must consider both the operative and proposed plan (notified version) rules. The application is made after the notification date of the PSWLP and was therefore assessed against both plans. The activity status in both plans are classified as non-complying. The PSWLP is only partly operative and Rule 33A is currently under appeal, the application will therefore be classified as a **non complying activity pursuant to Rule 2 of the RWPS**. The application must still consider the objectives and policies of the operative and proposed plans to determine the application.

5. Assessment of Environmental Effects

Under Section 104(1)(a) of the RMA, when considering an application for resource consent the consent authority must, subject to Part 2, have regard to any actual or potential effects on the environment.

The actual or potential effects of the proposal have been evaluated to a level appropriate to the scale and significance of effects as required by Section 88 of the RMA.

The application relates to the discharge of treated wastewater into the Winton Stream. The assessment does not assess the operation of the WWTP site as no consent is needed for the operation.

As the consent is for a non complying activity, there are no specific matters that must be addressed in this assessment of effects. Guidance has been taken from the following provisions:

Regional Fresh Water Plan for Southland

Objectives

- Objective 2, 3, 4 and 10 to manage and maintain water quality by encouraging best environmental practices to improve water quality and avoiding exceedance of water quality standards.

Policies

- Policy 1, 3, 4, 7, 8 and 9 associated with meeting regional plan water quality standards, encouraging best management practices to manage water quality in surface water bodies and encouraging discharges at times of high flow to improve the assimilation of contaminants.

Proposed Southland Water and Land Plan:

Objectives

Objective 1, 2 and 6 to manage land and water sustainably by recognising interconnectedness, protecting mauri of water and ensure water quality is maintained or improved where degraded.

Policies

- Policy 15B, 17a and 44 associated with the maintenance of water quality, managing community sewerage schemes in accordance with recognised industry standards and implementing Te Mana O Te Wai.

The nature, scale and intensity of these effects on the receiving environment are described and assessed in the sections below.

5.1 Positive effects and community benefits

The Winton WWTP has been in operation since 1962 and has undergone several changes over the years to improve the level of wastewater treatment and ultimately to minimise the adverse effects on the receiving environment as noted in Section 1.2.1.

There are obvious benefits to the Winton community of having an operating and efficient wastewater treatment plant. SDC and the urban Winton community rely on the wastewater treatment and disposal system to function sustainably and to maintain public health standards. An inability to continue to operate the wastewater treatment plant would have significant consequences on the wellbeing of the community, and on their health and safety. This is recognised in the Regional Policy Statement with the inclusion of the Plant as “regionally significant infrastructure”.

The short-term consent is to maintain the status quo in terms of the existing operation and water quality in the Winton Stream. As part of the consent application, the SDC does however propose to strengthen the monitoring regime and impose wider discharge triggers to manage the overall quality of the discharge. Based on discussion with stakeholders, it is agreed that the most pragmatic approach would be to reconsent the discharge to continue in the short term, while work is underway to upgrade the Winton WWTP and progressively convert the discharge from the WWTP to a suitable land disposal area.

The long term consent will ultimately result in a reduction of the adverse effects of discharges on surface water quality by removing the discharge from surface water altogether. The utilisation of land treatment where the

discharge can be undertaken in a sustainable matter and without significant adverse environmental effects is the preferred method. The removal of the discharge from Winton Stream will ultimately improve the degraded state of water quality. The long term solution may require discharges to the Winton Stream during winter under extreme circumstances of prolonged rain when the discharge to land will be inappropriate. The long term consent will be submitted to ES once more detailed land investigations have been conducted to determine the suitability of the land. The construction phase of the project will take approximately 2 years to complete including, installing a wastewater pipeline and additional filtration facilities on site to treat wastewater prior to land disposal.

The existing Winton WWTP have had issues in complying with the daily discharge volume and it has been determined that this is primarily caused by the infiltration of other unaccounted sources i.e stormwater and wastewater system discharges upstream of the Winton WWTP. The SDC has already implemented a Stormwater and Infiltration Program (SIP) with the aim of reducing infiltrations of other sources entering the wastewater reticulation system which subsequently end up at the Winton WWTP. Several other issues i.e surcharge pipes and gully traps infiltrating the wastewater reticulated network have been rectified to reduce infiltration of the system. General maintenance of wastewater and stormwater also reduced any leakages contributing to the issue. SDC has also carried out physical testing and die testing around properties to determine infiltration sources. The SIP also surveyed reticulated stormwater networks within various catchments of Winton to identify any issues.

Overall, the project achieves a sustainable balance in enabling the community to provide for its wellbeing into the future while maintaining the environment.

5.2 Actual or potential effects on surface water quality and aquatic ecology

5.2.1 Effects on surface water quality

The Winton WWTP has been in operation since 1962 and will continue to discharge treated wastewater into the Winton Stream over the next five years. Water quality sampling data (refer to Section 2.4) shows that water quality in the Winton Stream is generally poor upstream and downstream of the discharge point. Monitoring also show that the Winton WWTP is contributing to the overall decline of water quality in Winton Stream particularly in terms of Ammonical-N, Total Nitrogen, Total and Dissolved Reactive Phosphorus. Excessive concentrations of ammoniacal N will cause water hypoxia and can result in acute and chronic effects on instream ecology. Excessive levels of DRP and TP promote algae growth in water bodies and may increase the risk of harmful algal blooms. This can lead to a variety of water-quality problems, including low dissolved oxygen concentrations, which can cause harm to the overall health of the waterbody.

In order to protect the overall health of the waterbody, the effects of the discharge beyond the zone of reasonable mixing must be achieved for lowland hard bed waterbodies. These were assessed and determined that, in its current state, the Winton Stream does not comply with all of the required water quality standards. This includes oxygen saturation, total ammonia and faecal coliforms. It should be noted that oxygen saturation and faecal coliform levels exceed these standards upstream of the WWTP discharge as well. The 5 year median trends of water quality samples (based on LAWA[7]) taken in Winton Stream at Lochiel, indicates that E.Coli, suspended fine sediments, ammoniacal N, nitrate nitrogen, phosphorus and DRP levels are poor with trends not showing any likely improvement in the short term.

In summary, the discharge of treated wastewater into the Winton stream is adversely affecting aspects of water quality as suggested by the water quality sampling. The current water quality trends are unlikely to improve over the short-term period and no changes are being proposed in the short-term to upgrade the treatment system. As such, the wastewater discharge will continue to degrade water quality which adversely affects various sensitive human and ecological receptors within the receiving and downstream environment.

Alternative treatment options were considered but not deemed feasible over the short-term period as discussed in Section 3.4 of this report. The desired outcome is to avoid discharging into the Winton Stream as far as practically possible and ensure best environmental practices are achieved in the interim period. As such, the Winton WWTP will be managed in accordance with an O & M Plan. To ensure the existing system maintains the status quo,

[7] https://www.lawa.org.nz/explore-data/southland-region/river-quality/oreti-river/winton-stream-at-lochiel/

discharge quality trigger levels will be adopted in the proposed monitoring regime. The consent holder will be required to notify the regional council when any exceedance occurs and provide details of the potential cause and any immediate actions implemented to resolve the exceedance The purpose of this process is to determine if there are any additional issues unaccounted for beyond the anticipated performance levels that requires urgent remediation.

As previously mentioned, the SDC has also implemented a Stormwater and Infiltration Program (SIP) with the aim of reducing inflow and infiltration (I/I) entering the Winton wastewater reticulation system which subsequently end up in Winton Stream. A number of network improvements, i.e surcharging pipes and gully traps levels, have been rectified and ongoing general maintenance have been carried out to reduce I/I to the system. SDC has also carried out surveys of its reticulated stormwater network within various catchments to identify cross-connections, and physical testing and die testing around properties to identify I/I sources. The SIP is aimed to reduce inflow and infiltration (I&I) by 25% and will commence in 2023.

Based on the above assessment, the effects of the discharge, beyond the zone of reasonable mixing, will continue to not meet all the prescribed regional plan water quality standards for lowland hard bed water bodies in the short term. However, the intention is to maintain the existing performance of the Winton WWTP by applying best management practices through implementation of the O&M Plan and reduce inflow to the system through the implementation of a SIP whilst investing and designing the scheme long-term land disposal solution.

In summary, the discharge of treated wastewater to the Winton Stream is and will continue to have an adverse effect on water quality that is considered to be more than minor, however with the proposed mitigation measures the discharge is not anticipated to result in any further degradation of water quality in Winton Stream in the short term.

5.2.2 Effects on aquatic ecology

The impact of the current discharge on aquatic ecosystems in Winton Stream was assessed in March 2022 by 4Sight Consulting as summarised in Section 2.4.3 and included assessments of water quality, sediment, periphyton, and benthic macroinvertebrates. As there is no change to the proposed activity over the term of the proposed short-term consent then the findings of the survey are applicable to the activity being proposed.

The summary and conclusion is extracted directly from the 4Sight – Winton Wastewater treatment system – Biological Survey (August 2022) and is attached as Appendix C .

> *"The March 2022 biological survey of Winton Stream in the vicinity of the Winton wastewater treatment system revealed generally poor quality communities throughout the study reach. The stream had been adversely affected by other activities within the channel, including excavator and cattle movements, with increased sediment deposition and disturbance of the bed evident throughout the stream. Sediment cover was highest at the Upstream site*
>
> *Water quality was poor, with high conductivity and low clarity throughout the stream, although clarity was lower downstream of the discharge point. The water was visibly discoloured at each site, with clarity at all sites lower than the ES standard for water clarity for 'lowland hard bed' water bodies. Dissolved oxygen levels were low downstream of the discharge point, with saturation at Downstream 1 not meeting the minimum ES standard of 80%. Due to the low river flows at the time of the survey, the dilution and mixing of the discharge would have been low, which would have increased the influence of the discharge on the water quality of the stream.*
>
> *Periphyton communities had lower cover levels than MfE guideline levels and ES standards, however, cover of filamentous algae was highest at the most downstream site. Periphyton biomass, measured as chlorophyll a, was relatively high at each site, but there were no differences in average chlorophyll a level between sites. AFDM levels increased downstream, however AFDM remained below guideline levels at all three sites. Autotrophic index values were relatively low at each site and were not indicating periphyton communities affected by organic pollution. There were also no bacterial or fungal slime growths visible to the naked eye at any of the sites. Overall, results indicated that the discharge may be having minor effects on periphyton communities of the river.*
>
> *Benthic macroinvertebrate community health was poor throughout the stream, with communities dominated by taxa with low MCI taxon scores, indicating these taxa are tolerant of poor conditions. Midge*

larvae and worms dominated communities, with snails also abundant. Communities also included EPT taxa typically indicative of good water quality (EPT: mayflies, stoneflies, and caddisflies), such as Deleatidium mayflies, however abundance was low. Macroinvertebrate community health indices were low at each site, with scores for each site indicative of 'poor' quality conditions, except MCI scores at the Upstream site where scores were only slightly higher and indicative of 'poor-fair' quality conditions. There were, however, statistically significantly higher scores found at the Upstream site than Downstream. Health index scores at all sites were lower than ES's 'lowland hard bed' macroinvertebrate community standards. Overall, despite the low-quality communities at each site, macroinvertebrate results indicated some influence of the discharge on the benthic invertebrate communities of Winton Stream.

In conclusion, results from the March 2022 survey indicate that the discharge from the Winton wastewater treatment system was adversely affecting aspects of the biological communities of Winton Stream. However, the very low river flows at the time of sampling, and the extraneous activities within the stream channel, would have contributed to the differences found between the sites."

The discharge of treated wastewater into the Winton Stream is having adverse effects on aquatic ecosystems in the downstream environment. The survey demonstrated that the health index scores reduce between the upstream and downstream sites.

Based on the above assessment, the discharge of treated wastewater into the Winton Stream is and will continue in the short-term to have an adverse effect on aquatic ecology that is considered to be more than minor, however with the implementation of mitigation measures proposed the discharge is not anticipated to result in any further degradation on the Winton Stream ecological health in the short term.

5.2.3 Other river users

The land adjacent to the stream is predominantly agricultural and there are no known bathing spots in the Winton Stream. Given the modified nature and low flow characteristics of the stream during dry summer months, it does not support a wide variety of sport fishing opportunities. The stream is heavily polluted with high pathogen and nutrient levels. The biological survey suggested that the stream contains low ecological health conditions both up and downstream. Its therefore considered very unlikely that the Winton Stream is used for mahinga kai or food gathering purposes. The Winton Stream does not appear to support any other recreational activities i.e. hiking, swimming, camping or kayaking.. Access to the Winton Stream is also limited.

The Oreti River is approximately 6km downstream of the discharge point and converges just north of the Lochiel Road bridge. The Lower Oreti surface water zone provides many recreational opportunities all year round. In the lower reaches of the Oreti, swimming and recreational boating is very popular, along with sporting events such as rowing regattas and speed boat racing. Whitebaiting is also actively undertaken in the tidal reaches of this zone. Throughout the Lower Oreti, the streams and rivers are well known for their excellent brown trout fishing. In early winter, the riverine habitat and wetlands of the Lower Oreti zone provide great opportunities for duck hunters to stalk wily mallards.

The contaminant concentrations in the wastewater discharge will further reduce after thorough mixing of water in the Winton Stream before reaching the Oreti River. Water quality data taken from the Winton Stream downstream at Lochiel (Figure 12) indicated reductions in downstream ammoniacal nitrogen concentrations. The discharge will therefore have minor effects on the Oreti River as water quality standards will likely be achieved. However, given contaminants from the WWTP are being discharged into an already degraded stream with a poor ecological health status and high risk of causing human health issues, the effects on other users in Winton Stream is consider to be more than minor.

Based on the above assessment, the current state of the Winton Stream will likely discourage any potential recreational or other uses of the stream but this cannot be confirmed. The downstream environment is adversely affected by the discharge and the water quality standards are not being met with high contributions of ammoniacal nitrogen, E.coli and DRP in the discharge. Given there is no certainty around the use of Winton Stream downstream of the discharge point, the potential and actual adverse effects are considered to be more than minor.

5.2.4 Animal and human health risks

Wastewater can have negative effects on human health if exposed to high concentrations of contaminants. Some of the possible health risks associated with exposure to untreated or poorly treated wastewater include:

- Infections: Wastewater can contain harmful bacteria, viruses, and parasites that can cause gastrointestinal infections, skin infections, respiratory infections, and other health problems.
- Toxic substances: Wastewater often contains toxic chemicals, such as heavy metals, pesticides, and pharmaceuticals, which can accumulate in the environment and pose health risks to humans.
- Waterborne diseases: Wastewater can contaminate drinking water sources and lead to outbreaks of waterborne diseases, such as cholera, typhoid fever, and dysentery.

In terms of overall river water quality, Environment Southland's State of the Environment Report (ES SoE Report), classifies the water quality within the Winton Stream in the vicinity of the current WWTP discharge (Water quality sampling site at Lochiel downstream from current discharge location) as 'very poor' in terms of E.coli, 'poor' in terms of suspended sediment and 'fair in terms of nitrate and ammonia.

E.coli counts were generally measured at similar levels upstream and downstream of the discharge location in the Winton Stream (Figure 17). The sampling taken below in the stream suggests the discharge is not contributing to the instream E.coli levels given concentrations upstream of the discharge are already elevated. E. coli concentrations in the discharge, prior to mixing, are highly variable fluctuating between 100 MPN/100 mL and 30,000 MPN/100 mL. There were a few significant spikes over 100,000 MPN/100 mL in Feb 2016, Jun 2021 and Aug 2021, respectively (Figure 34).

Given the high concentrations of E.Coli discharged into the Winton Stream and considering the overall water quality in terms of E.coli is classified as being very poor as per the ES SoE Report. There is no certainty around the extent of use of the Winton Stream by human and animal activities i.e. mahinga kai or stock drinking water. To minimise risk to human exposure, signage must be maintained in a prominent place near the outfall to Winton Stream informing the public of the discharge of treated wastewater and associated health risks. The sign shall include a contact number for the consent holder.

Based on the above assessment, the actual and potential adverse effects on public and human health are considered to be more than minor.

5.2.5 Other consented activities

There are no other surface water takes authorised by Environment Southland downstream of the discharge point in the Winton Stream. AUTH-99139-V1 allows Invercargill City Council to take up to 47,200 cubic metres of water per day from the Oreti River at Branxholme for the Invercargill town supply. The surface water abstraction point in the Oreti River (SW/0030) is approximately 20km downstream of the Winton WWTP discharge point.

Table 8 below compares water quality parameters between Winton Stream at Lochiel and the Oreti River at Wallacetown, which is located just south of the Branxholme Invercargill town supply. Based on the 5 year median information provided by Land and Water Aotearoa (LAWA), there is a clear indication of a reduction of E.coli levels, ammoniacal nitrogen and dissolved reactive phosphorus between the monitoring sites. The data suggests that the concentrations measured at Winton Stream at Lochiel are decreasing via either dilution (via increasing stream flow) or geochemical changes between the Winton Stream and Oreti River.

Table 9 Water quality comparison between Winton Stream and Oreti River

Parameter - 5-year median	Winton Stream at Lochiel	Oreti River at Wallacetown
E.Coli	800 n/100ml	150 n/100ml
Total Nitrogen	2.6 mg/L	1.27 mg/L
Ammoniacal Nitrogen	0.129 mg/L	0.005 mg/L

[8] https://www.lawa.org.nz/explore-data/southland-region/river-quality/oreti-river/winton-stream-at-lochiel/
[9] https://www.lawa.org.nz/explore-data/southland-region/river-quality/oreti-river/oreti-river-at-wallacetown/

Parameter - 5-year median	Winton Stream at Lochiel	Oreti River at Wallacetown
Dissolved Reactive Phosphorus	0.054 mg/L	0.005 mg/L

Based on the information above its unlikely that the discharge of treated wastewater into the Winton Stream, in isolation from any other discharges of contaminants onto land or water, would adversely affect the Branxholme Invercargill town supply. However, when considering cumulative effects of the discharge on the Oreti River, the contribution of highly elevated nutrients and pathogens into a degraded catchment from other sources will likely increase the risk of contamination in the Oreti River..

The water quality data between the Winton Stream at Lochiel and Oreti River at Wallacetown monitoring sites show trends of improvement when measured over a 5-year median value. However, as a safety precaution, the SDC will notify Invercargill City Council as part of the accidental spill protocol in the event that partially untreated or untreated wastewater has been discharged accidentally to land or water that may potentially affect the Branxholme Invercargill town supply.

Based on the above assessment, the potential and actual adverse effects on other consented activities downstream of the Winton WWTP is minor.

5.3 Actual or potential effects on tangata whenua values

Te Mana o Te Wai is recognised by tangata whenua and is about recognising the vital importance of clean, healthy water for maintaining the health of our waterbodies, freshwater ecosystems and the communities that rely upon them for their sustenance and wellbeing.

The Winton stream has not been identified for any particular cultural significance values, however the stream merges with the Oreti River which is classified as a Statutory Acknowledgment Area. Although the discharge is not directly discharging into the Oreti River, the evidence suggests that the wastewater discharge is adversely affecting water quality and ecological health in the downstream environment which subsequently enters the Oreti River at the convergence point just north of Lochiel Bridge Road.

The overarching direction by Iwi is that wastewater should not be discharged directly into surface water and land disposal systems should be promoted in the first instance. This is mainly because of the sensitivity of the waterbody compared to a land disposal system. Land disposal systems may however still result in the potential for leaching where contaminants may enter groundwater. However, the effects associated with land disposal systems are significantly less than discharging treated wastewater directly into surface water as there is a multibarrier approach to reduce and minimise contaminants.

This short term consent will however allow SDC to undertake detailed land investigations, design the Winton WWTP upgrades and land disposal infrastructure. The detailed information will support the long-term consent application to convert the discharge to a land-based application system. The construction period to install the upgrades, pipeline and additional irrigation infrastructure will occur over a two-year period. This approach has been discussed with Runanga and SDC is committed to ongoing engagement during the development of the long term solution.

Based on the above assessment, the potential and actual adverse effects on tangata whenua values is minor

5.4 Actual or potential cumulative effects

The Winton WWTP has been discharging treated wastewater into the Winton Stream since 1962 and monitoring shows the stream continues to exceed water quality standards (in terms of acceptable change in water between upstream and downstream locations) beyond the zone of reasonable mixing in the Winton Stream.

There is evidence of infiltration of groundwater and stormwater sources upstream of the Winton WWTP causing non-compliance issues with the consented discharge volumes. Although the SDC is proactively working to rectify the problem to reduce inflow and infiltrations from other sources, these I&I sources also introduce additional contaminant concentrations (i.e hydrocarbons, heavy metals) into the Winton WWTP, which subsequently discharges into the stream and potentially harms the health and wellbeing of the waterbody. Although the oxidation pond and wetlands may treat the contaminants to some extent, the effectiveness of these processes can also depend on other factors such as the concentration and water conditions, and the presence of other contaminants

that may interfere with the treatment process. As such, they may not be the most efficient or reliable treatment option for these types of contaminants

The Winton Stream flows along the eastern boundary of Winton township which potentially introduces various other contaminants to the stream (hydrocarbons, heavy metals, Ecoli and various) as a result of stormwater runoff from properties, passive discharges into groundwater hydraulically connected to surface water and stormwater drains discharging directly into the Winton Stream. In addition, the Winton Stream flows through a vast area of agricultural land, which also introduces various other contaminants typically related to farming land use activities (nutrients and pathogens). These include passive discharges (i.e nitrogen and pathogens) where contaminants enter groundwater and surface water indirectly, or directly where stock have access to the Winton Stream as noted in the 4Sight Report (Appendix C), or windborne contaminants from effluent applicators where appropriate setbacks are not maintained between the discharge area and the waterbody.

As discussed in Section 2.4 of this report, water quality in the Winton Stream is overall poor. The recent monitoring data (ca. last 12 months) suggests that the Winton WWTP is responsible for a significant proportion of the ammoniacal N and DRP present at the downstream sampling location during low flow summer periods (below the zone of reasonable mixing). However for other contaminants of concern, e.g. DRP, nitrate and *E.coli*, are is also significantly elevated upstream of the current WWTP discharge point and that are comparable to downstream concentrations (after WWTP discharge and mixing). The results suggest that the Winton WWTP is not the key driver for elevated in-stream concentrations of these parameters.

Based on the above its considered that the actual and potential cumulative effects will be more than minor on the environment and minor on any other person using the Winton Stream.

5.5 Overall AEE conclusion

The assessment indicates that overall, the potential effects from the treated discharge into the Winton Stream results in significant adverse effects on the receiving environment that are more than minor. This is due to the degree of treatment employed, general high levels of anticipated contaminants and the sensitive environmental setting.

6. Statutory Assessment

The Resource Management Act (RMA) provides the framework for all resource utilisation in New Zealand. When making a determination on a resource consent under the RMA, a consent authority is required to have regard to a number of national, regional and district level statutory documents. The following provides an assessment of the main statutory considerations of relevance to the application.

6.1 Part 2 - Purpose and Principles

Part ll of the RMA Sections 5 to 8, outlines the purpose and principles of the Act, which apply in relation to any resource use, development or protection.

The purpose of the RMA as set out in Section 5 is to promote the sustainable management of natural and physical resources. The overriding purpose of the RMA is "to promote the sustainable management of natural and physical resources" (s.5). Sustainable management is to be achieved by avoiding, remedying or mitigating the adverse effects of activities on the environment.

Section 6 of the RMA sets out the matters of national importance, which must be recognised and provided for in relation to managing the use, development, and protection of natural and physical resource. The relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga have been recognised in the application since the Oreti River has been identified as a Statutory Acknowledgement that identifies Te Runanga o Ngai Tahu's cultural and spiritual associations with the river. The Winton Stream is a tributary of the Oreti River, and the discharge point is approximately 5.3km upstream of the Oreti River confluence. The Winton Stream has been modified over the years and there are no known sensitive Runanga values identified near the Winton WWTP based on information available in the RWPS or PSWLP. There are furthermore no areas containing significant indigenous vegetation and significant habitats of indigenous fauna along the margins of the Winton Stream where the discharge occurs.

Section 7 of the RMA provides a list of further matters that particular regard must be given to in relation to managing the use, development, and protection of natural and physical resources. Of relevance to the proposal, particular regard has been given to kaitiakitanga and the maintenance and enhancement of the quality of the environment. Kaitiakitanga ensures that Māori rights are actively protected through honourable conduct, fair processes, robust consultation, and good decision-making. Consultation is ongoing with Oraka Aparima Rūnanga and Waihōpai Rūnanga regarding the proposed short term consent and long term strategy. Initial discussions were carried out in May 2022 (Appendix D) with Te Ao Marama Inc, on behalf of the respective Rūnanga , regarding the consent renewal and long term solution. Te Ao Marama Inc initially preferred the option of pumping wastewater to Invercargill, this option was subsequently removed as noted in Section 1.2.2, leaving discharge to land as the recommended option. This option was consequently discussed with Te Ao Marama who provided initial advice on behalf of the Rūnanga (Appendix D) . When further information is available, Rūnanga would welcome the opportunity to receive this information. As such, consultation is ongoing with Te Ao Marama Inc and any further comments will be provided to ES.

Section 8 of the RMA relates to managing the use, development, and protection of natural and physical resources while taking account of the principles of the Treaty of Waitangi. The proposal will maintain water quality in the Winton Stream over the next 5 years while SDC design and implement the long term strategy to land application. Monitoring and reporting are required to ensure the health of the waterbody is monitored and maintained. The WWTP will be managed in accordance with best practice prescribed in an Operations and Management Plan, setting out the relevant processes required to maintain current treatment standards prior to discharging into the Winton Stream. The Oreti River, down stream of the discharge point, has been identified as a Statutory Acknowledgment and consultation with Te Runanga o Ngai Tahu and the relevant Rūnanga is ongoing to seek their feedback on the application. The proposal is considered to be in accordance with the principles of the Treaty of Waitangi.

The application has been assessed against the relevant planning provisions and it is considered that an approval from the consent authority to allow SDC to continue the operation of the existing WWTP for an interim period will not contravene the Purpose and Principles of the RMA. SDC is currently in the design phase of the wider project to improve the WWTP treatment system and the acquisition process to secure suitable land area to accommodate

the discharge. The SDC will submit a future long term consent in line with the proposed timeline given in Section 1.2.2 once the details for a land disposal system have been confirmed.

6.2 Section 15

Section 15(1) of the RMA states that no person may discharge any contaminant from any industrial or trade premises onto or into land unless the discharge is expressly allowed by a rule (in a regional plan and in any relevant proposed regional plan), a resource consent or regulations.

A Resource consent application must be prepared in accordance with Section 88 of the RMA. Applications must include a full description of the activity and an assessment of any actual or potential effects that the activity may have on the environment and the ways in which significant effects can be "avoided, remedied or mitigated". Such assessments must be prepared in accordance with the Fourth Schedule of the RMA. This Schedule sets out the matters that should be included and those that should be considered.

The proposed activity is not expressly allowed by a rule or regulation and resource consent is therefore required to authorise the activity in accordance with Section 15 of the RMA. This application has been prepared in accordance with Section 88 and the fourth schedule of the RMA.

6.3 Section 104

Section 104 of the RMA requires that when the consent authority considers an application for resource consent subject to Part 2 and section 77M, that they must have regard to the following:

1(a) any actual or potential effects on the environment of allowing the activity;

1(ab) any measure proposed or agreed to by the SDC 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; and

1(b) any relevant provisions of—

a) a national environmental standard:

b) other regulations:

c) a national policy statement:

d) a New Zealand coastal policy statement:

e) a regional policy statement or proposed regional policy statement:

f) a plan or proposed plan; and

1(c) any other matter the consent authority considers relevant and reasonably necessary to determine the application.

In accordance with s104(a), the actual or potential effects on the environment of the activity have been assessed in section 5 of this report and are considered to have more than minor effects on the environment and minor effects on any person. The application has had regard to a number of planning provisions. Other matters and to the Water Services Act to determine the application as set out in the following sub-sections.

6.3.1 Water Services Act 2021 (WSA)

Section 104(2D) of the RMA requires councils to have regard to the following matters:

When considering a resource consent application that relates to a wastewater network, as defined in section 5 of the Water Services Act 2021, a consent authority—

a. must not grant the consent contrary to a wastewater environmental performance standard made under section 138 of that Act; and

b. must include, as a condition of granting the consent, requirements that are no less restrictive than is necessary to give effect to the wastewater environmental performance standard.

In accordance with the WSA, the discharge from a WWTP is defined as part of a wastewater network. Wastewater network means the infrastructure and processes that –

a. are used to collect, store, transmit through reticulation, treat, or discharge wastewater; and

b. are operated by, for, or on behalf of one of the following:

   i. a local authority, council-controlled organisation, or subsidiary of a council-controlled organisation:

   ii. a department:

   iii. the New Zealand Defence Force.

Taumata Arowai is the current regulator of drinking water with an oversight role in relation to wastewater, but their wastewater oversight role (which will include establishing national standards and performance measures under section 138 WSA) won't commence until late 2023. Therefore, there aren't currently any wastewater environmental performance standards that must be considered under s.104 of the RMA.

6.3.2 National Policy Statement for Freshwater Management 2020 (NPS-FM)

The National Policy Statement for Freshwater Management 2020 (NPS-FM) came into effect on 3 September 2020 (amended in February 2023) and sets out the objectives and policies for freshwater management under the RMA.

An assessment in regard to the hierarchy of obligations in Te Mana o te Wai is provided below with an assessment of the relevant NPS-FM objective and policies given in Table 10.

(a) first, the health and well-being of water bodies and freshwater ecosystems

Comment: Water quality in the Winton stream is generally very poor as discussed previously. Sampling taken upstream and downstream of the discharge point indicate that the plant is contributing to declining water quality in the Winton Stream. In particular, the plant is contributing Ammoniacal Nitrogen, Total Nitrogen, Total Phosphorus, Dissolved Reactive Phosphorus and E.Coli. The Winton Wastewater Treatment System Biological Survey, August 2022 (Appendix C) revealed generally poor-quality biological communities reside upstream and downstream of the discharge point within the Winton Stream. The discharge is evidently contributing to the already deteriorating health and well-being of Winton Stream and associated freshwater ecosystems.

The proposal will enable SDC to discharge into Winton Stream for a maximum term of five years. This will allow SDC to finalise the long-term detailed designs to upgrade the Winton WWTP and convert the disposal system to a land based disposal scheme. The short-term consent does not fully align with the first priority of the NPS-FM, given the discharge will continue into the already degraded Winton Stream. However, monitoring and reporting requirements have been reinforced to provide a clearer picture to ES of the impact on Winton Stream, which will furthermore inform the long-term strategy scheme designs.

When the consent authority determines the application, the substantive decision must rather be focussed on the long-term solution and benefits associated with the new Winton WWTP and land disposal system. The new wastewater scheme for Winton will be designed to be consistent with the outcomes of the NPS-FM, with the main priority being to protect the health and well-being of water bodies and freshwater ecosystems. The SDC is currently in the design phase and investigating several locations on a case-by-case basis, which will determine if the proposed land disposal area is suitable to attenuate and further treat any remaining contaminants that may enter groundwater or connected surface water.

(b) second, the health needs of people (such as drinking water)

Comment: The Winton WWTP has been in operation since 1962 providing essential wastewater treatment services to the local Winton community. There are no identified bathing sites or swimming areas near the discharge point at the Winton Stream, or downstream of the discharge

site. Signs have also been provided on site to warn the public against attempting to use the stream for recreational activities or access in that area given the potential health risks associated with the contaminated discharge. There is no other identified water users within the mixing zone, or further downstream up to the point where the stream converges with the Oreti River. However, given the overall poor quality of the Winton Stream not meeting national bottom lines and the uncertainty around potential other unidentified recreational or cultural uses of Winton Stream, there is a potential health risk associated with water contact or incidental ingestion.

(c) third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.

Comment: The wastewater discharge into the Winton Stream does contribute to the overall poor health and wellbeing of the waterbody and potentially effects the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future. However, wastewater infrastructure and treatment systems are essential to support the growing populations within Winton and to provide for economic development. SDC is currently investigating detailed designs to convert the system to a land disposal system in the future. Significant investment and resources are required to implement any proposed changes which are anticipated to happen over the next five years.

Table 10 Assessment against NPS-FM

Objective	Policy	Comment
(1) The objective of this National Policy Statement is to ensure that natural and physical resources are managed in a way that prioritises: (a) first, the health and well-being of water bodies and freshwater ecosystems (b) second, the health needs of people (such as drinking water) (c) third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.	**Policy 1**: Freshwater is managed in a way that gives effect to Te Mana o te Wai.	The approach taken to apply for a short-term consent while detailed designs for the new Winton WWTP is underway, was agreed with stakeholders to be the most pragmatic solution. The short-term consent does not completely align with the desired outcomes of Te Mana o te Wai as noted above, however the short-term consent is essential to allow SDC to continue the discharge while working towards the long-term solution desired outcome. The long-term solution will be consistent with the desired outcomes of Te Mana o te Wai as the disposal of treated wastewater will be primarily land based.
	Policy 3: Freshwater is managed in an integrated way that considers the effects of the use and development of land on a whole-of-catchment basis, including the effects on receiving environments.	The existing discharge permit is due to expire and SDC consulted with various stakeholders to find a pragmatic approach to reconsent the Winton WWTP for an additional term of five years. Winton Stream is in a poor state from a water quality as well as biodiversity point of view. The AEE acknowledges the impact of the Winton WWTP discharge on the receiving environment. Improvements have been made to reduce concentrations of ammoniacal nitrogen through the installation of the diffuser. The long term solution, as agreed with stakeholders, will focus on

		reducing the impact of the discharge on the receiving environment and at a catchment scale.
	Policy 5: Freshwater is managed through a National Objectives Framework to ensure that the health and well-being of degraded water bodies and freshwater ecosystems is improved, and the health and well-being of all other water bodies and freshwater ecosystems is maintained and (if communities choose) improved.	The health and wellbeing of the Winton Stream is degraded upstream and downstream of the Winton WWTP discharge point. Monitoring shows that the discharge does contribute to further degradation of water quality and biodiversity of the stream. The purpose of the short term consent is to continue the current operation and performance of the WWTP, until the long term solution can be implemented within the next five years. The recommended option for disposal as discussed with stakeholders would be primarily land based and will lead to an improvement in the health and well-being of the Winton Stream in the near future.
	Policy 13: The condition of water bodies and freshwater ecosystems is systematically monitored over time, and action is taken where freshwater is degraded, and to reverse deteriorating trends.	SDC is required to provide an annual report to ES assessing the operation and performance of the WWTP and the impact of the discharge on water quality in the Winton Stream. In addition, SDC proposes to undertake intensive monitoring, assessing biodiversity values in the stream and compliance with associated water quality standards for lowland hard bed streams within 3 years following grant of consent. SDC also proposes to implement an Operations and Management Plan describing the various process and monitoring requirements. Accidental spillage and emergency protocols have been proposed to manage and report spills associated with dry weather or wet weather overflows. The long-term solution will take action to reverse deteriorating trends in Winton Stream. This can however not be achieved as part of the short-term consent.

The proposed short-term continuation of the current activity to discharge to the Winton Stream overall does not align with the objectives and policies of the NPS-FM, however the long-term strategy which is to be implemented during the short-term consent term will.

6.3.3 Environment Southland - Regional Policy Statement (RPS)

The Environment Southland Regional Policy Statement (RPS) became operative in December 2017. The purpose of the RPS is to integrate the management of natural and physical resources of the region by providing an overview of the issues, policies and methods relevant to the whole region.

The RPS establishes sustainable resource management policies relating to tangata whenua; biodiversity; water quality, quantity and water bodies; landscape and soils; transport and the built environment; the air, coast, energy and solid waste; and natural hazards, and hazardous substances.

Objectives and policies related to this resource consent application, but not directly related in terms of Regional or District Plans, are assessed within this document (Table 11), and include:

Table 11 Assessment against RPS

Objectives	Policies	Assessment
Chapter 3: Tangata Whenua		
Objective TW.2 All local authority resource management processes and decisions take into account iwi management plan.	**Policy TW.3** Take iwi management plans into account within local authority resource management decision making processes.	The proposal was assessed against the relevant Iwi Management Plans and is not completely aligned with the policies and objectives. Consultation is currently ongoing with the relevant Rūnanga , who have been informed of the proposal to reconsent the existing Winton WWTP for a term of 5 years. Te Ao Marama Inc has furthermore considered this approach and a final decision will be made following further consultation.
Objective TW.3 Mauri and wairua are sustained or improved where degraded, and mahinga kai and customary resources are healthy, abundant and accessible to tangata whenua.	**Policy TW.4** When making resource management decisions, ensure that local authority functions and powers are exercised in a manner that recognises and provides for cultural values and recognises that only tangata whenua can identify their relationship and that of their culture.	The intention of the resource consent is to maintain the status quo for up to 5 years. Te Runanga o Ngai Tahu and the relevant Rūnanga were consulted as part of the process to ensure the proposal has appropriate regard to tangata whenua values.
Chapter 4: Water		
Objective WQUAL.1 Water quality in the region: (a) safeguards the life-supporting capacity of water and related ecosystems; (b) safeguards the health of people and communities; (c) is maintained, or improved in accordance with freshwater objectives formulated under	**Policy WQUAL.1** Identify values of surface water and manage discharges and land use activities to maintain or improve water quality to ensure freshwater objectives in freshwater management units are met. **Policy WQUAL.2**	The existing Winton WWTP is manged in accordance with an Operations and Management Plan. The existing consent imposed very limited parameters to maintain water quality. The new consent application proposes a more robust monitoring regime and sets specific triggers for a range of contaminants in the discharge that lead to further action

the National Policy Statement for Freshwater Management 2014; (d) is managed to meet the reasonably foreseeable social, economic and cultural needs of future generations and traditions with their ancestral lands, water, sites, wāhi tapu and other taonga.	Maintain or improve water quality, having particular regard to the following contaminants: (a) nitrogen; (b) phosphorus; (c) sediment; (d) microbiological contaminants. **Policy WQUAL.5** Improve water quality by specifying targets to improve water quality within those water bodies within defined timeframes.	if exceeded. In particular, BOD5 (g/m3), Suspended Solids (g/m3), Dissolved Reactive Phosphorus (g/m3), Ammoniacal Nitrogen – N (g/m3), E.Coli (cfu/100mL) levels must be maintained to prevent any further reduction in water quality. Water quality standards below the reasonable zone of mixing have been proposed in accordance with the PSWLP. These water quality standards were developed to maintain intrinsic values of ecosystems, the health of the waterbody and enhance the quality of the environment. The water quality in Winton Stream is generally in a poor state. The long-term strategy for Winton WWTP will ensure that treated wastewater is progressively removed from the stream and discharged onto land once the new long-term resource consent application has been granted.
Chapter 6: Biodiversity		
Objective BIO.2 Maintain indigenous biodiversity in Southland and protect areas of significant indigenous vegetation and significant habitats of indigenous fauna for present and future generations.	**Policy BIO.4** Manage a full range of indigenous habitats and ecosystems to achieve a healthy functioning state, and to ensure viable and diverse populations of native species are maintained, while making appropriate provisions for lawful maintenance and operation of existing activities. **Policy BIO.8** Recognise the role of tangata whenua as kaitiaki, by providing for: (a) tangata whenua values and interests to be incorporated into the management of indigenous biodiversity; (b) consultation with tangata whenua regarding the means of maintaining and restoring or enhancing habitats identified in accordance with Policy BIO.1 that have particular significance to tangata whenua;	The site is not within protected areas of significant indigenous vegetation and significant habitats of indigenous fauna. The Winton Stream has been modified and the proposal will maintain the current state of any indigenous habitats within the stream. Tangata whenua has been actively involved in the discussions to date regarding the reconsenting of Winton WWTP. Consultation is continuing with tangata whenua to ensure cultural values and interests are considered as part of the long-term strategy.

	(c) active involvement of tangata whenua in the protection of cultural values associated with indigenous biodiversity;	
Chapter 9: Air Quality		
Objective AQ.1 Enable the discharge of contaminants into air while managing the adverse effects of those contaminants on human health and wellbeing, and the environment.	**Policy AQ.1** Avoid, remedy or mitigate the adverse effects of discharges of contaminants to air on human health, cultural and amenity values and the environment.	The wastewater is treated by the oxidation ponds and wetlands and discharged directly into the Winton Stream. Under normal operational conditions the WWTP and associated discharge is unlikely to result in adverse effects on air quality (odour). To support this, no complaints have been raised to date in relation to potential odours that would cause effects on human health, cultural and amenity values and the receiving environment. In the unlikely event abnormal operational conditions arose, such as if the ponds became anaerobic, the O&M plan will prescribe responses/actions to be taken in such events to manage any potential odorous discharges.

The proposed short-term continuation of the current activity to discharge to the Winton Stream does not align with all the RPS objectives and policies (in particular Chapter 4), however the long-term strategy which is to be implemented during the short-term consent term will achieve this.

6.3.4 Regional Water Plan for Southland (RWPS)

The Regional Water Plan for Southland (RWPS) promotes the sustainable management of Southland's rivers, lakes and freshwater resources.

There are several policies and objectives that relate to this proposal. As well as this, there are rules which define the standards which must be met for any discharge to water (Table 12).

Table 12 Assessment against RWPS

Objectives	Policies	Assessment
Objective 2 - To manage water quality so that there is no reduction in the quality of the water in any surface water body, beyond the zone of reasonable mixing for discharges. Objective 3 - Maintain and enhance waterbodies so that water quality is maintained or improved, and	**Policy 1** - Recognise the differing characteristics of each water body class, including lowland hard bed.	While the discharge is not avoidable, the existing treatment system was originally designed to reduce concentration levels of harmful contaminants entering the stream. The Winton Stream is currently in a poor state and some water quality standards for lowland hard bed streams are not being achieved beyond the point of reasonable mixing. The long-term solution will however significantly

therefore protects the values of bathing, trout and native fish habitat, stock drinking water, Ngai Tahu cultural values and the natural character of the water body.		improve the state of the waterbody as the discharge of treated wastewater will progressively be reduced into the stream and primarily discharged onto land in an appropriate location.
	Policy 3 - Allow no discharges to surface water bodies that will result in degradation of the water quality beyond a zone of reasonable mixing.	The discharge is contributing to the deteriorating state of the Winton Stream. Water quality standards beyond the mixing zone are also not achieved. Reconsenting the current Winton WWTP discharge will only be for a five-year duration, which will enable the SDC time to finalise the detailed designs for the new WWTP and predominant effluent land application system which will ultimately meet the intent of Policy 3.
	Policy 4 - In waters other than natural state waters, manage discharges to meet or exceed water quality standards, and so avoid levels of contaminants in water or sediments that could harm the health of humans, domestic animals, including stock, and/or aquatic life.	The existing discharge does result in an exceedance of some water quality standards beyond the reasonable zone of mixing for lowland hard bed streams. As previously mentioned, the short term content provides for a more robust monitoring regime and the high risk contaminants will be closely managed to prevent further degradation of water quality caused by the WWTP. The discharge in the short term cannot be avoided, however the long term solution will meet the intent of Policy4.
	Policy 6 - Encourage best management practices to: • Reduce faecal contaminant inputs • Reduce nutrient inputs • Avoid or reduce discharges that increase BOD • Reduce contaminants that alter water colour and clarity	The exiting WWTP was designed to provide adequate treatment of wastewater prior to discharging into the Winton Stream. The receiving environment is also challenged with low flow conditions in the summer months when there is less mixing of waters to reduce the concentration of contaminants in the discharge. Minor improvements have been made to the WWTP i.e. installing a diffuser in the stream to encourage mixing of contaminants. The Winton Stream is generally in a poor state already and the additional discharge is contributing to the further decline of water quality and aquatic health. The

		SDC is committed to improving the wastewater scheme which will be upgraded in accordance with best management practice to address the issues in Winton Stream. This process will however take time to design and install and forms part of the long term solution.
	Policy 7 - Prefer discharges to land over discharges to water where this is practicable, and the effects are less adverse	Treated wastewater from the WWTP is currently discharged into the Winton Stream. The SDC is currently in the design phase to upgrade the Winton WWTP and convert the discharge onto land predominantly. The process will however take time and a consent duration of five years is sought to allow this to happen.
	Policy 8 - Prefer point source discharges to water at times of high flow over discharges at normal or low flows and ensure that where discharging does take place at low flows, the effects that could not be practically avoided are minimised.	The Winton Stream is a relatively small waterbody compared with the Oreti River. The stream struggles to dilute contaminants during the summer months when the flow is low. The discharge cannot be avoided as there is currently no alternative location to the discharge. The existing treatment system minimises the effects on water quality as much as physically possible within its current capacity. The system would require major upgrades to reduce the effects, hence why a land disposal system will be the focus of the long term strategy.
	Policy 9 - In determining the zone of reasonable mixing, minimise the size of area where water quality standards will be breached. Included in the considerations should be: • Aquatic ecosystem values in area • Need for fish passage • Users of the water body, adjacent to and downstream of discharge	Refer to section 3.2.2 for further discussion.
	Policy 10- Promote, where appropriate, the use of diffusers for point source discharges into water.	The Winton WWTP has recently been fitted with a diffuser to encourage more mixing of water in the stream. The diffuser was

		initially installed to address noncompliance issues with consent conditions, in particular meeting ammoniacal nitrogen limits.

The proposed short-term continuation of the current activity to discharge to the Winton Stream does not align with all the RWP objectives and policies, however the long-term strategy which is to be implemented during the short-term consent term will achieve this.

6.3.5 Proposed Southland Water and Land Plan (PSWLP)

The Proposed Southland Water and Land Plan (PSWLP) promotes the sustainable management of Southland's rivers, lakes and freshwater resources.

There are a number of policies and objectives that relate to this proposal. As well as this, there are rules which define the standards which must be met for any discharge to water (Table 13).

Table 13 Assessment against PSWLP

Objectives	Policies	Assessment
Objective 1 - Land and water and associated ecosystems are sustainably managed as integrated natural resources, recognising the connectivity between surface water and groundwater, and between freshwater, land and the coast. Objective 2 - The mauri of water provides for te hauora o te taiao (health and mauri of the environment), te hauora Objective 6 - Water quality in each freshwater body, coastal lagoon and estuary will be: a. maintained where the water quality is not degraded; and b. improved where the water quality is degraded by human activities.	Policy 1 – Enable papatipu rūnanga to participate Policy 2 – Take into account iwi management plans	Consultation with the relevant papatipu runanga is ongoing to ensure participation and consideration of the relevant iwi management plans are given to the proposed short and long-term solutions for Winton WWTP. Based on our assessment of the receiving environment, the site does not appear to affect a Statutory Acknowledgement area, tōpuni (landscape features of special importance or value), nohoanga, mātaitai or taiāpure to Te Rūnanga o Ngāi Tahu and the relevant papatipu rūnanga.
	Policy 14 – Preference for discharges to land	Treated wastewater from the WWTP is currently discharged into the Winton Stream. The short term consent seeks authorisation to continue the discharge for a maximum term of 5 years while the SDC finalises detailed designs to upgrade the wastewater scheme and convert the discharge to land predominantly. Work is currently underway by the SDC to identify suitable land options to accommodate the discharge of treated wastewater and thus work toward fulfilling the intent of Policy 14.

	Policy 15B– Improve water quality where standards are not met.	Water quality measured below the zone of reasonable mixing is currently not meeting the lowland hard bed streams water quality standards set out under the provision of the PSWLP. The proposal will however improve the robustness of the monitoring regime and includes specific triggers and actions to manage the quality of the discharge to ensure that water quality in the Winton Stream is maintained and not getting any worse.
	Policy 17A - Community sewerage schemes and on-site wastewater systems.	The existing WWTP was designed, operated and maintained in accordance with recognised industry standards. Going forward there will be no changes to the operation of the WWTP until SDC have finalised the long term solution. The design of the new Winton WWTP is already underway and will ensure measures are implemented to progressively reduce the frequency and volume of wet weather overflows and implement adequate maintenance to minimise the likelihood of dry weather overflows.
	Policy 32 – Protect significant indigenous vegetation and habitat	The Winton Stream is a modified watercourse and does not contain any significant indigenous vegetation and habitats. This is likely due to the already degraded state and poor water quality and ecological health. The discharge from the WWTP contributes to the declining water quality which subsequently effects terrestrial and aquatic biodiversity within the stream.
	Policy 44 – Implementan Te Mana o te Wai	The Winton Stream has been heavily affected by human activities and is overall considered to be in a moderately polluted state given the poor water quality. The proposal has been assessed against the hierarchy of obligations and Te Mana o te Wai and does not currently place the health and wellbeing of the waterbody first. As

		previously mentioned, the discharge is unavoidable in the interim period until the long-term solution can be implemented. The intention is to upgrade the Winton WWTP in the next five years and convey the discharge predominantly onto land. The long term solution will have the values associated with Te Mana o te Wai at the forefront of the detailed design.

The proposed short-term continuation of the current activity to discharge to the Winton Stream does not align with all the PSWLP objectives and policies, however the long-term strategy which is to be implemented during the short-term consent term will achieve this.

6.3.6 Other relevant matters for consideration by the consent authority

Section 104 of the RMA requires that the consent authority must have regard to any other matters relevant and reasonably necessary to determine the application.

6.3.6.1 Ngai Tahu Fresh Water Policy

This document has been prepared by Te Runanga O Ngai Tahu as its Freshwater Policy Statement. Its focus is the management of the freshwater resource within the rohe of Ngai Tahu. As water is central to all life, and as a taonga provided by Maori ancestors, the present generation of Ngai Tahu is responsible for ensuring that this taonga continues to be available for future generations. Objectives and policies of specific relevance to this application are:

Mauri

Objective – Restore, maintain and protect the mauri of freshwater resources.

Policies: Identify freshwater resources where mauri is adversely affected, and the activities that cause such effects.

Water quality in Winton Stream is overall poor and the mauri is already adversely affected as a result of upstream discharges into the stream. Based on water quality sampling taken over the years, it's evident that the Winton WWTP does however contribute to the further degradation of the stream. The main concerns with regard to water quality is during the summer months when the flow reduces and subsequently the mixing of contaminants with water. The proposal will maintain the current discharge quality until the long-term solution can be implemented. The desired long term outcome would be to avoid discharging contaminants into the Winton Stream which will contribute to the restoration of the mauri of freshwater resources.

Mahinga Kai

Objective - To maintain vital, healthy mahinga kai population and habitats capable of sustaining harvesting activity.

Policies: Protect critical mahinga kai habitats and identified representative areas.

The health and wellbeing of the Winton Stream is poor and mahinga Kai habitats and populations are under pressure. The biological assessment undertaken in August 2022 noted that the health index scores at all sites (upstream and downstream of the discharge point) were lower than ES's 'lowland hard bed' macroinvertebrate community standards. Healthy mahinga kai habitats are not prevalent within the Winton Stream and the biological assessment indicated that the discharge from the Winton wastewater treatment system was adversely affecting aspects of the biological communities of Winton Stream. The proposal will not restore mahinga kai populations and habits in the short term while the discharge continues.

Summary

The proposal is overall not aligned with the objectives and policies of the Ngai Tahu Fresh Water Policy, however it is anticipated the long-term strategy will address many of these.

6.3.6.2 Te Whakatau Kaupapa O Murihiku

This document is a resource management strategy, which expresses Kai Tahu beliefs and values, which regulatory authorities need to have regard to, as part of their decision-making processes. It can be used as a basis for consultation between Treaty partners, in accordance with the principles of the Treaty of Waitangi.

Te Whakatau Kaupapa o Murihiku identifies values, objectives, policies and outcomes sought by the tangata whenua of Murihiku.

Policies of relevance to this application are:

- That the Southland Local Authorities should actively encourage the disposal of effluent onto land rather than into water, provided that the groundwater is not polluted in the process.

The proposal requires the discharge of treated wastewater into the Winton Stream to continue for another five years while work is underway by the SDC to design the new Winton WWTP and land-based disposal system. The relevant Rūnanga have been consulted throughout the process and were part of stakeholder discussions. The resource consent application was also referred to Te Ao Marama Inc for final comment which will be provided to ES on receipt to support the application.

Summary

The proposal is generally aligned with the objectives and policies of Te Whakatau Kaupapa O Murihiku.

6.3.6.3 Te Tangi a Tauira Iwi

Section 3.5 Te Rā a Takitimu (Southland Plains)

This section of the plan describes ngā take and ngā kaupapa associated with the Southland Plains. This includes the lands, waters, mahinga kai and biodiversity from the Waiau River east to the Matāura River and the foothills that separate the Waimea Plains from the mountain ranges.

Wastewater Disposal

- *Require that sufficient and appropriate information is provided with applications to allow tangata whenua to assess cultural effects (e.g. nature of the discharge, treatment provisions, assessment of alternatives, actual and potential effects).*
- *Wastewater disposal options that propose the direct discharge of treated or untreated effluent to water need to be assessed by the kaitiaki rūnanga on a case by case, individual waterway, basis.*
- *Wastewater disposal options that propose the direct discharge of treated or untreated effluent require that the highest environmental standards are applied to consent applications involving the discharge of contaminants to land or water (e.g. standards of treatment of sewage).*
- *Any discharge activity must include a robust monitoring programme that includes regular monitoring of the discharge and the potential effects on the receiving environment. Monitoring can confirm system performance, and identify and remedy any system failures.*
- *Duration of consent for wastewater disposal must recognise and provide for the future growth and development of the industry or community, and the ability of the existing operations to accommodate such growth or development.*
- *Require conditions of consent that allow for a 5-year review of wastewater disposal activities. During review, consent holders should be required to consider technological improvements.*

Comment:

Sufficient information regarding the proposed activity is provided in the application to allow tangata whenua to assess cultural effects in the stream. The proposal involves the discharge of treated wastewater to water for a

maximum duration of five years. There is a robust monitoring programme which is required to monitor the effects on the receiving environment. Winton Stream is currently not meeting water quality standards and it is evident that the discharge is also influencing the overall health and wellbeing of the waterbody. In addition, an Operations and Management Plan is currently implemented which sets out system performance requirements and more stringent restrictions to manage contaminant concentrations in the discharge to prevent further deterioration of the stream beyond the mixing zone.

General Water Policy

- *Protect and enhance the mauri, or life supporting capacity, of freshwater resources throughout Murihiku.*
- *Promote the management of freshwater according to the principle of ki uta ki tai, and thus the flow of water from source to sea.*

Comment:

As previously mentioned, the short term proposal is to allow SDC more time to design the new Winton WWTP and move to a predominantly land based disposal system. In the short term the effects on the receiving environment will not change to protect or enhance the mauri, or life supporting capacity of freshwater resources. The proposal was initially discussed with Te Ao Marama Inc as they are one of the iwi partners. The resource consent application has also been provided to Te Ao Marama Inc for comment which will be provided to ES in support of the application. In the long term, the wastewater scheme will be able to achieve and promote the management of freshwater according to the principle of ki uta ki tai.

Discharge to Water

- *When existing rights to discharge to water come up for renewal, they must be considered in terms of alternative discharge options.*
- *Any discharge activity must include a robust monitoring programme that includes regular monitoring of the discharge and the potential effects on the receiving environment.*

Comment:

The existing resource consent authorises the discharge of treated wastewater into the Winton Stream. The proposal is to consent the discharge for another five years while designs are underway to upgrade the Winton WWTP and finding alternative discharge locations. As previously mentioned, the proposal will adjust the monitoring program to improve the understanding around the potential effects throughout the year. The proposal does however not involve any upgrades to the system in the interim period, but more stringent management measures have been proposed to maintain the discharge quality being discharged into the Winton Stream. The triggers have been based on the current operation when the wastewater system is meeting performance requirements.

Water Quality

- *Strive for the highest possible standard of water quality that is characteristic of a particular place/waterway, recognising principles of achievability. This means that we strive for drinking water quality in water we once drank from, contact recreation in water we once used for bathing or swimming, water quality capable of sustaining healthy mahinga kai in waters we use for providing kai.*
- *Require cumulative effects assessments for any activity that may have adverse effects of water quality.*
- *Avoid the use of water as a receiving environment for the direct, or point source, discharge of contaminants. Generally, all discharge must first be to land.*

Comment:

There are no bathing sites or domestic water takes directly downstream of the discharge point that would potentially be affected by the proposal. There are signs in place to warn the public accessing or using the environment that the area downstream of the discharge point is contaminated and may cause harm to human health. Cumulative effects have been considered under the assessment of effects section of the report and it was concluded that the overall health and wellbeing of the waterbody is generally poor and the discharge from the WWTP has an effect on the stream below the discharge point. Water quality upstream and downstream of the discharge point does currently not meet the lowland hard bed water quality standards set out in the proposed

Water and Land Plan. Work is underway to redirect the discharge to land predominantly, however this will take time and the SDC is committed not to cause unreasonable delay in designing the new Winton WWTP and disposal system.

Summary

The proposal is overall not aligned with the objectives and policies of the Te Tangi a Tauira Iwi Plan.

6.3.6.4 Statutory Acknowledgement for Oreti River

The Oreti River is recognised as a Statutory Acknowledgement Area and listed within Schedule 42 of the Ngāi Tahu Claims Settlement Act 1998.

> ***Ngai Tahu Association with the Oreti River***
>
> *"The Oreti River traverses a significant area of Murihiku, stretching from its mouth at Invercargill almost to the edge of Whakatipu-wai-maori (Lake Wakatipu). As such, it formed one of the main trails inland from the coast, with an important pounamu trade route continuing northward from the headwaters of the Oreti and travelling, via the Mavora or Von River Valley, to the edge of Wakatipu and onto the Dart and Routeburn pounamu sources. Indeed, pounamu can be found in the upper reaches of the Oreti itself.*
>
> *The tupuna had considerable knowledge of whakapapa, traditional trails and tauranga waka, places for gathering kai and other taonga, ways in which to use the resources of Oreti, the relationship of people with the river and their dependence on it, and tikanga for the proper and sustainable utilisation of resources. All of these values remain important to Ngai Tahu today.*
>
> *The kai resources of the Oreti would have supported numerous parties venturing into the interior, and returning by mokihi (vessels made of raupo), laden with pounamu and mahinga kai. Nohoanga (temporary campsites) supported such travel by providing bases from which the travellers could go water fowling, eeling and catching inaka (whitebait), and were located along the course of Oreti River.*
>
> *There were a number of important settlement sites at the mouth of the Oreti, in the New River estuary, including Omaui, which was located at the mouth of the Oreti, where it passes the New River Heads. Oue, at the mouth of the Oreti River (New River estuary), opposite Omaui, was one of the principal settlements in Murihiku. Honekai who was a principal chief of Murihiku in his time was resident at this settlement in the early 1820s, at the time of the sealers. In 1850 there were said to still be 40 people living at the kaik at Omaui under the chief Mauhe.*
>
> *As a result of this pattern of occupation, there are a number of urupa located at the lower end of the Oreti, in the estuarine area. Urupa are the resting places of Ngai Tahu tupuna and, as such, are the focus for whanau traditions. These are places holding the memories, traditions, victories and defeats of Ngai Tahu tupuna, and are frequently protected by secret locations.*
>
> *The mauri of the Oreti represents the essence that binds the physical and spiritual elements of all things together, generating and upholding all life. All elements of the natural environment possess a life force, and all forms of life are related. Mauri is a critical element of the spiritual relationship of Ngai Tahu Whanui with the river."*

Although the discharge is not directly into the Oreti River, the Winton Stream is a tributary of the Oreti River. The inclusion of the wider receiving environment in the assessment is considered appropriate given the direct impact the Winton WWTP discharge has on downgradient waterbodies. Consultation with the relevant paptipu runanga have already occurred and the resource consent application has been submitted to Te Ao Marama Inc and Te Runanga o Ngai Tahu for final comment. Feedback will be provided to ES to support the resource consent application.

6.4 Section 104B

The proposal has been classified as a non-complying activity pursuant to Rule 2 of the RWPS. Refer to Section 4.3 of this report complete rule assessment.

Section 104B of the RMA relates to the determination of applications for discretionary or non-complying activities.

Section 104B sates:

> *"After considering an application for a resource consent for a discretionary activity or non-complying activity, a consent authority—*
>
> *(a) may grant or refuse the application; and*
>
> *(b) if it grants the application, may impose conditions under section 108"*

Consultation with ES and other stakeholders have agreed the most pragmatic approach would be to reconsent the discharge to continue over a maximum term of five years while the SDC finalises the new Winton WWTP and land disposal system detailed designs and implements the new scheme. The discharge is unavoidable as there is currently no other wastewater scheme for the Winton township. This application proposes a range of consent conditions reflecting the existing operation with some changes made to improve the monitoring regime and overall management of the wastewater scheme's operation to ensure performance objectives and targets will be achieved.

6.5 Section 105

Section 105 states:

1. *"If an application is for a discharge permit or coastal permit to do something that would contravene section 15 or section 15B, the consent authority must, in addition to the matters in section 104(1), have regard to—*
    a. *the nature of the discharge and the sensitivity of the receiving environment to adverse effects; and*
    b. *the applicant's reasons for the proposed choice; and*
    c. *any possible alternative methods of discharge, including discharge into any other receiving environment.*
2. *If an application is for a resource consent for a reclamation, the consent authority must, in addition to the matters in section 104(1), consider whether an esplanade reserve or esplanade strip is appropriate and, if so, impose a condition under section 108(2)(g) on the resource consent."*

The nature of the discharge and the sensitivity of the receiving environment has been discussed in Section 3.1.3 and Section 2.4 of this document. Water quality within the Winton Stream is already in a degraded state and biodiversity health is poor throughout the stream. SDC is proposing to renew the existing resource consent for an additional duration of five years, while the long-term solution is designed and implemented. Until this work has been completed and the disposal system converted to a predominantly land-based disposal system, treated wastewater from the Winton WWTP will continue to be discharged to the Winton Stream. SDC is expects to establish the new WWTP within the next five years. There are no alternatives considered suitable for the next five-year period. The proposed long-term solution has been discussed and agreed with stakeholders as the most pragmatic outcome for the Winton WWTP. There are no possible alternative methods of discharge, including discharge into any other receiving environment that are feasible from an environmental standpoint as demonstrated in the options assessment (Section 1.2).

Funding for the upgrades for Winton WWTP have been approved in the Long Term Council Community Plans.

6.6 Section 107

Section 107 states:

> *(1) Except as provided in subsection (2), a consent authority shall not grant a discharge permit or a coastal permit to do something that would otherwise contravene section 15 or section 15A allowing—*
>
> > *(a) the discharge of a contaminant or water into water; or*
> >
> > *(b) a discharge of a 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*

(ba) the dumping in the coastal marine area from any ship, aircraft, or offshore installation of any waste or other matter that is a contaminant,—

if, after reasonable mixing, the contaminant or water discharged (either by itself or in combination with the same, similar, or other contaminants or water), is likely to give rise to all or any of the following effects in the receiving waters:

(c) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials:

(d) any conspicuous change in the colour or visual clarity:

(e) any emission of objectionable odour:

(f) the rendering of fresh water unsuitable for consumption by farm animals:

(g) any significant adverse effects on aquatic life.

(2) A consent authority may grant a discharge permit or a coastal permit to do something that would otherwise contravene section 15 or section 15A that may allow any of the effects described in subsection (1) if it is satisfied—

(a) that exceptional circumstances justify the granting of the permit; or

(b) that the discharge is of a temporary nature; or

(c) that the discharge is associated with necessary maintenance work—

and that it is consistent with the purpose of this Act to do so.

6.7 Section 107(1)

The Winton WWTP discharges contaminants into the Winton Stream and monitoring records have shown that after reasonable mixing (100m downstream of the discharge point), there is no indication of conspicuous oil or grease films, scums or foams, or floatable or any emission of objectionable odour. However, during summer months when the flows in Winton Stream are at its lowest, the discharge results in a conspicuous change in the colour or visual clarity and has shown to have adverse effects on the health of aquatic biodiversity as a result of elevated concentrations of Ammoniacal N, DRP and Ecoli. The discharge does not result in any emission of objectionable odours.

As previously noted, during the summer of 2021/22, a diffuser was installed in the Winton Stream to enable more thorough mixing of the discharge with the stream water and to remedy noted water quality compliance issues potentially associated with poor mixing of the discharge between the point of discharge and the downstream sampling point.

6.8 Section 107(2)

Whether or not a discharge meets one of the limbs of section 107(2) is a case-specific assessment, however the recent Environment Court decisions of Shannon Wastewater[10] and Pahiatua Wastewater[11] provide useful guidance on the factors that decision makers will consider in scenarios similar to the current one. In the 2015 Shannon Wastewater decision, the Environment Court accepted that continuing to discharge to the Otauru Stream for two years was "temporary" in terms of section 107(2)(b)[12]. Furthermore, the Court considered that the "exceptional circumstances" limb of section 107 was also met because there was no practicable alternative to continued discharge to the Stream while the other works were carried out, and allowing the continued discharge for two years.

The Winton WWTP was originally consented in 1962 and has been operating for the last 30 years. The planning framework under which the activity was initially determined, predates modern policy direction under the NPS-FM,

[10] Re Horowhenua District Council [2015] NZEnvC 45.
[11] Rangitāne o Tamaki nui-a-Rua Incorporate v Manawatu-Wanganui Regional Council [2021] NZEnvC 51 (first interim decision), [2021] NZEnvC 85 (second interim decision) and [2021] NZEnvC 106 (final decision).
[12] *Re Horowhenua District Council* [2015] NZEnvC 45 at [90].

RWPS and PSLWP. In accordance with the current planning framework, there is a strong focus on Te Mana o Te Wai and the protection of the health and well-being of water bodies and freshwater ecosystems as a first priority. Based on the assessment against the NPS-FM in Section 6.4 of this report, the proposed short-term continuation of the current activity to discharge to the Winton Stream overall does not align with the objectives and policies of the NPS-FM, however the long-term strategy which is to be implemented during the short-term consent term will.

SDC is committed to the long term solution and is expecting to finalise detailed designs of the Winton WWTP upgrades and land disposal system within the next two years. The preparation of the long term consent will be undertaken in parallel with the design schedules of the future system and will be submitted to ES in the first half of 2024. The SDC is anticipating construction to start once the long terms consent has been granted and aims to have the majority of the disposal fields operational during the short term consent period of five years. The short term consent is imperative to allow the discharge to continue while SDC carries out the works required to design and implement the much needed changes to the wastewater scheme.

Based on consultation with Iwi partners and stakeholders including Fish & Game, Department of Conservation, Southland District Health Board, Invercargill City Council, SDC Councillor and various Community Boards, the recommended option was to focus on the long-term solution and invest in upgrading the wastewater scheme to a predominant land disposal system as this will result in greater environmental outcomes. Short term solutions were initially considered during the inception stage of the project. However, these short term options were not carried forward into the design stages as the overarching direction was to implement the long term solution as soon as possible to prevent any further delays in getting the discharge out of Winton Stream.

The proposal is intended to allow the discharge to continue for a short term period while SDC is commitments to expedite the process and bring forward the engineered design and construction stages so the disposal fields will be largely operational within the next 5 years. The Winton WWTP is a key priority for SDC and the long term consent will significantly reduce the adverse visual clarity and aquatic ecology effects of the discharge to the Winton Stream. There are no other practicable solutions to improve the discharge in the interim period as these have already been considered and implemented i.e. diffuser to increasing mixing of waters. The proposal justified that exceptional circumstances may apply to this proposal given Winton WWTP provides for basic community sanitation needs and has been discharging to the Winton Stream since 1962. There are furthermore no alternative wastewater schemes to treat wastewater for the Winton community during the short term period proposed.

As such, the proposal is therefore consistent with section 107 of the RMA and the consent can be granted for a short term period under exceptional circumstances while detailed designs and construction progresses.

6.9 Section 108

In assessing a resource consent application a consent authority can, under the provisions of Section 108 of the RMA, impose consent conditions as considered necessary to avoid, remedy or mitigate the adverse effects of the activity on the environment. Suggested consent conditions are outlined in Section 8.

6.10 Section 123

The SDC seeks a five-year consent duration to allow the discharge into Winton stream to continue while further investigation and detailed designs to upgrade the Winton WWTP and convert the discharge to a land disposal system.

To determine the term of resource consent, consideration must be given to the relevant planning framework. Policy 40 of the PSWLP sets out planning direction to determine the term of resource consents.

The determination should consider the following factors:

1. granting a shorter duration than that sought by the applicant when there is uncertainty regarding the nature, scale, duration and frequency of adverse effects from the activity or the capacity of the resource;
2. relevant tangata whenua values and Ngāi Tahu indicators of health;
3. the duration sought by the applicant and reasons for the duration sought;
4. the permanence and economic life of any capital investment;

5. the desirability of applying a common expiry date for water permits that allocate water from the same resource or land use and discharges that may affect the quality of the same resource;
6. the applicant's compliance with the conditions of any previous resource consent, and the applicant's adoption, particularly voluntarily, of good management practices; and
7. the timing of development of FMU sections of this Plan, and whether granting a shorter or longer duration will better enable implementation of the revised frameworks established in those sections.

The consent application has provided sufficient information to understand the nature, scale, duration and frequency of the adverse effects from the activity on the environment. The AEE has determined that the Winton WWTP discharge into the Winton Stream does contribute to the already degraded water quality and biodiversity health. Although the consent application is not completely aligned with tangata whenua values and Ngāi Tahu indicators of health, the stakeholders agreed that SDC seek a short-term consent to allow the discharge to continue until the long-term solution can be implemented as the most pragmatic approach.

The proposed five-year consent duration will however align more favourably with the timing of development of Freshwater Management Units (FMU) and the council's implementation of the revised planning frameworks established to give effects to the provisions of the NPS-FM. Five years will furthermore provide SDC with an opportunity to better understand future FMU water quality targets and objectives which will subsequently inform the detailed design of the new WWTP and the location of the predominant land disposal system. The SDC have had some issues with complying with consent conditions, however measures have been proposed to improve the overall operation and performance of the wastewater to ensure better management of the consent conditions.

In addition to the above, the SDC is actively pursuing the long-term solution and intends finalising the detailed designs as soon as possible. As previously mentioned, consultation with prospective landowners has already started and further assessments will be carried out on a case-by-case basis to ensure the areas identified are suitable and not near any sensitive receptors. Please refer to Section 1.2 that summarises the process to date and includes details around the optioneering phase as well as consultation with various stakeholders.

Based on the above assessment, the proposed consent duration of 5 years is considered reasonable taking into account SDC's commitment to achieve the desired outcomes of the long-term solution.

7. Proposed conditions of consent

SDC are seeking that a similar suite of consent conditions currently authorising the activities of the Winton WWTP are applied to the proposed short-term, with newly proposed management and monitoring requirements.

Consent Purpose

1. This consent authorises the discharge of treated sewage effluent, at an average flow of 1,300m^3/ day, into Winton Stream at about map reference NZTM2000 1239478E - 4877088N, as shown on Plan XXX, which forms part of this resource consent.

   Advice notes Compliance with the average daily flow volume is determined by calculating the annual volume (1January – 31 December) and dividing the aggregate volume by 365 days.

Monitoring Requirements

2. The consent holder shall undertake monthly samples during the period 1 November to 31 March each year, and at least once during the period 1 June to 31 August each year, and monitor both:

   a. the discharge of treated sewage effluent to Winton Stream by taking a representative sample of the discharge at the outfall (manhole combining wetland cells) to the receiving waters, at about NZTM2000 1239472E - 4877088N, and analysing the sample for the following:

      i. pH
      ii. Temperature
      iii. Electrical Conductivity
      iv. Dissolved Oxygen concentration
      v. Carbonaceous Biochemical Oxygen Demand ($cBOD_5$) concentration
      vi. Total Suspended Solids concentration
      vii. E. Coli concentration
      viii. Nitrate Nitrogen concentration
      ix. Total Ammoniacal Nitrogen concentration
      x. Total Nitrogen concentration
      xi. Dissolved Reactive Phosphorus concentration
      xii. Total Phosphorus concentration; and

   b. the receiving waters, 5 metres upstream and 100 metres downstream of the point of discharge, by taking representative samples and analysing each sample for the following:

      i. pH
      ii. Temperature
      iii. Electrical Conductivity
      iv. Dissolved Oxygen concentration
      v. Turbidity
      vi. E. Coli concentration
      vii. Nitrate Nitrogen concentration
      viii. Total Ammoniacal Nitrogen concentration
      ix. Total Nitrogen concentration
      x. Dissolved Reactive Phosphorus concentration

xi. Total Phosphorus concentration.

Advice Note: *The discharge and receiving water samples shall be taken at about the same time, within a one-hour period, on each monitoring occasion. In addition, representative samples referred to in the condition refer to grab samples.*

3. Samples collected for discharge and receiving water monitoring shall conform with the following:
    a. the monitoring occasions specified in Condition (2) are to be at least 21 days apart, and the monitoring occasions between 1 November and 31 March are to occur, as far as is practicable, when the flow in the Winton stream is low and the water clarity is clear (ie. stream bed visible).
    b. sample collection, preservation and analysis, shall be carried out in accordance with the most recent edition of APHA "Standard Methods for the Examination of Water and Wastewater".
    c. the monitoring and analyses are to be carried out by a laboratory with IANZ registration or equivalent, or as agreed to, in writing, by the Council's Director of Environmental Management
    d. the results of analysis, carried out in accordance with Condition (2), shall be supplied to the Council no later than 20 working days from the end of the month in which the samples are taken. The methods of analysis are to be specified with the results.

Discharge Trigger Levels

4. The discharge of treated sewage effluent:
    a. must be monitored in accordance with Condition (2) and the results analysed against the following mean concentration trigger levels:
        i. BOD5 – 50 g/m3
        ii. Suspended Solids – 100 g/m^3
        iii. Dissolved Reactive Phosphorus – 5 g/m^3
        iv. Ammoniacal Nitrogen – 30 g/m^3
        v. E.Coli – 10,000 cfu/100mL;
    b. in the event of any exceedance of the mean concentration trigger levels stipulated in Condition (4)(a):
        i. the wastewater discharge must be monitored at least once every seven days for one month; and
        ii. a report must be submitted to the Southland Regional Council's Manager of Environmental Compliance within 20 working days and include the following details:
            1. Sampling date and method
            2. Sampling results and analysis
            3. Potential reason for concentration exceedance
            4. Any actions required or taken to restore treatment performance

Advice Note: For the purposes of this consent, the mean shall be from the last four rolling samples taken at the wetland manhole (bottom of wetland cells) prior to discharging into the Winton Stream.

Water Quality Standards

5. The consent holder shall monitor and analyse the change in effect of the discharge against the following water quality standards in the Winton stream (Classified as lowland hard bed):
    a. when measured inside of the zone of reasonable mixing:
        i. There shall be no bacterial or fungal slime growths visible to the naked eye as obvious plumose growths or mats; and
    b. when measured outside of the zone of reasonable mixing:

ii. The temperature of the water:

1. shall not exceed 23°C;
2. the daily maximum ambient water temperature shall not be increased by more than 3°C when the natural or existing water temperature is 16°C or less, as a result of any discharge;
3. if the natural or existing water temperature is above 16°C, the natural or existing water temperature shall not be exceeded by more than 1°C as a result of any discharge; and

iii. The pH of the water shall be within the range 6.5 to 9, and there shall be no pH change in water due to a discharge that results in a loss of biological diversity or a change in community composition;

iv. The change in sediment cover must not exceed 10%;

v. The concentration of dissolved oxygen in water shall exceed 80% of saturation concentration;

vi. When the flow is below the median flow, the visual clarity of the water shall not be less than 1.6 metres, except where the water is naturally low in clarity as a result of high concentrations of tannins, in which case the natural colour and clarity shall not be altered[13];

vii. The concentration of total ammonia shall not exceed the values specified in Table 14 “Ammonia standards for Lowland surface water bodies”;

viii. For the period 1 November through to 30 April, filamentous algae of greater than 2 cm long shall not cover more than 30% of the visible stream bed. Growths of diatoms and cyanobacteria greater than 0.3 cm thick shall not cover more than 60% of the visible stream bed[14];

ix. Biomass shall not exceed 35 grams per square metre for either filamentous algae or diatoms and cyanobacteria[15].;

x. Chlorophyll a shall not exceed 120 milligrams per square metre for filamentous algae and 200 milligrams per square metre for diatoms and cyanobacteria[16];

xi. The Macroinvertebrate Community Index shall exceed a score of 90 and the Semi-Quantitative Macroinvertebrate Community Index shall exceed a score of 4.5;

xii. There shall be no bacterial or fungal slime growths visible to the naked eye as obvious plumose growths or mats;

xiii. The concentration of faecal coliforms shall not exceed 1,000 coliforms per 100 millilitres; and

xiv. Fish shall not be rendered unsuitable for human consumption by the presence of contaminants.

c. The monitoring and analysis undertaken under this condition shall be in accordance with the requirements set out in Condition (2) and the findings shall be reported to the Southland Regional Council's Manager of Environmental Compliance in accordance with Condition (19).

Advice Note 1*: For the purpose of this condition, the zone of reasonable mixing in the Winton stream shall extend from 5 metres upstream of the discharge point to 100 metres downstream of the discharge point.*

Advice Note 2: *Monitoring requirements require sample collection, preservation and analysis to be*

[13] Visual clarity is assessed using the black disc method or other comparable method employed by Environment Southland.
[14] Applies to the part of the bed that can be seen from the bank during summer low flows or walked on.
[15] Expressed in terms of reach biomass per unit of exposed strata (i.e., tops and sides of stones) averaged across the full width of the stream or river
[16] Expressed in terms of reach biomass per unit of exposed strata (i.e., tops and sides of stones) averaged across the full width of the stream or river

carried out in accordance with the most recent edition of American Public Health Association (APHA) "Standard Methods for the Examination of Water and Wastewater" or National Environmental Monitoring Standard (NEMS) and analyses to be carried out by a laboratory with International Accreditation New Zealand (IANZ) registration or equivalent.

Table 14 Ammonia standards for Lowland surface water bodies[17]

Total Ammoniacal Nitrogen Freshwater Trigger Values in mg/m^3 at different pH (Temperature is not taken into account)	
Ph	**$NH4^+$ - N + NH_3 – N mg/m^3**
6.0	2570
6.1	2555
6.2	2540
6.3	2520
6.4	2490
6.5	2460
6.6	2430
6.7	2080
6.8	2330
6.9	2260
7.0	2180
7.1	2090
7.2	1990
7.3	1880
7.4	1750
7.5	1610
7.6	1470
7.7	1320
7.8	1180
7.9	1030
8.0	900
8.1	780
8.2	660
8.3	560
8.4	480
8.5	400
8.6	340
8.7	290
8.8	240
8.9	210
9.0	180

Source: Australian and New Zealand Environment and Conservation Council (ANZECC) October 2000: Australian and New Zealand Guidelines for Fresh and Marine Water Quality

Winton Stream Survey

6. The consent holder shall undertake more intensive environmental monitoring within three years following grant of consent, between the months of January and March. The survey shall be as follows:

[17] Source - Australian and New Zealand Environment and Conservation Council (ANZECC) October 2000: Australian and New Zealand Guidelines for Fresh and Marine Water Quality

a. The survey shall be undertaken at a time when the flow conditions in Winton stream is low, for a period of at least twenty consecutive days.

b. The survey shall occur at two sites, one 5m above and one at least 100 metres below the discharge point but within the mixing zone, as shown on Plan XXX, which forms part of the resource consent.

c. The following parameters are to be surveyed:

    i. Macroinvertebrates.

    ii. Periphyton.

    iii. Sediment.

    iv. Biomass.

    v. The 'lowland hard bed' standards.

d. The methodology for this monitoring regime shall be submitted to the consent authority for approval prior to the monitoring commencing.

Advice note: *The macroinvertebrate fauna monitoring results shall be presented as a species inventory together with mean relative abundances, and shall be summarised as a total number of species and total number of organisms per square metre. The mean total invertebrate densities at each site shall be compared statistically using the Mann Whitney U Test to assess the significance ($p<0.05$) of any difference that may occur.*

7. The consent holder shall submit a report to the Council's Compliance Manager within 20 working days of the completion of the required field work described in Condition (6). This report shall include but not be limited to the following details:

    a. Description of survey sites

    b. Survey and analysis technique

    c. Assessment against discharge triggers and water quality standards

    d. Assessments of water quality, sediment, periphyton, and benthic macroinvertebrates

    e. Assessment against previous biological surveys and identification of trends.

    The consent holder shall maintain a flow meter at the Winton WWTP to measure wastewater influent volumes.

Operation and Management of the WWTP

8. The consent holder shall maintain signage in a prominent place near the outfall to Winton Stream informing the public of the discharge of treated wastewater and associated health risks. The sign shall include a contact number for the consent holder.

9. The consent holder shall ensure that the wetland is maintained in such a manner that it does not discharge treated wastewater to land in a manner that may enter the groundwater.

10. There shall be no addition of nitrogen, phosphorus or sulphur based chemicals to the treatment system without the authorisation of the Council's Director of Environmental Management.

11. The consent holder shall maintain an Operations and Management Plan (O & M Plan) for the Winton wastewater treatment plant, which includes, but not limited to the following information:

    a. describing the various treatment process steps;

    b. describing how the wastewater treatment system will be operated and maintained to ensure that treatment is optimised at all times;

    c. outline contingency measures to handle emergency events.

12. The consent holder shall operate and maintain the Winton wastewater treatment system in accordance with the O & M Plan and make it available to the Council's Compliance Manager on request.
13. The consent holder shall update the O & M Plan if there are any changes or upgrades to the Winton wastewater treatment system or its operation.
14. The consent holder shall maintain a log of inspections and works carried out on the treatment system, and make the log available, upon request, to the Council's Compliance Manager or a Health Protection Officer

Accidental Discharge Protocol

15. In the event of an accidental or emergency discharge of partially treated or untreated wastewater to land or water, the consent holder (or the consent holder's agent) shall notify, within 24 hours the following parties:
    a. Environment Southland Compliance Manager
    b. Te Ao Marama Inc
    c. Branxholm Water Treatment Plant

    ***Advice Note**: accidental or emergency discharge of wastewater also include any wet weather or dry weather overflows from any part of the wastewater treatment plant.*
16. When informing Environment Southland of any accidental or emergency discharge of wastewater to land or water, as specified in Condition (15), the Consent Holder shall provide the following information:
    a. The date, time, location and estimated volume of the discharge;
    b. The cause of the discharge;
    c. Clean up procedures undertaken;
    d. Measures to be undertaken to prevent a recurrence of the accidental discharge.

Groundwater monitoring

17. The consent holder shall take a sample from the groundwater monitoring well E46/0812 located in the property at 154 Winton-Lorneville Road within three years following grant of consent, between the months of May and July. The sample shall be analysed for faecal coliform (MPN/100ml) concentrations and Nitrate Nitrogen (g/m^3) concentrations. The results of analysis shall be supplied to the landowner, and the Southland Regional Council's Manager of Environmental Compliance, no later than 20 working days from the end of the month in which the samples are taken.

Complaints

18. The consent holder shall maintain a register of complaints received about the wastewater treatment and disposal system. The register shall record the response and actions taken to each complaint.

Annual Reporting

19. The consent holder shall submit an annual report to the Council's Compliance Manager by 31 July each year. This report shall include but not be limited to the following details completed during the reporting year:
    a. Summary of wastewater influent and comparison to WWTP system capacity.
    b. Assessment of water sampling data and comparison between upstream and downstream monitoring sites;
    c. Assessment against water quality standards for "lowland hard bed" beyond the mixing zone and discharge trigger levels;
    d. Description of planned and unplanned maintenance activities;

e. Description of any maintenance or operations failures and actions taken;

f. Assessment of consent conditions and demonstrating compliance within consent;

g. Description of any system updates or changes to the operation and any improvement of the WWTP;

h. Description of any accidental or emergency discharges and actions taken;

i. Summary of results associated with implementation of the Stormwater Infiltration Program.

j. Summary of any complaints associated with the WWTP or discharge to Winton Stream.

Advice note: The reporting year starts 1 January and finishes 31 December of each year.

8. Consultation

SDC consulted with ES regarding the renewal of the resource consent to allow the discharge to continue for an additional five years while further investigation is underway to find optimal solutions to improve the overall performance of the existing WWTP.

The proposal has been discussed with Te Ao Marama Inc, who speaks on behalf of the following Runanga:

- Waihōpai Rūnaka
- Awarua Rūnanga

Consultation is currently underway with Te Ao Marama Inc to discuss the final options regarding the land disposal options. Additional feedback will be provided to ES upon receipt.

9. Notification

9.1 Public Notification

Section 95A of the RMA sets out four steps to be taken by the consent authority in deciding whether to publicly notify an application. An assessment of the proposed works against these steps is provided in Table 15 below:

Table 15 Public notification assessment

(Step 1) A consent authority must notify an application if:	
– Public notification is required under Section 95C (public notification after request for further information or report); – The applicant requests public notification; or – The application has been made jointly with an application to exchange recreation reserve land.	Public notification is requested under Section 95C. The application does not include any exchange of recreation reserved land.
(Step 2) A consent authority must not notify an application if:	
– A rule or national environmental standard precludes public notification of the application; – The activity is a restricted discretionary, discretionary, or non-complying activity, but only if the activity is a boundary activity.	The application is not subject to a rule or NES that precludes public notification, is not for a controlled activity, or a boundary activity.
(Step 3 and Step 4) Therefore, public notification is only required if:	
– A rule or national environmental standard that requires public notification; – The consent authority decides, in accordance with section 95D, that the activity will have or is likely to have adverse effects on the environment that are more than minor; or – Special circumstances apply.	The application is not subject to a rule or national environmental standard that requires public notification The adverse effects of the proposal overall will be more than minor on the environment as discussed in section 5 of this report. There are no special circumstances that exist to justify the public notification of this application.

Having undertaken the section 95A public notification tests, the following conclusions are reached:

– Under step 1, Public notification is requested under Section 95C
– Under step 2, there is no rule or NES that specifically precludes public notification of the activities, and the application is for an activity other than those specified in section 95A(5)(b).
– Under step 3, public notification is required as it is considered that the activity will have adverse effects on the environment that are more than minor as per the matters specified in section 95A(8)b) and 95D, albeit the effects will be maintained to avoid further degradation and short-term.
– Under step 4, there are no special circumstances however the effects of the proposed activity,

It is, therefore, requested that this application be processed on a public notified basis.

10. Conclusion

The SDC seeks resource consent from ES in accordance with Section 88 of the RMA to renew Consent:202026 relating to the existing Winton WWTP, which is due to expire on 8 December 2023.

The SDC furthermore seeks approval and confirmation from ES to lawfully continue operation under the existing resource consent in accordance with Section 124 of the RMA while the proposed short-term consent (5-year consent duration) is being processed and determined by ES.

The application to renew Consent: 202026 will be assessed as a new activity against the provisions of the operative and proposed regional plans (RWPS and PSWLP) to determine the actual or potential adverse effects on the receiving environment.

The effects of the discharge have been assessed against the water quality standards for lowland hard bed surface water bodies. The water quality sampling undertaken upstream and downstream of the point of reasonable mixing shows that the Winton Stream, in its current state, does not comply with all of the required water quality standards. Based on water quality sampling in the stream and considering the biological survey conclusions, the discharge of treated wastewater from the Winton WWTP is adversely affecting aspects of the biological communities of Winton Stream and is overall not compliant with the lowland hard bed biological water quality standards.

The overall water quality in the receiving surface water environment at Winton Stream is considered poor. The recent monitoring data suggests that the Winton WWTP is responsible for a significant proportion of the ammoniacal nitrogen and DRP present at the downstream sampling location during low flow summer periods. The assessment concludes that the potential effects on the environment caused by existing discharge and thus the proposed continuation of this activity over the short-term are more than minor. The proposal does not algin with the relevant objectives and policies of the respective planning frameworks relevant within Southland as assessed in Section 6.

SDC is committed to the long term solution and proposes to complete the detailed designs associated with the land disposal system and lodge the long-term consent application in the first half of 2024. Construction will get underway immediately after the long term consent is granted, with the expectation that at least most of the disposal field will be in operation within the next 5 year period. The long-term solution will significantly improve the environmental conditions in the Winton stream once the wastewater is predominantly discharged to land. The short term consent is therefore imperative to the project as this allows SDC to finale designs and construct the future land disposal system.

Given the assessment in this application, SDC requests that the application be publicly notified pursuant to Section 95A(3)(a) of the RMA.

Appendices

Appendix A

Certificate of Title

Terranet document ordering service

Certificate of Title with diagram: 222/11

Billing Code: 12528505-DEL.Phase 4-AEE

CoreLogic Reference: 3134652/1

Processed: 01 June 2023

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Search Copy

R.W. Muir
Registrar-General
of Land

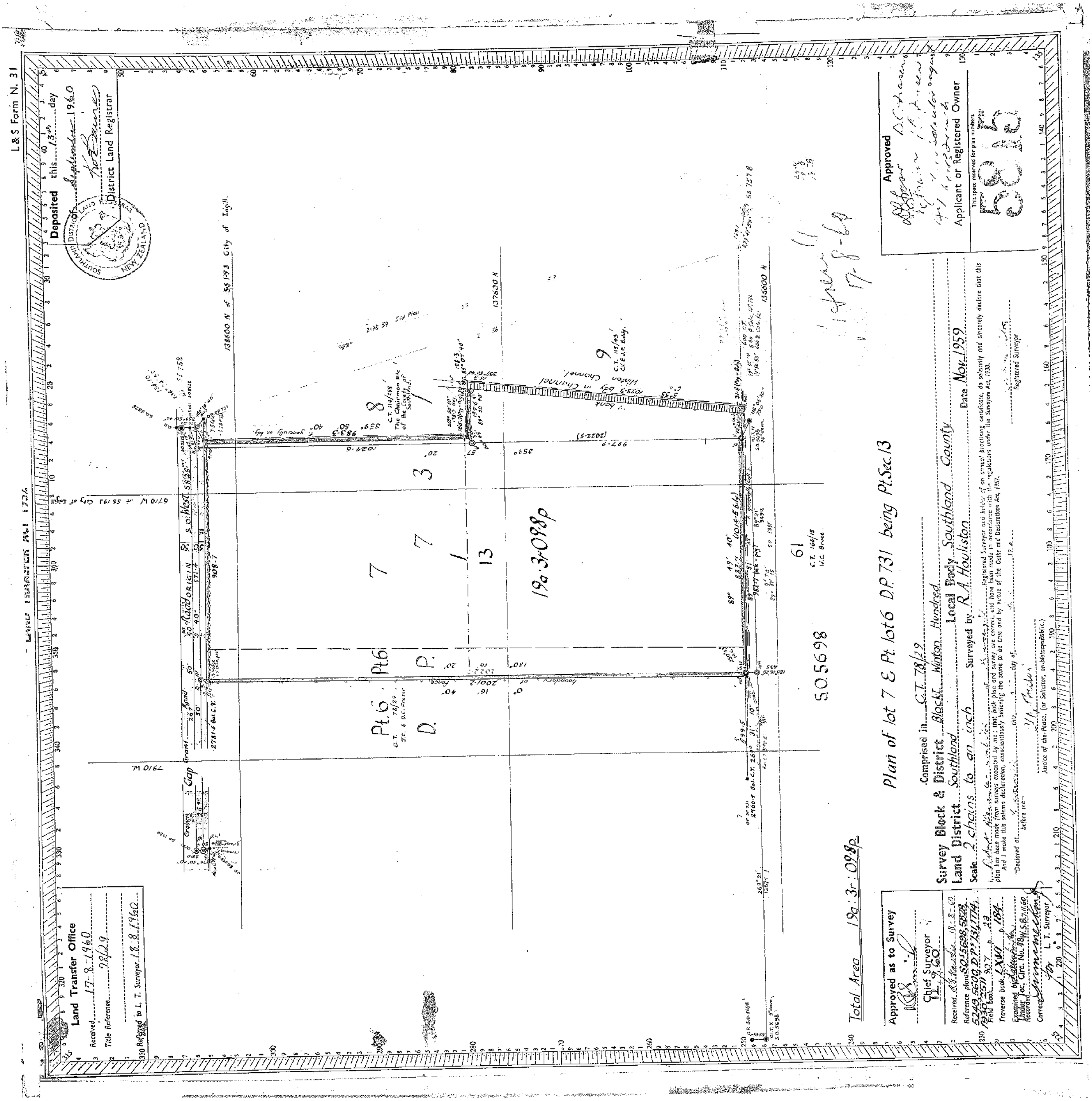
Identifier	**SL222/11**
Land Registration District	**Southland**
Date Issued	07 October 1960

Prior References
SL78/29

Estate	Fee Simple
Area	8.0173 hectares more or less
Legal Description	Lot 1 Deposited Plan 5815
Registered Owners	

Southland District Council

Interests



L&S Form N. 31
Deposited this 13th day
District Land Registrar
Approved
Applicant or Registered Owner
Plan of lot 7 & Pt lot 6 D.P. 731 being Pt.Sec.13
Comprised in C.T. 78/29
Survey Block & District Block I Winton Hundred
Land District Southland
Local Body Southland County
Scale 2 chains to an inch
Surveyed by R.A. Houliston
Date Nov. 1959
Total Area 19a: 3r: 09.8p
19a 3r 09.8p
S.O. 5698
Land Transfer Office
Approved as to Survey
Chief Surveyor

Appendix B

Consent:202026

10344

environment SOUTHLAND

Application No: S122-004
Consent No:202026

Cnr North Road and Price Street
(Private Bag 90116)
Invercargill

Telephone (03) 215 6197
Fax No. (03) 215 8081
Southland Freephone No. 0800 76 88 45

Discharge Permit

Pursuant to Section 105(1) of the Resource Management Act 1991, a resource consent is hereby granted by the Southland Regional Council (the "Council") to **Southland District Council** (the "consent holder") of **P O Box 903, Invercargill** from **8 December 2003**.

Please read this Consent carefully, and ensure that any staff or contractors carrying out activities under this Consent on your behalf are aware of all the conditions of the Consent.

Details of Permit

Purpose for which permit is granted:		To discharge treated sewage to water
Location	- site locality	Winton Stream about 2km south of Winton
	- map reference	E46:493-392
	- receiving environment	Winton Stream
	- catchment	Oreti
Legal description of land at the site:		Lot 1 DP 5815 Block I Winton SD
Expiry date:		8 December 2023

Schedule of Conditions

Consent Period

1. The consent period is 20 years, commencing upon expiry or surrender of Resource Consent 97195.

   (Note: Pursuant to Sections 123 and 124 of the Resource Management Act 1991, a new consent will be required at the expiration of this consent. The application will be considered in accordance with the plans in effect at that time, and the adverse effects of the proposed activity).

Purpose

2. This consent authorises the discharge of treated sewage effluent, at an average flow of 750 m^3/day, into Winton Stream at about map reference NZMS 260 E46:493:392. This consent does not authorise the disposal of sludge or untreated sewage or wastes collected from any point in the reticulation or treatment systems.

3. Within two years of the date of commencement of this resource consent, the consent holder shall ensure that the wetland, proposed in the application of June 2003, has been constructed and incorporated into the operation of the Winton Wastewater Treatment System.

Accidental or Emergency Discharges

4. In the event of an emergency or accidental discharge of sewage or partially treated sewage to land or water, the consent holder (or the consent holder's agent) shall, without undue delay, notify:

   - the Branxholme water treatment plant (ph 03 218 1959);
   - the Medical Officer of Health, or Health Protection Officer (ph 03 211 0900);
   - the Area Manager (Murihiku) Department of Conservation (ph 03 214 4589);
   - Te Ao Marama Inc (ph 03 214 1573); and
   - the Council's Director of Environmental Management (ph 03 2156197).

   NB: Invercargill City Council's Branxholme water treatment plant and the Alliance Group Limited's Lorneville plant abstract water downstream of the oxidation pond and should be notified of any discharge of untreated sewage to Winton Stream.

Complaints

5. The consent holder shall maintain a register of complaints received about the wastewater treatment and disposal system. The register shall record the response and actions taken to each complaint. The complaints register shall be forwarded to Council's Director of Environmental Management annually, within three months of the anniversary of grant of this consent.

Monitoring

6. The consent holder shall, on at least two occasions during the period 1 November to 31 March each year, and at least once during the period 1 June to 31 August each year, monitor both:

   (a) the discharge of treated sewage effluent to Winton Stream by taking a representative sample of the discharge at the outfall to the receiving waters, at about NZMS 260 Series map reference E46:493:392, and analysing the sample for the following:

   - Temperature
   - Electrical Conductivity
   - Dissolved Oxygen concentration
   - Carbonaceous Biochemical Oxygen Demand (BOD_5) concentration
   - Total Suspended Solids concentration
   - E. Coli concentration
   - Nitrate Nitrogen concentration
   - Total Ammonia Nitrogen concentration (NH_4^+-N and NH_3-N)
   - Total Nitrogen concentration
   - Total Phosphorus concentration.

   (b) the receiving waters, upstream and 100 metres downstream of the point of discharge, by taking representative samples and analysing each sample for the following:

   - pH
   - Temperature
   - Electrical Conductivity
   - Dissolved Oxygen concentration
   - Black disk distance
   - E. Coli concentration
   - Nitrate Nitrogen concentration
   - Total Ammonia Nitrogen concentration (NH_4^+-N and NH_3-N)
   - Total Nitrogen concentration
   - Dissolved Reactive Phosphorus concentration

   The discharge and receiving water samples shall be taken at about the same time, within a one hour period, on each monitoring occasion.

7. (a) The monitoring occasions specified in condition 6 are to be at least 30 days apart, and the monitoring occasions between 1 November and 31 March are to occur, as far as is practicable, when the Winton Stream is low and clear.

   (b) For the purpose of condition 6 representative samples shall be grab samples.

   (c) Sample collection, preservation and analysis, as required by condition 6, shall be carried out in accordance with the most recent edition of APHA "Standard Methods for the Examination of Water and Wastewater".

   (d) The monitoring and analyses are to be carried out by a laboratory with IANZ registration or equivalent, or as agreed to, in writing, by the Council's Director of Environmental Management.

(e) The results of analysis, carried out in accordance with condition 6, shall be supplied to the Council no later than 20 working days from the end of the month in which the samples are taken. The methods of analysis are to be specified with the results.

8. The consent holder (or the consent holder's agent) shall maintain a log of inspections and works carried out on the treatment system and make the log available, upon request, to the Council's Director of Environmental Management or a Health Protection Officer.

9. During the months of January to March in the summer preceding each "Environmental Effects Review", as described in Condition 19, the consent holder shall undertake more intensive environmental monitoring than that required for the annual monitoring carried out in accordance with this resource consent. The methodology for this intensive monitoring shall be submitted to the consent authority for approval prior to the monitoring commencing. The monitoring shall include:

(a) monitoring of both the effluent and the receiving environment for the parameters and at the locations used during the regular monitoring rounds. The additional monitoring shall include up to 10 monitoring rounds over the specified monitoring period. An attempt shall be made to collect samples during low flow conditions;

(b) the inclusion of a biomonitoring assessment focussing on assessing the effects of the discharge on the aquatic ecosystem. This shall include a study of macroinvertebrates and periphyton.

10. The consent holder shall, prior to the construction of the 'constructed wetland', and every three years thereafter, take a sample from the groundwater bore located in the property at 154 Winton-Lorneville Road. The sample shall be analysed for faecal coliform concentrations and nitrate. The results of analysis shall be supplied to the landowner, and the Southland Regional Council's Manager of Environmental Compliance, no later than 20 working days from the end of the month in which the samples are taken.

Limits and Standards

11. For the purposes of this consent the zone of reasonable mixing in Winton Stream shall extend from 5 metres upstream of the outfall to 100 metres downstream of the outfall.

12. The minimum standards for Class D waters, as described in the Council's Transitional Southland Regional Plan, shall apply and be maintained in respect of the exercise of this permit beyond 100 metres from the point of discharge to the Winton Stream. A copy of the standards for Class D waters is appended to these conditions.

13. For the purposes of condition 10, a conspicuous change in clarity shall be a 20% reduction in black disk distance.

14. The concentration of total ammonia nitrogen in Winton Stream, beyond the zone of reasonable mixing, may not exceed the following tabled values at the appropriate pH as a result of any discharge made pursuant to this consent:

Total Ammoniacal Nitrogen Freshwater Limits in mg/m^3 at different pH (Temperature is not taken into account)	
pH	NH_4^+-N + NH_3-N mg/m^3
6.0	2570
6.1	2555
6.2	2540
6.3	2520
6.4	2490
6.5	2460
6.6	2430
6.7	2380
6.8	2330
6.9	2260
7.0	2180
7.1	2090
7.2	1990
7.3	1880
7.4	1750
7.5	1610
7.6	1470
7.7	1320
7.8	1180
7.9	1030
8.0	900
8.1	780
8.2	660
8.3	560
8.4	480
8.5	400
8.6	340
8.7	290
8.8	240
8.9	210
9.0	180

Source: *Australian and New Zealand Environment and Conservation Council (ANZECC) October 2000: Australian and New Zealand Guidelines for Fresh and Marine Water Quality*

Treatment System Operation

15. There shall be no addition of nitrogen, phosphorus or sulphur based chemicals to the treatment system without the authorisation of the Council's Director of Environmental Management.

16. The consent holder shall maintain signage in a prominent place near the outfall to Winton Stream informing the public of the discharge of treated wastewater.

17. The consent holder shall ensure that the wetland is constructed in such a manner that it does not discharge treated wastewater to land in a manner that may enter the groundwater.

18. The consent holder shall:

    (a) compile an Operations and Management Plan (O & M Plan) covering all treatment and disposal systems associated with the Winton Wastewater Treatment System within six months of the commencement of this resource consent. The plan shall detail how the system is to be operated to ensure that treatment is optimised at all times, and shall outline contingency measures to handle emergency events;

    (b) update the O & M Plan when there are significant changes or upgrades to the Winton Wastewater Treatment System or its operation. The need for such an update is to be assessed at least once every two years;

    (c) operate and maintain the Winton Wastewater Treatment System substantially in accordance with the O & M Plan.

Environmental Effects Review and Reporting

19. Three years after the grant of this resource consent, and thereafter every five years, the consent holder shall undertake a review of the Winton Wastewater Treatment System. Each review shall assess, but not be limited to, the following:

    - the operation and performance of the Winton WTS;
    - the results of all monitoring undertaken in association with this resource consent;
    - any other relevant data that is available and of relevance to the discharge of treated wastewater into Winton Stream;
    - whether there is any significant adverse effect on the environment that can be "avoided, remedied or mitigated" by changes or upgrades to the Winton WTS;
    - the nature of any improvements, if considered necessary; and
    - impacts of any changes on the resource consent conditions.

    The consent holder shall prepare an "Environmental Effects Review" report that is to be submitted to the consent authority within three months of each review being undertaken. The report shall outline all relevant outcomes of the review process.

Sewerage Network

20. The consent holder shall undertake a proactive programme aimed at reducing stormwater and groundwater intrusion in the sewerage network, in order to attempt to reduce wet weather flows through the Winton Wastewater Treatment System. The nature of the programme and any associated results shall be outlined in the "Environmental Effects Review" report.

Annual Charges

21. The consent holder shall pay Southland Regional Council an administration charge, set by Special Order under the Resource Management Act, payable in advance on the first day of July each year.

Review of Conditions

22. Southland Regional Council may in accordance with the conditions of this resource consent and Sections 128 and 129 of the Resource Management Act 1991, serve notice of its intention to review the conditions of this consent, in the month of June each year, for the purposes of:

    (i) addressing the results of the review specified in Condition 19;
    (ii) dealing with any minor additions or alterations to the sewage treatment and discharge system;
    (iii) dealing with any significant adverse effects on the environment which may arise from the exercise of this consent; or
    (iv) complying with the requirements of a regional plan.

for the **Southland Regional Council**

W J Tuckey
Director of Environmental Management

Appendix 1
Standards for Class D Waters

The quality of Class D waters shall conform to the following requirements:

a) The natural water temperature shall not be changed by more than 3 degrees Celsius.

b) The acidity or alkalinity of the waters as measured by the pH shall be within the range of 6.0 to 9.0 except when due to natural causes.

c) The waters shall not be tainted so as to make them unpalatable, nor contain toxic substances to the extent that they are unsafe for consumption by farm animals, nor shall they emit objectionable odours.

d) There shall be no destruction of natural aquatic life by reason of a concentration of toxic substances.

e) The natural colour and clarity of the waters shall not be changed to a conspicuous extent.

f) The oxygen content in solution in the waters shall not be reduced below 5 milligrams per litre.

Southland District Council

Winton Wastewater Treatment System
Resource Consent Application and Supporting AEE

Contents

Summary

The Southland District Council (Council) is responsible for providing sanitary works for the treatment and disposal of wastewater within its District. Given this requirement, the SDC operates the Winton Wastewater Treatment System (WWTS) which collects wastewater from Winton township and reticulates it to an aerated oxidation pond located to the south of the township. From the oxidation pond, the treated wastewater currently passes through two planted channels before discharging into the Winton Stream, which runs along the eastern boundary of the site. Council proposes constructing approximately 1.4 hectares of wetland, consisting of 6 cells, for land treatment of the wastewater prior to discharge to the Stream. The constructed wetland will be located generally where the current planted channels are.

The discharge of Winton's treated wastewater is currently authorised under the Resource Management Act (RMA) by a discharge permit which is due to expire on 4 December 2003 (Consent No. 97195 – refer to Appendix A). This document is a resource consent application to renew this discharge permit. It has been lodged six months prior to expiry of Consent No. 97195 so that the SDC can continue to operate the WWTS, in accordance with the original resource consent, until a new consent is granted. Accordingly, SDC is applying for the following resource consent:

- A ***discharge permit*** (s.15) to discharge treated wastewater into the Winton Stream from the Winton Wastewater Treatment System for a term of 20 years.

The WWTS has the potential to adversely affect the water quality, and therefore the aquatic ecology, of the Winton Stream. From the monitoring data, it is evident that the discharge of treated wastewater from the WWTS is having an effect on the concentrations of ammonia-nitrogen, and to a lesser extent dissolved reactive phosphorous, in the Winton Stream. From the data it appears that this occurs at times of warmer climatic conditions. In addition, at times, faecal coliform levels are elevated due to the current discharge. However, it is also acknowledged that the water quality of the Winton Stream, a tributary of the Oreti River, is generally poor. The Stream exhibits high faecal coliform levels and nutrient enrichment, as evidenced by periphyton growth on the bed of the stream, upstream and downstream of the discharge, during summer low flow conditions.

The proposal to construct a 1.4 hectare wetland will provide improvements in treated wastewater quality, thus addressing some of the effects that are attributable to the discharge from the WWTS. In particular, biochemical oxygen demand, suspended solids and faecal coliforms levels will be significantly reduced while ammonia concentrations will reduce to a lesser degree, particularly at certain times of year. In addition, ongoing monitoring of the stream for the key nutrient parameters will determine the improvements arising from the upgraded discharge on the Winton Stream.

Part One – Resource Consent Application Form

Form 5 of the Resource Management Act

Application for Resource Consent under Section 88 of the Resource Management Act 1991.

To: Environment Southland

We: Southland District Council
PO Box 903
INVERCARGILL

apply for the resource consent described below:

1 The names and addresses of the owner and occupier which this application relates are:

Owner and Occupier: Southland District Council

2 The location to which this application relates is:

The Winton Wastewater Treatment System is located alongside the Winton Stream, which is located approximately 2 kilometres south of the centre of Winton township. The site is located immediately southwest of the SH6 intersection with Gap Road West.

Grid reference: NZMS260 E46 493 392

Legal description: Lot 1, DP5815, Block I, Winton SD

3 The type of resource consents sought are:

Discharge permit to discharge treated wastewater into Winton Stream from the Winton Wastewater Treatment System, for a term of 20 years.

4 A description of the activities to which the application relates is:

Discharge of treated wastewater from the Winton Wastewater Treatment System to Winton Stream. The treatment system currently consists an aerated oxidation pond followed by two planted channels. The planted channels will be replaced by 1.4 hectares of constructed wetland. The Winton Wastewater Treatment Systems receives wastewater from Winton township (refer Section 2 of the AEE).

5 The following additional resource consents are required in relation to this proposal and have or have not been applied for:

N/A.

6 Attached is an assessment of any effects that the proposed activity may have on the environment in accordance with Section 88 of, and the Fourth Schedule to, the Act.

7 Attached is information (if any), required to be included in the application by the district or regional plan or regulations.

8 [Not applicable as this application is not for a subdivision consent].

9 [Not applicable as this application is not for a reclamation consent].

.....
Signature of applicant or person authorised
to sign on behalf of applicant

3 June 2003
.....
Date

Address for Service:
Southland District Council
c/- MWH New Zealand Limited
PO Box 4
DUNEDIN

Attention: Dr Dave Stewart

Telephone No. 03-477 0885
Fax No. 03-477 0616

Part Two – Supporting Information

1. Introduction

1.1 Purpose of the AEE

The Southland District Council (SDC) is responsible for ensuring that they operate within legal requirements, including the provisions of the Resource Management Act 1991 (RMA). Accordingly, this document is an application for a discharge permit for the continued discharge of treated wastewater from the Winton Wastewater Treatment System (WWTS). The SDC is the applicant.

The SDC currently holds a discharge permit (Consent No. 97195 – refer to Appendix A), to discharge treated wastewater from the WWTS into Winton Stream. This discharge permit expires on 4 December 2003. So that the discharge of treated wastewater can continue lawfully until a new resource consent is granted, this application has been lodged six months prior to the expiry of the existing discharge permit.

This documentation contains the information necessary to support the resource consent application for the operation of the WWTS and the discharge of treated wastewater into Winton Stream, and includes an Assessment of Effects on the Environment (AEE). The AEE has been prepared in accordance with the Fourth Schedule of the RMA. It includes an assessment of the actual and potential effects of the wastewater treatment system and the ways in which any adverse effects from the existing operation can be "avoided, remedied or mitigated".

1.2 Structure of the AEE

The structure of this document has been prepared to facilitate an understanding of the WWTS.

Part One of this document contains the application form (Form 5) for the discharge permit. The second part of this document is the Assessment of Effects on the Environment and it consists of:

- **Section 1** sets the overall theme to this document;
- **Section 2** describes the current and proposed operation and nature of the WWTS;
- **Section 3** summarises the relevant legislative and policy framework which must be considered for the discharge permit;
- **Section 4** describes the environmental setting within which the WWTS is located and operated;
- **Section 5** describes the actual and potential effects of the operation of the WWTS;
- **Section 6** discusses the alternative methods of treatment and disposal considered for the WWTS;
- **Section 7** outlines the nature of consultation with the key stakeholders that is proposed with regards to this resource consent application; and
- **Section 8** outlines proposed resource consent conditions which are intended to avoid, remedy or mitigate any actual and potential adverse effects on the environment resulting from the operation of the WWTS;

- **Appendices** have also been provided where they are referred to directly in this document.

2. The Winton Wastewater Treatment System

2.1 Location and Ownership

The SDC provides sanitary works for the treatment of wastewater within its District. The SDC is the owner and operator of the WWTS, which is located on SDC land. The area of land owned by the SDC at the WWTS is 8.017 hectares

Wastewater from Winton township is collected by a reticulated sewer system and pumped to an oxidation pond treatment system. The treatment site is located alongside the Winton Stream, which is located approximately 2 kilometres south of the centre of Winton, immediately southwest of the SH6 intersection with Gap Road West. The location of the WWTS is shown in Figure 1.

2.2 Background

The WWTS was built in 1962 and services the township of Winton. Originally, a clarigester was used to settle solids from the wastewater with drying beds to dry the solids (sludge). However, the clarigester suffered operating problems and it was found that the oxidation pond has sufficient capacity to provide suitable treatment on its own. The clarigester and drying beds were therefore decommissioned.

A resource consent application was lodged in December 1997 to renew the previous discharge permit (which expired on 23 May 1995). However, during the pre-hearing meeting on 1 September 1998 submitters raised a number of issues, which resulted in the SDC agreeing to modifications to the consent application. A discharge permit for the discharge of treated wastewater from the WWTS was granted on 11 November 1998 (Consent No 97195).

The current discharge permit (Consent No. 97195 – refer to Appendix A) expires on 4 December 2003. The discharge permit allows the discharge of treated wastewater from the oxidation pond at a dry weather flow rate of up to 525m^3/day and at a wet weather flow rate of up to 1600m^3/day into Winton Stream. Condition 15 of the discharge permit also requires the assessment and development of alternative oxidation pond effluent treatment and disposal options, particularly land disposal options, that would address the concerns about water quality effects on the Winton Stream. In addition, as a result of the resource consent application process, a number of improvements were made to the treatment system which included:

- using the planted channels simultaneously, not alternately
- establishment of more vegetation in the channels
- placement of a screen at the outlet of the pond
- re-fencing of the site to improve grasing, litter control and access for maintenance.

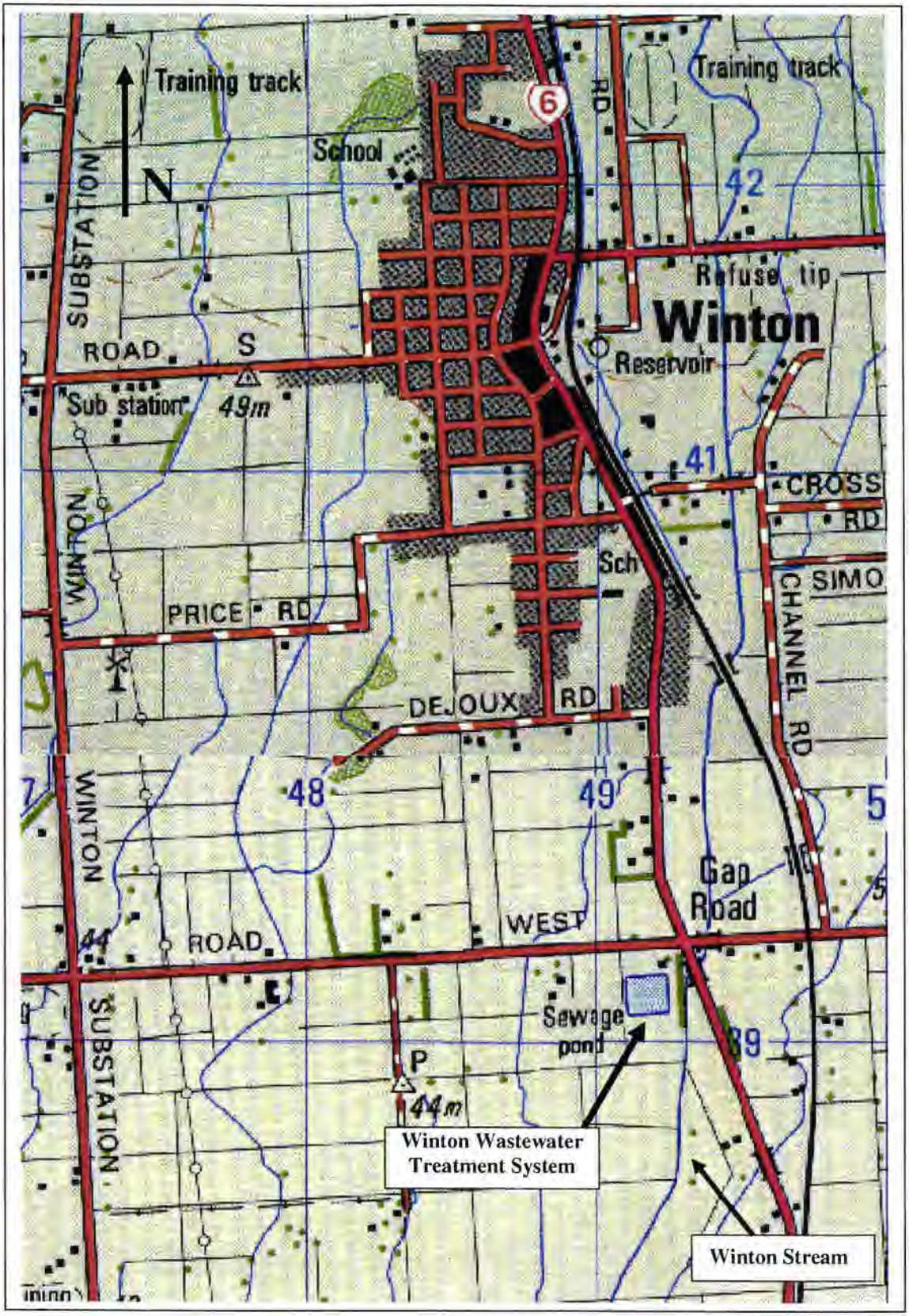


Figure 1 – Location Plan

2.3 Description of the Winton Wastewater Treatment System

2.3.1 Components of the Winton Wastewaster Treatment System

Wastewater collected from Winton by the reticulated sewerage system is pumped to an oxidation pond at the treatment plant site. The oxidation pond has an area of 1.96 hectares. Two floating electrically driven 2.2kW aerators are moored in the pond to provided supplemental oxygen in winter.

Treated wastewater from the oxidation pond overflows and flows by gravity through two channels planted with flax and other wetland species before discharging into the Winton Stream.

2.3.2 Overview of the Operation of the Winton Wastewaster Treatment System

An overview of the operation of the WWTS up until August 2001 is contained in a report prepared by MWH New Zealand Ltd and entitled *"Winton Sewerage Scheme – Resource Consent – Condition 15 Report"* (*"Condition 15 Report"*). This report is attached in Appendix B of this document. Information from the *"Condition 15 Report"* is referenced and summarised in this document where appropriate.

2.3.3 The Population Serviced by the Sewerage System

An assessment of Winton's current and future population was carried out as part of the December 1997 resource consent application. This information was then utilised in the *"Condition 15 Report"* which states *"The population of Winton was estimated, based on the 1996 Census, at 2191 persons. Based on 1991 census information, the population in 2016 is projected to be in the range of 1692 to 2300 persons (Statistics New Zealand)."*

2.3.4 Wastewater Flows into the Oxidation Pond

An assessment of the estimated flows into the WWTS is contained in Section 5.4.2 of the *"Condition 15 Report"*. It stated:

"The average dry weather flow entering the oxidation pond was estimated by assuming a daily wastewater flow allowance of 230 litres/person/day. The peak wet weather flow was estimated using a peaking factor of 4 on the average dry weather flow.

1996 Winton Population (2191)
Average Dry Weather Flow $504\ m^3/day$
Peak Wet Weather Flow $2016\ m^3/day$

Highest projected Winton population for the year 2016 (2300 persons)
Average Dry Weather Flow $529\ m^3/day$
Peak Wet Weather Flow $2116\ m^3/day$

The resource consent is for a maximum discharge into Winton Stream of treated oxidation pond effluent of 525m^3/day at dry weather flow and 1600m^3/day at wet weather flow. The oxidation pond will attenuate incoming flows to some extent"

The above volumes are identical to those contained in Condition 2 of the current discharge permit (Consent No. 97195).

In addition to the above assessment, Section 5.4.3. of the *"Condition 15 Report"* reviewed flow monitoring data from July 1994 to October 2000. This data shows that average daily flow was 715m^3/day. The maximum recorded flow was 6470m^3/day. In addition, the *"Condition 15 Report"* observes that:

- The peaking factor of wet weather flows has been greater than 4
- The average daily flow (wet and dry weather) is approximately 1.4 times the estimated average dry weather flow
- During dry summer periods the flow is typically between 300 to 700m^3/day
- During wet weather periods the flow is typically greater than 1000m^3/day.

On this basis, the flow volumes proposed as consent conditions in Section 8 of this document reflect the above information, rather than the volumes contained in the current discharge permit (Consent No. 97195).

2.3.5 Capacity of the Oxidation Pond

The WWTS oxidation pond is a conventional 1.15m deep aerobic pond constructed in accordance with the Ministry of Works guidelines of a maximum loading of 84kg BOD_5/ha/day and a retention time of about 40 days.

The pond has a surface area of 1.96ha, giving it a volume of 22540m^3. The pond design would be adequate to treat domestic wastewater from a population of 2350 persons (ie 70g BOD_5/person/day). The installation of two aerators is design to improve the performance of the pond in winter.

An additional amount of freeboard (less than 0.5m) is available to the crest of the embankments, although allowing for wave action this may not be available for use.

Thus, the pond is operating within its design capacity, based on the accepted guideline organic loading of 84kg BOD_5/ha/day. For the highest projected Winton population increase, the oxidation pond would still operate within its design capacity.

2.3.6 Performance of the Winton Wastewater Treatment System

Condition 6(a) of Consent No.97195 requires that a representative sample of the treated wastewater shall be taken *"on at least two occasions during the period 1 November to 31 March each year"* and analysed for:

- Temperature
- Electrical conductivity

- Dissolved oxygen concentration
- BOD_5
- Total suspended solids
- Faecal coliform
- Total Ammonia Nitrogen
- Total Phosphorous.

The monitoring data for the effluent quality is summarised in Table 2.3 below and also compared to the typical composition of treated wastewater from an oxidation pond.

Table 2.3 - Summary of Winton treated wastewater quality and comparison to typical pond treated wastewater quality (from Hickey *et al* 1989, Davies-Colley *et al* 1995)

Date	BOD_5 (g/m^3)	DO (g/m^3)	Total P (g/m^3)	Amm-N (g/m^3-N)	TSS (g/m^3)	pH	Temp (°C)	Cond. (mS/cm@25°C)	FC (/100mL)[1]
7-Mar-96	25	12.20	-	20.0	41	7.6	21.7	0.605	-
19-Jun-96	23	10.60	-	13.0	39	7.6	5.2	0.413	-
18-Sep-96	39	11.30	-	11.0	220	8.7	14.4	0.440	-
6-Dec-96	42	12.90	-	16.0	130	8.3	17.6	0.490	-
21-Mar-97	37	5.90	-	20.0	60	7.7	14.1	0.540	-
12-Jun-97	35	8.10	-	17.0	80	7.7	9.6	0.477	-
17-Dec-97	37	9.40	-	14.0	160	8.8	20.2	0.428	-
30-Mar-98	32	5.50	-	11.0	100	7.7	12.5	0.377	-
3-Jun-98	39	5.30	-	22.0	80	7.6	5.0	0.052	-
2-Sep-98	50	5.60	-	15.0	140	7.7	7.6	0.458	-
3-Dec-98	41	7.20	-	10.0	200	7.9	15.0	0.490	-
4-Mar-99	56	3.35	9.9	21.1	187	-	17.5	0.628	260000
25-Mar-99	25	5.00	7.5	22.0	57	7.5	14.6	0.548	28000
10-Feb-00	79	0.13	24.0	8.8	230	-	20.0	0.429	7000
3-Mar-00	37	7.60	-	12.0	160	7.9	13.0	0.484	57000
20-Mar-00	86	0.41	11.2	11.7	396 ?	-	16.0	0.508	9000
7-Dec-00	56	13.69	8.8	13.1	97	-	18.5	0.487	30000
7-Feb-01	76	9.07	7.0	11.8	134	-	11.6	0.527	30000
26-Mar-01	100	0.50	-	23.0	120	7.3	18.0	0.648	160000
28-Feb-02	29	5.07	11.7	15.2	77	-	15.5	0.537	600000
4-Apr-02	30	8.36	80.9 ?	18.0	59	-	16.0	0.581	110000
6-Nov-02	34	14.76	17.4	20.4	44	-	19.0	0.498	70000
3-Feb-03	31	3.70	10.8	19.3	100	-	19.0	0.574	9300
25-Mar-03	48	4.10	7.3	19.0	120	7.6	18.3	0.561	36000
Mean	***45***	***7.07***	***11.6***	***16.0***	***115***		***15.0***	***0.491***	
Median	***38***	***6.55***	***10.8***	***15.6***	***100***	***7.7***	***15.8***	***0.494***	***36000***
Typical values[2]	12-41 (27)	3-13.7 (8)	2.4-9.6 (8.2)	0.3-16 (7)	4-101 (56)	7.8-8.9 (8.1)	9.8-19.1 (16)	27-81.7 (42.2)	800-164,000 (4,300)

Note: (1) Some test are reported as MPN/100mL, while others are cfu/100mL
(2) Expressed as the range of median values for oxidation ponds in New Zealand and the (median) of these medians
? This data has not been included in the mean and median calculations.

The monitoring data in Table 2.3 shows that the existing quality of the treated wastewater from the Winton oxidation pond is generally within the range of effluent quality produced by other oxidation pond systems in New Zealand. However, it falls in the upper range of values for most parameters.

2.4 Proposed Upgrading of the Winton Wastewater Treatment System

SDC proposes, as part of the process of gaining a new resource consent, to construct a new wetland to provide additional treatment of the effluent from the oxidation pond before discharge to the Winton Stream. The new wetland will replace the existing planted channels.

The new wetland will comprise six parallel cells, and cover an area of approximately 1.4 hectares. The new constructed wetland will incorporate the existing planted channels where possible.

The proposed layout is shown in Figure 2.

The design of the wetland will be similar to that designed by MWH for St Arnaud in Tasman District, which was constructed in 1999/2000. The St Arnaud system comprises two parallel wetland cells, each 10m wide and 75m long. Photographs of the oxidation pond and wetlands at St Arnaud are shown in Figure 3.

Constructed wetlands can be expected to improve the quality of effluent from an oxidation pond as set out in Table 2.4.

Table 2.4 - Comparison of the existing effluent quality from the WWTS and the expected effluent quality after treatment in a constructed wetland expressed as range (median).

	BOD_5 (mg/L)	SS (mg/L)	TN (mg/L)	NH_3-N (mg/L)	TP (mg/L)	FC (cfu/100ml)
Existing effluent composition	23-100 (27)	39-230 (56)	-	8.8-23 (14.5)	7-24	7,000-600,000 (4,300)
Expected composition of effluent from a constructed wetland	10-30 (20)	15-35 (25)	5-35 (15)	0-25 (10)	5-25 (12)	400 - 2,000 (800)

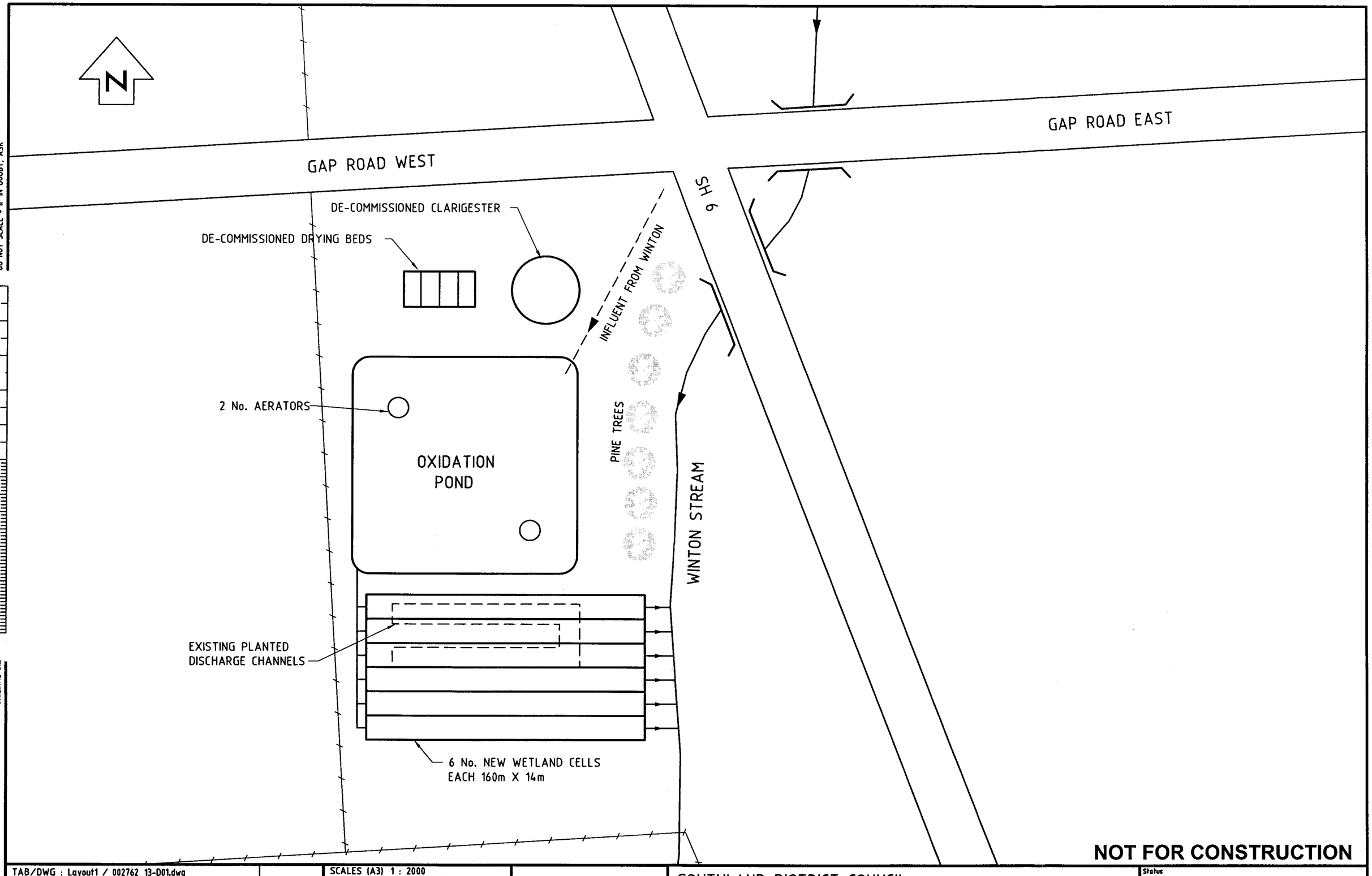
Note: BOD_5 = organic strength, SS= suspended solids, TN = total nitrogen, NH_3-N = ammonia nitrogen, TP = total phosphorus, FC = faecal coliform bacteria

The performance of constructed wetlands is variable because they are natural systems and therefore subject to factors such as the season and climate, and therefore similar to oxidation ponds.

The reduction of faecal coliform concentration in constructed wetlands is usually highest in summer when longer sunshine hours increase the exposure of the wastewater to ultra-violet light. The reduction of BOD is also greatest in summer when warmer temperatures stimulate bacterial activity and oxygen supply by algae. The uptake of nitrogen is usually greatest in spring when plant growth is at a maximum, but in winter when the wetland plants die off and plant material decays, nitrogen is often released back to the wetland.

Constructed wetlands are not usually effective at nitrification (oxidation of ammonia to nitrate), especially in winter when nitrification rates are naturally low. High removals of nitrogen are only attainable when nitrification is achieved prior to the wastewater entering the wetland.

A constructed wetland can therefore be expected to considerably improve the existing effluent quality from the Winton oxidation pond in terms of BOD, SS and faecal coliform bacteria concentrations, with small reductions in ammonia, total nitrogen and total phosphorus concentrations.



DO NOT SCALE - IF IN DOUBT, ASK

0 10 20 30 40 50 60 70 80 90 100

ORIGINAL SIZ

NOT FOR CONSTRUCTION

TAB/DWG : Layout1 / 002762_13-D01.dwg	COPYRIGHT © MWH NZ Ltd.	SCALES (A3) 1 : 2000	
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		CHECKED CNC /	
REV AMENDMENTS	DATE APP	APPROVED	

MWH

SOUTHLAND DISTRICT COUNCIL
RESOURCE CONSENT APPLICATION
DISCHARGE FROM WINTON OXIDATION POND

FIG. 2 - GENERAL SITE LAYOUT

Status Stamp	FOR CONSENT
Date Stamp	29.05.2003
Job No.	002762-13
Sheet No.	D01
Rev.	A

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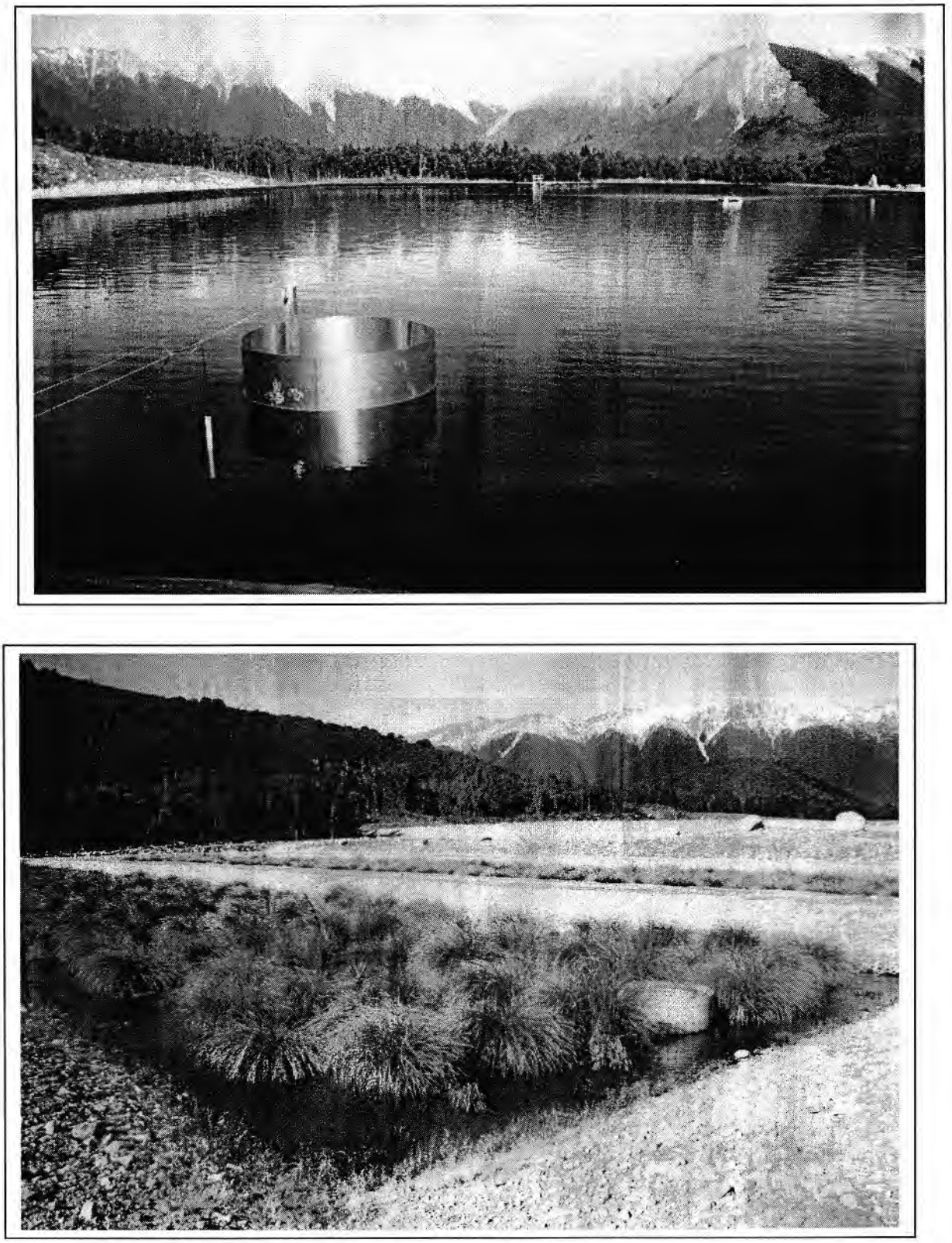


Figure 3 – Photographs of the oxidation pond (top) and constructed wetland (bottom) designed by MWH for St Arnaud in Tasman District

3. Legislation, Policy and Guidelines

3.1 Resource Management Act 1991

The overriding purpose of the Resource Management Act (RMA) enacted in 1991 *"is to promote the sustainable management of natural and physical resources"*. Part II of the RMA, sections 5 to 8, outlines the broader principles that are to be considered for any resource use, development or protection.

Any activity can either be authorised by a rule, either in a regional plan or district plan, or through a resource consent or a designation.

Resource consent applications must be prepared in accordance with S.88 of the RMA. Applications must include a full description of the activity and an assessment of any actual or potential effects that the activity may have on the environment and the ways in which significant effects can be *"avoided, remedied or mitigated"*. Such assessments must be prepared in accordance with the Fourth Schedule of the RMA. This schedule sets out the matters that should be included and those that should be considered.

When considering resource consent applications, the consent authority must primarily consider Part II of the RMA, while Section 104 outlines matters the Council must consider.

3.2 Environment Southland - Regional Policy Statement for Southland

The Southland Regional Council's Regional Policy Statement (RPS) became operative in December 1997. The RPS purpose is to integrate the management of natural and physical resources of the region by providing an overview of the issues, policies and methods relevant to the whole region. All regional and district plans must be consistent with the RPS.

The RPS establishes sustainable resource management policies relating to tangata whenua; biodiversity; water quality, quantity and water bodies; landscape and soils; transport and the built environment; the air, coast, energy and solid waste; and natural hazards, and hazardous substances.

Objectives and policies of relevance to this application are:

"***Chapter 5.1 Takata Whenua O Murihiku***

Objective 1.2 - To recognise the importance of wahi tapu, wahi taoka, mahika kai and the customary use of water to Kai Tahu.

Objective 1.3 - To incorporate Maori cultural and traditional spiritual values where appropriate into resource management decision making processes.

Chapter 5.4 – Water Quantity

Objective 4.1 - To sustain the quantity of the Region's water resources so as to:

a. meet the needs of a range of uses, including the reasonably foreseeable needs of future generations;

b. safeguard the life-supporting capacity of water and related ecosystems.

Objective 4.2 - To manage the use and development of water and land resources so as, wherever practicable, to maintain and enhance flow regimes.

Chapter 5.5 Water Quality

Objective 5.1- To sustain the quality of the Region's water resources so as to:

a. meet the needs of a range of uses, including the reasonably foreseeable needs of future generations

b. safeguard the life-supporting capacity of water and related ecosystems.

Objective 5.2 - To ensure that in the use and development of water and land resources, and the discharge of contaminants, water quality is maintained and wherever practicable enhanced.

Policy 5.2 - Require all point source discharges, after reasonable mixing, to comply with water quality standards.

Policy 5.4 - Utilise land treatment of liquid wastes where this can be undertaken in a sustainable manner and without significant adverse environmental effects.

Chapter 5.12 Air Quality

Objective 12.1 – To protect the Region's air quality, and to enhance the air quality in areas where it has been degraded."

3.3 Environment Southland - Proposed Freshwater Plan for Southland

The proposed plan was released in October 2000 and submissions closed on 16 February 2001. Cross submissions closed on 27 July 2001.

The purpose of the Plan is to promote the sustainable management of Southland's rivers, lakes and freshwater resources. The Plan is also aimed at enabling the use and development of fresh water where this can be undertaken in a sustainable manner. At present this plan is not operative, however, its provisions must be considered by Council when considering resource consent applications.

The WWTS discharges to the Winton Stream, which is identified as a lowland waterbody. The Winton Stream is a tributary of the Oreti River. The Oreti River is a Statutory Acknowledgement Area under the Ngai Tahu Claims Settlement Act 1998. The Statutory Acknowledgement is contained in Appendix C of the proposed plan. Also, Map 4 in Appendix D of the Plan identifies that the groundwater resource below the site consists of a Quarternary Gravel Aquifer.

Objectives and policies of relevance to this application are:

*"**Objective 3 – Lowland waterbodies***
Maintain and enhance lowland waterbodies ...so that water quality:

- *there is no net deterioration below the existing state at the date of notification of this Plan*
- *is suitable for stock drinking water, native fish and salmonids by 2010; and*
- *is suitable for Contact Recreation, in terms of human health risk, by the year 2020.*

Policy 2 – Waters other than natural state water.
Encourage best management practises that:

- *reduce nutrient inputs to water,*

- *avoid or reduce discharges that increase BOD in the water,*
- *reduce faecal contaminant inputs to water, and*
- *reduce inputs of contaminants that alter colour and clarity of water.*

Policy 3 – Contaminants that harm health
Avoid levels of contaminants in water or sediments, that could harm the health of humans, domestic animals, including stock and/or aquatic life.

Policy 4 – Prefer discharges to land
Prefer discharges to land over discharges to water where this is practicable and has less adverse effects.

Policy 5 – Contingencies for low flow events
Have contingencies in place to minimise the adverse effects of point source discharges during low flow events.

Policy 6 – Discharges to water
Prefer point source discharges to water at times of high flow over discharges at normal or low flows.

Policy 11 – Consented Discharges
Require resource consents for discharges that have more than minor adverse effects.

Policy 15 – Zone of reasonable mixing
Adopt, on a case by case basis, the minimum size of zone of reasonable mixing necessary to avoid adverse effects from discharges and to meet the relevant water classification standards."

Rule 3 – Discharges into lowland waterbodies applies to this activity. The rule identifies standards for lowland waterbodies which are contained in Appendix C of this document. The rule then states that *"the discharge of any contaminant into the waters or the beds of lowland rivers ... is a restricted discretionary activity"*. In exercising its discretion, the Council shall consider among other things; the adverse effects of the discharge on the ability of the water body to achieve Objective 3, including the rate of discharge in relation to the dilution capacity of the receiving environment.

Therefore in accordance with Rule 3 of the Plan, a discharge permit to discharge contaminants to Winton Stream from the WWTS is required.

3.4 Environment Southland – Effluent Land Application Plan for Southland

This plan addresses the disposal of foul water from sanitary appliances, community sewerage scheme discharges, sludges, agricultural effluent and trade process effluent discharges. It promotes discharges onto or into land rather than into water. The plan is concerned with ensuring that discharges of effluent or sludge onto or into land do not produce adverse effects. It attempts to avoid adverse effects to human and animal health, promotes good practice and regular maintenance of effluent systems, recognises tangata whenua concerns, and seeks to avoid adverse effects on amenity values.

Policies of relevance for any scheme that includes land disposal are:

*"**Policy 4.2.2** – Utilise land treatment of effluent and sludge where this can be undertaken in a sustainable manner and without significant adverse effect.*

Policy 4.2.3 *– Avoid where practicable, remedy or mitigate adverse effects on water quality, water ecosystems and water potability from effluent and sludge discharges onto or into land.*

Policy 4.2.6 *– Avoid where practicable, remedy or mitigate any adverse effects to human and animal health arising from the discharges of effluent and sludge onto or into land.*

Policy 4.2.7 *– Promote good practice and regular maintenance of effluent and sludge systems.*

Policy 4.2.8 *– Recognise and provide for takata whenua concerns related to the discharge of effluent and sludge onto or into land.*

Policy 4.2.10 *– Monitor, as appropriate, discharge of effluent and sludge onto or into land and, where practicable, the effects."*

Rules 5.2.1 and 5.3.2 state that the discharge of effluent and sludges into or onto land is a discretionary activity for which resource consent will be required.

As the WWTS will continue to discharge treated wastewater to water, Rule 5.2.1 does not apply to this proposal. Also, any residual sludge will be disposed at approved facilities that already have consent under the RMA.

3.5 Environment Southland – Regional Air Quality Plan for Southland

The thrust of this document is to maintain and enhance Southland's existing air quality and to avoid unnecessary regulation. It is concerned with the effect of discharges on air quality, public health and the environment; the release of greenhouse or ozone depleting gases; and the effect of objectionable and noxious discharges.

Rule 5.5.2 states that *"Discharges of contaminants into air from the following activities are discretionary*

... ...

(16) *Foulwater treatment processes with a design capacity population equivalent for BOD_5 of 10,000 people or more."*

As outlined in Section 2, the population of Winton is significantly less than 10,000 people. Thus a discharge permit to discharge contaminants to air from the WWTS is not required.

3.6 Southland District Council - District Plan

The WWTS is designated (Designation D175) for Sewage Treatment. In addition, a 150m building line buffer is also placed around the designated area (refer to Map 64). The WWTS is located within the Plains Resource Area and is also identified as a Potential Floodable Area.

The proposed upgrade of the WWTS, which consists of the construction of a 1.4 hectare constructed wetland, will be accommodated within the designated area. The proposed works are consistent with the purpose of the designation. However, prior to the works commencing, as required by the RMA, an Outline Plan will be submitted to the SDC's Planning Department.

Although, no resource consents are required, the following objectives in the District Plan are considered relevant to the ongoing operation of the WWTS:

*"**Manawhenua Issues***

***Objective MAO.1 Kaitiakitanga** - To have particular regard to the concept of Kaitiakitanga in relation to managing the use, development and protection of natural and physical resources.*

***Objective MAO.5 Wai (Water)** - To recognise the significance of water to Kai Tahu traditions and culture and to provide for such traditions and culture where practicable and appropriate.*

***Objective MAO.6 Mahika Kai (Places Where Food is Procured)** - To recognise the importance of mahika kai to Kai Tahu by, where possible, maintaining and enhancing mahika kai, and access to those traditional resources.*

Public Networks and Utilities

***Objective PWN.1** – To provide for the efficient development, operation and maintenance of public works and network utilities throughout the District, while as far as practicable avoiding, remedying and mitigating potentially adverse effects."*

3.7 Te Runanga o Ngai Tahu – Freshwater Policy

This document has been prepared by Te Runanga O Ngai Tahu as its Freshwater Policy Statement. Its focus is the management of the freshwater resource within the rote of Ngai Tahu. As water is central to all life, and as a taonga provided by Maori ancestors, Ngai Tahu present generation is responsible for ensuring that this taonga continues to be available for future generations.

3.8 Te Whakatu Kaupapa O Murihiku – Ngai Tahu Resource Management Strategy for the Southland Region

This document is a resource management strategy that expresses Kai Tahu beliefs and values, which regulatory authorities need to have regard to, as part of their decision-making processes. It can be used as a basis for consultation between Treaty partners, in accordance with the principles of the Treaty of Waitangi. Te Whakatau Kaupapa o Murihiku identifies values, objectives, policies and outcomes sought by the tangata whenua of Murihiku.

4. Environmental Setting

4.1 Social Environment and Surrounding Land Uses

Winton township lies on the flood plains of the Oreti River, approximately 25km north of Invercargill.

The District Plan states the following about the township of Winton:

"It is one of the few urban areas of Southland District that has experienced both a population increase and an increase in the number of dwellings over the past ten years. The town's primary function is to act as a servicing centre for the surrounding local community and it is a popular retirement locality."

As identified in the District Plan, the catchment is predominantly pastoral sheep farming country. This is evident from the photographs contained in Appendix B of the *"Condition 15 Report"*, which is contained in Appendix B of this document.

The Oreti River itself is used extensively for recreational pursuits, particularly fishing. However, the Winton Stream, principally given its size and limited public access, is not used extensively for such pursuits.

4.2 Climate

The climatic environment around Winton, including the WWTS, is overviewed in Section 5.3.5 of the *"Condition 15 Report"* contained in Appendix B of this document. For this reason, this information has not been repeated in this document.

4.3 Aquatic Environment

Winton Stream arises amongst the Hokonui Hills some 26km north of Winton township, and runs for most of its length across flat pasture lands, past Winton township and then for a further 8km to its confluence with the Oreti River. Winton Stream is a moderately small water course with a median flow of 0.69m^3/s.

Measurements of the flows in Winton Stream were obtained from Environment Southland for the December 1997 resource consent application. These are presented in Table 4.3 below.

Table 4.3 - Flow Data for Winton Stream at Winton Dam

Site Name	Map Ref	Data Time Range	Max Flow (m^3/s)	Median Flow (m^3/s)	Mean Annual 7 Day Low Flow (m^3/s)
Winton at Winton Dam	E45 502 572	1974-87	64.47	0.69	0.13

From the available flow data, the minimum flow in Winton Stream at the approximate location of the discharge is 0.13m^3/s, the maximum flow is 64.47m^3/s and the median flow is 0.69m^3/s.

Winton Stream is modified, having been straightened in the past by the local authority, and then modified again to re-establish a natural meander pattern which was accompanied by the planting of willows. The stream supports brown trout and native fish populations.

In the vicinity of the Winton oxidation pond, the stream flows through a broad but well-defined channel. The stream bed has a low gradient and a substrate consisting of sand, gravels and small cobbles. Macroinvertebrate monitoring undertaken by Southland Fish and Game in 1994 showed limited species diversity (7-9 taxa) and moderately low MCI scores (84-97 MCI), which indicate moderate organic enrichment both upstream and downstream of the oxidation pond discharge.

During periods of summer low flow, periphyton commonly covers the stream bed both upstream and downstream of the discharge. These growths are attributed to a lack of riparian shading and a generally high nutrient status of the stream. However, frequent freshes during winter generally keeps the stream clear of these nuisance growths.

A 1992 study of Oreti catchment's water quality (prepared for Environment Southland by Robertson), found that poor water quality existed in various subcatchments of the Oreti River, in particular Winton Stream. Bacterial quality deteriorated in the tributary streams with Winton Stream being the poorest (range 400 - 2000 FC per 100 ml). Despite the much poorer water quality of Winton Stream, Robertson (1992) noted that its comparatively low flow meant that its impacts on the Oreti were not likely to be as great as the Makarewa River (at the 7Q10* flow the Makarewa flow was about 15% of that in the Oreti River at the confluence - in comparison, the Winton Stream was about 1%).

The quality of the water in Winton Stream has been monitored by Southland Regional Council and SDC as a consent condition on the current discharge permit. The water quality results upstream and downstream of the discharge are provided and assessed in Section 5.3 of this document.

4.4 Soils and Terrestrial Environment

From published information (Soil Map of the South Island, New Zealand and Soil Bureau Bulletin No. 27) and field observations undertaken in the preparation of the *"Condition 15 Report"*, the area is underlain by Gley Recent Soils of the Makarewa soil set, overlying outwash gravels. Generally, the Makarewa soil set comprise sandy loams to clay loams, around 0.30m thick, derived from underlying gravel. The gravel comprises poorly sorted, sub-rounded top rounded clasts, up to 0.25m across, in a rather tight silty, locally sandy, matrix. The gravel clasts are generally hard but towards the surface they become progressively weathered so that within the upper 1m they have largely disintegrated into a sandy clay. Permeability of the gravels is generally low but layers of freer draining gravel form minor aquifers.

* The 7Q10 flow is the mean daily flow over seven consecutive days of lowest flow in a ten year period

The Winton Stream catchment is highly modified and contains only a few scattered remnants of native vegetation. Riparian vegetation beside Winton Stream is limited and in most cases consists of grasses and scattered shrubs. The land around the oxidation pond along with much of the land in the vicinity is vegetated in pastoral grasses, with a row of pine trees to the east of the WWTS site. The nature of the site and surrounding area is evident from the photographs contained in Appendix B of the *"Condition 15 Report"*.

The Conservation Management Strategy for Mainland Southland-West Otago indicates that no sites of conservation interest occur in the area

4.5 Cultural Setting

Maori started exploring the southern regions of New Zealand approximately 800 years ago. The two canoes to which southern Maori trace their ancestry are Takitimu and Araiteuru. Te Rapuwai and Waitaha were the names of the early Maori tribes. Kati Mamoe followed around the 1500s and Kai Tahu around the 1600s. These early Maori were hunter-gatherers who moved with the seasons to utilise the various available mahika kai resources of the region's waterways and terrestrial environment.

Ngai Tahu association with the Oreti catchment, of which the Winton Stream is a tributary, is outlined in the Statutory Acknowledgement for the Oreti River. It states:

"The Oreti River traverses a significant area of Murihiku, stretching from its mouth at Invercargill almost to the edge of Whakatipu-wai-maori (Lake Wakatipu). As such, it formed one of the main trails inland from the coast, with an important pounamu trade route continuing northward from the headwaters of the Oreti and travelling, via the Mavora and Von River Valley, to the edge of Wakatipu and onto the Dart and Routeburn pounamu sources. Indeed, pounamu can be found in the upper reaches of the Oreti itself.

The tupuna had considerable knowledge of whakapapa, traditional trails and tauranga waka, places for gathering kai and other taonga, ways in which to use the resources of Oreti, the relationship of people with the river and their dependence on it, and tikanga for the proper and sustainable utilisation of resources. All of these values remain important to Ngai Tahu today.

The kai resources of the Oreti would have supported numerous parties venturing into the interior, and returning by mokihi (vessels made of raupo), laden with pounamu and mahinga kai. Nohoanga (temporary campsites) supported such travel by providing bases from which the travellers could go water fowling, eeling and catching inaka (whitebait), and were located along the course of Oreti River.

...

The mauri of the Oreti represents the essence that binds the physical and spiritual elements of all things together, generating and upholding all life. All elements of the natural environment possess a life force, and all forms of life are related. Mauri is a critical element of the spiritual relationship of Ngai Tahu Whanui with the river." (Ngai Tahu Claims Settlement Act 1998)

5. Assessment of Effects on the Environment

5.1 Effects on Amenity, Economic and Social Values

Wastewater facilities, such as the WWTS, are often perceived as Locally Undesirable Land Uses (LULU's), especially if treating domestic wastewater. However, it should be recognised that people produce waste and the proper management of wastewater is necessary for the general good of the community and the environment.

The amenity values (natural or physical qualities and characteristics that contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes) of Winton Stream and its environs are influenced by a highly modified pastoral environment.

Generally, it is considered that, due to the level of treatment, the location and the well-maintained condition of the WWTS, the surrounding environment is not compromised by the WWTS, except for the effects on the water quality of the Winton Stream which is discussed separately in Section 5.3 below.

5.2 Air Emissions - Odour

Malodorous discharges to air can be an all too frequent feature of wastewater treatment facilities. The potential to produce nuisance odour is therefore something that needs to be managed. Good operation and management of the site should mean that odour nuisance is not a problem.

In addition, odour nuisance can be dependent on geographic location. Odour can be diluted by wind. The worst conditions for odour nuisance are stable weather conditions with low wind speed. To date, no odour complaints have been received regarding the WWTS.

5.3 Effects of Treated Effluent Discharge on Winton Stream

5.3.1 Water Quality

Condition 6(b) of Consent No.97195 requires that a representative sample of *"the receiving waters, upstream and 100 metres downstream of the point of discharge*" shall be taken *"on at least two occasions during the period 1 November to 31 March each year"* and analysed for:

- pH
- Temperature
- Electrical Conductivity
- Dissolved Oxygen concentration
- Black disk concentration
- Faecal coliforms
- Total Ammonia Nitrogen

- Dissolved Reactive Phosphorous.

Sections 3.2, 4.2 and Appendix C of the *"Condition 15 Report"* reviewed all receiving water monitoring data from May 1996 to January 2001. This assessment states that:

"In summary, the pH, dissolved oxygen and temperature parameters of the Winton Stream do not appear to have been adversely affected by the discharge. The ammoniacal nitrogen, dissolved reactive phosphorous, faecal coliforms and conductivity levels do appear to have increased. However, the ammoniacal nitrogen levels do comply with the resource consent requirements. The dissolved reactive phosphorous, faecal coliforms and conductivity levels do not have a quantitative range of concentration level to comply with, in the discharge consent."

Table 5.3(a) below, contains all the water quality monitoring data collected in accordance with the requirements of Condtion 6(b), up to the preparation of this document.

Table 5.3(a) - Water quality in the Winton Stream upstream and downstream of the discharge point for treated wastewater from the Winton WTS

Date US/DS*	DO (mg/L)	DRP (mg/L)	Amm-N (mg/L-N)	pH	Temp (°C)	Con. (mS/cm)	FC CFU/100ml
Guidelines/Standards	*>6.5**	*0.01*	*0.9*[1]	*6.5- 9*[1]	*	*1.5*[1]	-
7 Mar 96 US	11.7	0.014	0.016	8.8	17.9	0.202	-
DS	3.0	0.540	1.800	8.4	18.5	0.239	-
19 Jun 96 US	12.1	0.023	0.048	7.2	4.1	0.175	-
DS	12.0	0.050	0.220	7.2	4.2	0.177	-
18 Sep 96 US	17.7	0.013	0.012	9.3	13.0	0.205	-
DS	17.2	0.230	0.710	9.2	12.9	0.220	-
6 Dec 96 US	10.8	0.026	0.028	8.0	14.5	0.199	-
DS	10.5	0.460	1.800	8.0	14.7	0.223	-
21 Mar 97 US	10.5	0.031	0.021	7.8	15.0	0.169	-
DS	10.4	0.026	0.360	7.8	15.0	0.179	-
12 Jun 97 US	10.9	0.045	0.015	7.3	13.1	0.211	-
DS	10.3	0.620	2.400	7.9	13.1	0.248	-
17 Dec 97 US	10.8	0.028	0.041	7.6	9.4	0.208	-
DS	10.4	0.110	0.480	7.6	9.4	0.215	-
30 Mar 98 US	7.8	0.068	0.080	6.9	11.4	0.188	-
DS	7.8	0.120	0.180	6.9	11.4	0.190	-
3 Jun 98 US	10.2	0.028	0.077	7.1	5.8	0.204	-
DS	10.2	0.065	0.310	7.1	5.8	0.208	-
2 Sep 98 US	11.0	0.018	0.028	7.5	6.3	0.198	-
DS	10.9	0.088	0.290	7.5	6.4	0.197	-
3 Dec 98 US	11.0	0.025	0.010	8.0	13.0	0.207	-
DS	11.2	0.510	0.820	8.0	13.5	0.231	-
4 Mar 99 US	11.76	0.057	0.004	7.9	14.5	0.255	610
DS	9.24	0.822	6.000	7.7	14.5	0.354	51,000
25 Mar 99 US	10.6	0.041	0.020	7.7	12.9	0.171	2,700
DS	10.1	0.250	0.820	7.5	12.9	0.187	3,600
10 Feb 00 US	10.2	0.042	0.010	7.9	19.0	0.194	390
DS	10.6	0.141	0.530	8.1	19.0	0.203	2,000
13 Mar 00 US	10.2	0.055	0.059	7.7	11.8	0.169	19,000
DS	9.6	0.650	1.700	7.8	12.0	0.222	34,000

Date US/DS*	DO (mg/L)	DRP (mg/L)	Amm-N (mg/L-N)	pH	Temp (°C)	Con. (mS/cm)	FC CFU/100ml
Guidelines/Standards	*>6.5**	*0.01*	*0.9[1]*	*6.5- 9[1]*	*	*1.5[1]*	-
30 Mar 00 US	12.82	0.123	0.010	8.0	15.0	0.221	340
DS	12.26	0.288	0.660	8.1	15.0	0.232	2,000
7 Dec 00 US	10.19	0.067	0.040	7.6	17.5	0.194	420
DS	10.62	0.316	0.530	7.7	18.0	0.208	1,200
7 Feb 01 US	9.64	0.004	0.010	7.5	11.5	0.226	290
DS	10.28	0.815	1.830	7.5	11.4	0.269	2,700
26 Mar 01 US	10.2	0.026	0.034	8.2	18.0	0.233	1,900
DS	9.0	0.720	3.400	7.8	18.0	0.277	14,000
28 Feb 02 US	8.73	0.342	0.430	7.5	13.0	0.191	6,500
DS	8.23	1.080	2.880	7.4	13.5	0.265	104,600
4 Apr 02 US	12.18	0.206	0.260	8.4	14.5	0.204	280
DS	10.97	1.220	2.460	8.0	14.5	0.254	16,330
6 Nov 02 US	10.16	0.021	0.560	7.6	15.0	0.181	1,800
DS	10.11	0.020	1.150	7.5	15.0	0.193	14,000
3 Feb 03 US	10.23	0.045	0.020	7.6	15.0	0.189	3,400
DS	10.06	0.434	1.170	7.4	16.0	0.211	3,500
25 Feb 03 US	9.7	0.029	0.021	7.7	15.8	0.191	2,500
DS	8.9	0.360	1.200	7.8	16.4	0.212	4,200

Notes: US = upstream of the discharge
DS = 100m downstream of the discharge
* Water Quality Standard for Lowland Waterbodies (refer to Appendix C of this document)
(1) ANZECC 2000 Guidelines for the Protection of Aquatic Life

In addition to the above monitoring, samples were analysed for turbidity on 25 March 1999. The upstream sample was 12 NTU while the downstream was 11 NTU.

In addition to the monitoring data collected by SDC, Environment Southland also collects monitoring data from around the region. Environment Southland's monitoring data from upstream and downstream of the WWTS discharge is contained in Table 5.3(b) below.

Table 5.3(b) - Water quality in the Winton Stream upstream and downstream of the discharge point for treated wastewater from the Winton WTS from Environment Southland Monitoring

Date US/DS*	Nitrate-N (mg/L-N)	Con. (µS/cm)	Total Coliforms (cfu/100ml)	E. Coli (CFU/100ml)
12 May 01 US	-	>243	-	-
DS	-	>245	-	-
27 Jun 01 US	-	241	-	1700
(am) DS	-	-	-	-
27 Jun 01 US	2.3	155.5 & 113.2	-	98
(pm) DS	-	169.3	-	720
28 Jun 01 US	2.3	-	5200	1700
DS	-	-	-	-

The monitoring data in Table 5.3(a) shows that the discharge of effluent from the Winton oxidation pond is having a significant effect on the concentration of ammonia-nitrogen in the Winton Stream,

and to a lesser extent the DRP concentration. The effect on faecal coliform bacteria concentrations is less clear cut, with significant increases at some test dates and very little increase at other times.

The increases in ammonia concentration in the Winton Stream downstream of the discharge appear to be very high because the upstream ammonia concentrations are quite low. The increased ammonia concentrations are of concern because of the potential toxicity of ammonia to fish.

The total nitrogen concentration is of more concern in relation to its effect on nuisance algae and periphyton growth. However, it is not possible to determine whether the total nitrogen concentration is increased by a similar magnitude because total nitrogen concentrations have not been measured. The two measurements of nitrate concentration in the Winton Stream made by Environment Southland show a relatively high concentration of 2.3mg/L upstream of the discharge. This suggests that total nitrogen concentrations may be high upstream of the discharge, and the increase in total nitrogen concentration downstream of the discharge may be small.

The DRP concentrations in the Winton Stream both upstream and downstream of the discharge could also stimulate nuisance algae and periphyton growth. However, it is not known whether nitrogen or phosphorus is the limiting nutrient in the Winton Stream.

For the time being it is recommended that the wetland is constructed and monitoring of the stream continue, with the addition of total nitrogen and nitrate-nitrogen to the monitoring suite. The monitoring will show any improvements in the levels of nutrients as a result of the WWTS discharge.

5.3.2 Effects on Aquatic Ecology

Section 4.3 of the *"Condition 15 Report"*, contained in Appendix B of this document, assessed the effects of the discharge on the aquatic ecology in the Winton Stream. The assessment relies on two investigations undertaken by Fish and Game in the summer and winter of 1994. The assessment concludes that the existing discharge is likely to be having an effect on the aquatic ecology, especially on a seasonal basis.

No other macro-invertebrate testing has been carried out to determine the effects of the discharge since 1994.

5.4 Effects on Cultural Values

Te Whakatau Kuapapa o Murihiku provides a comprehensive list of archaeological sites in Southland (listed in Appendix B of the document). A review of the list shows that there are no sites in the immediate vicinity of the WWTS. It is recognised however that the database may not necessarily provide a complete picture of archaeological sites or wahi taonga (special places) in the immediate area.

The maintenance of water quality and quantity are paramount resource management issues to Ngai Tahu. Te Whakatau Kuapapa o Murihiku states that:

"Ngai Tahu resource management is primarily focussed on the ethic of sustainability and the long term welfare of the environment, and therefore the long term welfare of the people within that

environment... To this end, the utmost effort must be made to maintain and increase the quality and quantity of water in all waterways. Further deterioration, of either water quality or quantity is unacceptable to Ngai Tahu."

As outlined in Section 5.3 above, the results of water quality monitoring and the 1994 analysis of the aquatic ecology of the Winton Stream shows that the existing discharge of treated wastewater from the WWTS is causing an adverse effect on the aquatic environment. This is evidenced from the elevated levels of nutrients downstream of the discharge, especially during warmer weather, and at times, from elevated levels of indictor bacteria contamination. However, it is also acknowledged that the Winton Stream has a poor water quality generally.

Te Ao Marama provided comment on the WWTS prior to the lodgment of the 1997 resource consent applications. Their comments were:

- Discharge to waterways is a concern.
- They are seeking concentrations of less than 150FC/100mL in the treated wastewater.
- It was noted the channels don't seem to be working very well.
- Alternatives, mitigation and upgrades, to the extent practicable, should be investigated
- Concerned when oxidation ponds are not performing efficiently, specially when faecal coliforms (and the potential for human pathogens) are high
- Noted that the background nitrates are likely to be quite high, as with lots of streams in the area.

In addition, the *"Condition 15 Report"*, in Section 2, identifies a number of issues raised by submitters during the 1997 consent process. One of the issues noted is that *"the discharge is contrary to iwi policy as it effects mana and mauri of the waterway"*. Along with other issues identified by submitters, this is one of the key drivers for Condition 15 of the existing discharge permit (refer to Appendix A). As required by this condition, an assessment of land disposal and treatment options for the WWTS was carried out and presented in the *"Condition 15 Report"*. The outcome of this assessment is that a constructed wetland is the only practicable land treatment option for the WWTS, as land disposal of the treated wastewater was not considered feasible. Accordingly, the SDC propose upgrading the WWTS by adding a 1.4 hectare constructed wetland in accordance with the outcome of this assessment. It is anticipated that this may address some of the concerns expressed by Te Ao Marama with regards to the WWTS discharge.

It is acknowledged that at the time of lodging this application, the issues associated with a new consent for the WWTS had not been specifically discussed with Kai Tahu. Having made this statement, the *"Condition 15 Report"* was sent to Te Ao Marama by Environment Southland in February 2003, as a submitter to the 1997 resource consent application. Although comment was sought on that report, no comment has been received to date. However, once this application is lodged, SDC does propose consulting with Te Ao Marama with regards to this resource consent renewal.

6. Alternative Options for Treatment and Disposal of Wastewater from Winton

The *"Condition 15 Report"* contained in Appendix B of this document, is an assessment of land treatment and disposal options for the WWTS.

The *"Condition 15 Report"* undertook a review of the following options:

1. Land Treatment and Disposal Options
    - Slow rate infiltration disposal
    - Rapid infiltration disposal
2. Land Contact Treatment Options and Disposal to Surface Water
    - Constructed Wetland
    - Weeded Channels
    - Overland Flow
3. Other Treatment Options and Disposal to Surface Water
    - Trickling filters
    - Rotating biological contactors
    - Sand filters
    - Activated sludge processes.

The *"Condition 15 Report"* states that *"it concentrates on the land treatment and disposal options and land contact treatment and disposal to surface water options. The other treatment options and disposal to surface water were not considered because:*

- *Condition 15 requires investigation and reporting on alternative **land-based** methods of disposal*
- *The current treatment system is considered to be adequate*
- *Any other treatment option is likely to add to any upgrade costs (ie it may not avoid the need for a land-based method)."*

As a result of the assessment undertaken, the *"Condition 15 Report"* concludes that:

"... based on the available information, a constructed wetland is considered a feasible option. The cost of a wetland is estimated to be between $270,000 and $644,000 plus the cost of land and a lining system (if required). Where a lower degree of treatment is acceptable the lower cost would apply and, conversely, where a high degree of treatment is required the higher cost will apply."

Given this assessment, the SDC propose constructing a 1.4 hectare wetland at the WWTS.

7. Consultation Undertaken

This document has been prepared in order to meet the statutory requirement (S.124(a) of the RMA) to lodge new resource consents 6 months prior to the expiry of the existing discharge permit (Consent No. 97198). The existing discharge permit expires on 4 December 2003. By ensuring that this application is lodged with Environment Southland by 24 June 2003, the SDC can continue to lawfully operate the WWTS under the requirements of the original resource consent until the new consent is granted.

In order to meet this timeframe, this application has relied heavily on existing information and has not undertaken specific consultation with affected and interested parties. For this reason, it is proposed that once the application has been lodged the affected and interested parties will be consulted.

The affected and interested parties are considered to be:

- Kai Tahu C/o Te Ao Marama
- Fish and Game New Zealand
- Department of Conservation
- Public Health South
- Royal Forest and Bird Society of New Zealand Ltd
- Adjoining Landowners
  - LN and PD Warnock
  - CW & HE Pirie
  - Sleepy Acres Ltd

Although consultation has not been undertaken specially in regard to this resource consent renewal, the submitters on the 1997 resource consent were invited by Environment Southland, in February 2003, to provide comment on the *"Condition 15 Report"*. To date, Fish & Game, Forest & Bird and Public Health South have responded (refer to Appendix D). Although these organisations generally supported the concept of the constructed wetland for improving effluent quality, the following concerns were also raised:

- **Fish & Game** - Considered it essential that the option chosen for further treatment results in a lowering of ammonia, DRP, conductivity and faecal coliform counts in the Winton Stream. Also suggested that performance standards for the WWTS are considered.
- **Public Health South** - Concerned about faecal coliform bacteria concentrations in the Winton Stream. Recommended that the wetland should be lined to avoid possible contamination of groundwater. Also concerned about effects of the discharge on other water users, including the Branxholme water intake on the Oreti River.
- **Forest & Bird** - Were concerned about the effluent quality from a wetland. Also suggested uv disinfection could be required.

The proposed constructed wetland will provide improvements in effluent quality (reduced BOD, SS and faecal coliform bacteria concentrations) that will address most of the concerns raised by the

submitters above. However, the wetland will not significantly reduce the ammonia concentration except under favourable climatic conditions, primarily over summer. Fortunately, the time of year when ammonia reduction in the wetland will be most effective will coincide with the low flows in the Winton Stream. There should therefore be a reduction in ammonia concentrations in the stream at the most critical low flow periods.

Ammonia concentrations and significant removal of total nitrogen can be achieved by wetlands where the ammonia is nitrified (converted to nitrate) prior to entering the wetland. However, this would require increased aeration in the oxidation pond or the construction of a nitrifying filter prior to the wetland. For the time being it is recommended that the wetland is constructed and monitoring of the stream continue, with the addition of total nitrogen and nitrate-nitrogen to the monitoring suite. The monitoring will show any improvements in the levels of nutrients as a result of the WWTS discharge.

8. Proposed Monitoring and Suggested Resource Consent Conditions

To discharge treated wastewater from the Winton Wastewater Treatment Systems into Winton Stream, for a term of 20 years, subject to the following conditions:

- ***Monitoring*** – The consent holder shall undertake monitoring in general accordance with the programme outlined in Conditions 6 to 12 of Consent No. 97195 (refer to Appendix A of this document). Total nitrogen and nitrate nitrogen shall also be added to the list of parameters sampled, as identified in Condition 6 of Consent No. 97195. The results of all monitoring shall be forwarded to Council's Director of Environmental Management annually, within three months of the anniversary of grant of this consent.
- ***Limits and Standards***
  - For the purposes of this consent, the zone of reasonable mixing in Winton Stream shall extend from five metres upstream of the discharge point to 100 metres downstream.
  - The minimum standard for lowland waterbodies, in accordance with Rule 3 of the Proposed Freshwater Plan for Southland, shall apply and be maintained outside of the mixing zone.
- ***Treatment System Operation*** – There shall be not addition of nitrogen, phosphorous or sulphur based chemicals to the treatment system without the authorisation of the Council's Director or Environmental Management.
- ***Signage*** – The consent holder shall ensure that signage informing the public that the discharge of treated wastewater is occurring. The signage shall be maintained in a prominent place near the discharge point.
- ***Complaints*** – The consent holder shall maintain a register of complaints received about the wastewater treatment and disposal system. The register shall record the response and actions taken to each complaint. The complaints register shall be forwarded to Council's Director of Environmental Management annually, within three months of the anniversary of grant of this consent.
- ***Accidental or Emergency Discharges*** - In the event of an emergency or accidental discharge of wastewater or partially treated waste to land or water, the consent holder shall, without undue delay, notify the Branxholme water treatment plant, Medical Officer of Health, the Area Manager of the Department of Conservation, Te Ao Marama and Council's Director of Environmental Management.
- ***Review of Conditions*** – The consent holder may apply to the Council for a change to the monitoring conditions at the annual anniversary of the grant of this consent.

References

Davies-Colley, Hickey and Quinn (1989) *"Effluent characteristics of domestic sewage oxidation ponds and their potential impacts on rivers"*. NZ Jour Marine and Freshwater Research Vol 23, pp 585 - 600.

DSIR Soil Bureau (1968) *"General Survey of the soils of the South Island, New Zealand. Soil Bureau Bulletin 27"*. New Zealand Department of Scientific and Industrial Research Soil Bureau, Wellington.

Ministry of Works and Development (1974) *"Guideline for the Design, Construction and Operation of Oxidation Ponds"* Ministry of Works and Development, Wellington.

Montgomery Watson (Now MWH New Zealand Ltd) (December 1997) *Winton Oxidation Pond Discharge – Resource Consent Application and Technical Support Document and Assessment of Effects on the Environment (AEE)"*. Report prepared for the Southland District Council.

Robertson (1992) *"Oreti - New River Estuary Review of Existing Water Quality"*. A report prepared for Southland Regional Council by Barry Robertson and Associates, Dunedin.

Appendix A – Winton WTS Discharge Permit (Consent No. 97195)

Application no. A0005 Consent no. 97195

SOUTHLAND REGIONAL COUNCIL

Private Bag 90116
Telephone (03) 215-6197
Fax No. (03) 215-8081

Cnr North Road and Price Street
Waikiwi
Invercargill

DISCHARGE PERMIT

Pursuant to Section 105(1) of the Resource Management Act 1991, a resource consent is hereby granted by the **Southland Regional Council**

to Southland District Council (called the "consent holder")

COPY FOR YOUR INFORMATION

of P O Box 903, Invercargill

from 11th November 1998

PLEASE READ THIS CONSENT CAREFULLY AND ENSURE THAT ANY STAFF OR CONTRACTORS CARRYING OUT ACTIVITIES UNDER THIS CONSENT ON YOUR BEHALF ARE AWARE OF ALL THE CONDITIONS OF THE CONSENT.

DETAILS OF PERMIT

Purpose for which permit is granted: -		To discharge treated sewage to the Winton Stream
Location	- site locality :-	Winton
	- map reference :-	E46:493:392
	- receiving environment :-	Winton Stream
	- catchment :-	Oreti
Legal description :-		Lot 1, DP 5815, Block I, Winton Hundred
Expiry date :-		4th December 2003

SCHEDULE OF CONDITIONS

Consent Period

1. The consent period is five years.

Purpose

2. This consent authorises the discharge of oxidation pond treated sewage effluent, at a dry weather flow rate of up to 525 m^3/day and at a wet weather flow rate of up to 1,600 m^3/day, into Winton Stream at about map reference NZMS 260 E46:493:392.

3. This consent does not authorise the disposal of sludge or untreated sewage or wastes collected from any point in the reticulation or treatment systems.

Accidental or Emergency Discharges

4. In the event of an emergency or accidental discharge of sewage or partially treated sewage to land or water, the consent holder (or the consent holder's agent) shall, without undue delay, notify:

- the Branxholme water treatment plant;
- the Medical Officer of Health (or Health Protection Officer);
- the Area Manager (Murihiku) Department of Conservation;
- Te Ao Marama Inc; and
- the Council's Director of Environmental Management.

NB: The Branxholme water treatment plant, the Alliance Group Limited's Lorneville plant and Wensley Farms all abstract water downstream of the oxidation pond and should all be notified of any discharge of untreated sewage to Winton Stream.

Complaints

5. The consent holder shall notify the Council's Director of Environmental Management, in writing, of any complaints received about the sewage treatment and disposal system, and the actions taken, or to be taken, in response to each complaint, within 48 hours of receipt of the complaint.

Monitoring

6. The consent holder shall, on at least two occasions during the period 1 November to 31 March each year, monitor both:

   (a) the discharge of treated sewage effluent to Winton Stream by taking a representative sample of the discharge at the outfall to the receiving waters, at about NZMS 260 Series map reference E46:493:392, and analysing the sample for the following:

   - Temperature
   - Electrical Conductivity
   - Dissolved Oxygen concentration
   - Carbonaceous Biochemical Oxygen Demand (BOD_5) concentration
   - Total Suspended Solids concentration
   - Faecal Coliform concentration (by the MPN method)
   - Total Ammonia Nitrogen concentration (NH_4^+-N and NH_3-N)
   - Total Phosphorus concentration.

   (b) the receiving waters, upstream and 100 metres downstream of the point of discharge, by taking representative samples and analysing each sample for the following:

   - pH
   - Temperature
   - Electrical Conductivity
   - Dissolved Oxygen concentration
   - Black disk distance
   - Faecal Coliform concentration (where practicable by the MF method)
   - Total Ammonia Nitrogen concentration (NH_4^+-N and NH_3-N)
   - Dissolved Reactive Phosphorus concentration

   The discharge and receiving water samples shall be taken at about the same time, within a one hour period, on each monitoring occasion.

7. (a) The monitoring occasions specified in condition 6 are to be at least 30 days apart.

   (b) For the purpose of condition 6 representative samples shall be grab samples.

   (c) Sample collection, preservation and analysis, as required by condition 6, shall be carried out in accordance with the most recent edition of APHA "Standard Methods for the Examination of Water and Wastewater".

   (d) The monitoring and analyses are to be carried out by a laboratory with IANZ registration or equivalent, or as agreed to, in writing, by the Council's Director of Environmental Management.

   (e) The results of analysis, carried out in accordance with condition 6, shall be supplied to the Council no later than 20 working days from the end of the month in which the samples are taken. The methods of analysis are to be specified with the results.

8. The consent holder (or the consent holder's agent) shall maintain a log of inspections and works carried out on the treatment system and make the log available, upon request, to the Council's Director of Environmental Management or a Health Protection Officer.

Limits and Standards

9. For the purposes of this consent the zone of reasonable mixing in Winton Stream shall extend from 5 metres upstream of the pond outfall to 100 metres downstream of the outfall.

10. The minimum standards for Class D waters, as described in the Council's Transitional Southland Regional Plan, shall apply and be maintained in respect of the exercise of this permit beyond 100 metres from the point of discharge to the Winton Stream. A copy of the standards for Class D waters is appended to these conditions.

11. For the purposes of condition 10, a conspicuous change in clarity shall be a 20% reduction in black disk distance.

12. The concentration of total ammonia nitrogen in Winton Stream, beyond the zone of reasonable mixing, may not exceed the following tabled values at the appropriate pH and temperature as a result of any discharge made pursuant to this consent:

Total Ammonia Nitrogen Concentration (mg/litre NH_3-N & NH_4^+-N)
Temperatures (°C)

pH	0	5	10	15	20	25	30
6.5	29.0	26.0	25.0	25.0	24.0	16.4	11.8
6.75	26.0	25.0	23.0	22.0	22.0	15.3	10.9
7.0	23.0	21.0	21.0	20.0	18.9	13.5	9.5
7.25	19.0	18.0	16.0	16.2	15.8	11.0	7.8
7.5	14.3	13.4	12.7	12.2	12.0	8.4	6.0
7.75	10.0	9.4	9.0	8.6	8.5	5.9	4.3
8.0	6.6	5.6	5.8	5.7	5.6	4.0	2.9
8.25	3.7	3.5	3.4	3.3	3.2	2.3	1.72
8.5	2.1	2.0	1.89	1.89	1.89	1.41	1.05
8.75	1.21	1.15	1.12	1.13	1.16	0.88	0.68
9.0	0.71	0.68	0.68	0.71	0.75	0.59	0.48

Treatment System Operation

13. There shall be no addition of nitrogen, phosphorus or sulphur based chemicals to the treatment system without the authorisation of the Council's Director of Environmental Management.

14. The consent holder shall, within 1 month of the date of commencement of this consent, erect and maintain signage, in a prominent place near the pond outfall to Winton Stream informing the public of food gathering hazard due to the discharge of treated human effluent to Winton Stream.

Report on Treatment Improvements and Land Disposal

15. The consent holder shall:

(a) by 1 June 2001, investigate and report, to the Council and the submitters to the application, on:

(i) the effectiveness of the effluent treatment improvements;
(ii) the effect of the discharge on the environment; and
(iii) alternative land-based methods of disposal;

(b) by 1 December 2001, develop an action plan to implement any improved or alternative effluent treatment or disposal systems, after consultation with the submitters to this application.

NB: 1. The action plan is intended to specify improvements that will be implemented at, or within a short period of, the commencement of the next consent for this discharge in 2003.

2. It is preferable that the applicant and submitters reach agreement concerning the action plan.

Annual Charges

16. The consent holder shall pay Southland Regional Council an administration charge, set by Special Order under the Resource Management Act, payable in advance on the first day of July each year.

Review of Conditions

17. The consent holder may apply to the Council for a change to conditions 6 and 7 in the month of June each year.

18. Southland Regional Council may in accordance with the conditions of this resource consent and Sections 128 and 129 of the Resource Management Act 1991, serve notice of its intention to review the conditions of this consent, in the month of June each year, for the purposes of:

    (i) dealing with any minor additions or alterations to the sewage treatment and discharge system;
    (ii) dealing with any adverse cumulative effects on the environment which may arise from the exercise of this consent; or
    (iii) complying with the requirements of a regional plan.

For: **THE SOUTHLAND REGIONAL COUNCIL** 4th December 1998

W J Tuckey
DIRECTOR OF ENVIRONMENTAL MANAGEMENT

SRC/08/92

Appendix I
Standards for Class D Waters

The quality of Class D waters shall conform to the following requirements:

a) The natural water temperature shall not be changed by more than 3 degrees Celsius.

b) The acidity or alkalinity of the waters as measured by the pH shall be within the range of 6.0 to 9.0 except when due to natural causes.

c) The waters shall not be tainted so as to make them unpalatable, nor contain toxic substances to the extent that they are unsafe for consumption by farm animals, nor shall they emit objectionable odours.

d) There shall be no destruction of natural aquatic life by reason of a concentration of toxic substances.

e) The natural colour and clarity of the waters shall not be changed to a conspicuous extent.

f) The oxygen content in solution in the waters shall not be reduced below 5 milligrams per litre.

Appendix B – Winton Sewage Treatment and Disposal Plant – Resource Consent Condition 15 Report

Southland District Council

Winton Sewage Treatment and Disposal Plant Resource Consent Condition 15 Report

August 2001

MWH
MONTGOMERY WATSON HARZA

This report has been prepared solely for the benefit of Southland District Council. No liability is accepted by this company or any employee or sub-consultant of this company with respect to its use by any other person.

This disclaimer shall apply notwithstanding that the report may be made available to other persons for an application for permission or approval or to fulfil a legal requirement.

Quality Assurance Statement	
MWH New Zealand Ltd **31 Stafford Street** **PO Box 4, Dunedin** **Ph 0-3-477 0885** **Fax 0-3-477 0616**	**Prepared by:** Rima Lee **Reviewed by:** John Cocks **Approved for issue by:** Project Manager August 2001—RML 801/47317-19

Southland District Council

Winton Sewerage Scheme
Resource Consent
Condition 5 Report

Contents

Executive Summary

The Winton oxidation pond was built in 1962 and services the township of Winton. The oxidation pond discharges treated wastewater into two planted channels and then the effluent is discharged into Winton Stream.

A permit to discharge oxidation pond treated sewage at a maximum rate of $700m^3$/day to Winton Stream expired on 23 May 1995. A resource consent was granted on 11 November 1998 for a period of 5 years to allow the assessment and development of alternative oxidation pond effluent treatment and disposal options that would address the concerns about water quality effects on the Winton Stream. The discharge permit allows the discharge of oxidation pond treated sewage effluent at a dry weather flow rate of up to $525m^3$/day and at a wet weather flow rate of up to $1600m^3$/day into Winton Stream.

Condition 15 of the resource consent states that:

> *"(a) By 1 June 2001, investigate and report, to the Council and submitters to the application, on:*
>
> *(i) the effectiveness of the effluent treatment improvements;*
>
> *(ii) the effect of the discharge on the environment; and*
>
> *(iii) alternative land-based methods of disposal;*
>
> *(b) By 1 December 2001, develop an action plan to implement any improved or alternative effluent treatment or disposal systems, after consultation with the submitters to this application."*

The Council commissioned MWH New Zealand Ltd to undertake this report addressing the requirements of Condition 15 of the resource consent.

The Effectiveness of the Effluent Treatment Improvements

The following improvements have been made:

- Additional flax planting was undertaken in 1998
- The planted channels are now loaded simultaneously
- A baffle-type screen was installed on the pond outlet
- The farmer (lessee) has erected some temporary electric fencing which prevents stock from accessing the channels.

The monitoring results at the outfall after the improvements do not show any discernible improvement in effluent quality over the monitoring results prior to improvements being made. Therefore it is concluded that the improvements made to the channels and operation were not effective in improving effluent quality. However, the Council reports that no odour complaints have been received regarding the oxidation ponds and the discharge outlet.

The Effect of the Discharge on the Environment

With regard to the water quality of the Winton Stream, monitoring results show that the pH, dissolved oxygen and temperature parameters of the Winton Stream do not appear to have been adversely affected by the discharge. The ammoniacal nitrogen, dissolved reactive phosphorous, faecal coliforms and conductivity levels do appear to have increased downstream of the discharge. However, the ammoniacal nitrogen levels do comply with the resource consent requirements. The resource consent conditions do not set a quantitative range for dissolved reactive phosphorous, faecal coliforms and conductivity to comply with.

The effect of the discharge on the aquatic ecology in the Winton Stream is unknown as no macro-invertebrate testing has been undertaken since 1994 when two investigations were undertaken. These concluded that the discharge did have an adverse effect but that it was a seasonal problem. However, the water quality monitoring shows that the downstream faecal coliforms, ammoniacal nitrogen, conductivity and dissolved reactive phosphorous concentrations are elevated compared to the upstream concentrations. Therefore the discharge is likely to be having an effect on the aquatic ecology. Irregular single macro-invertebrate sampling events are unlikely to illustrate effects conclusively.

Site visits have indicated that the intensity and degree of offensiveness of odours produced by the Winton Oxidation pond is low. Council records indicate that no official complaints regarding odour have been received about the oxidation pond, weeded channels or outfall since 1998. Thus, it is assumed that offensive or objectionable odours have not been produced beyond the site boundary.

Winton Stream is a moderately small watercourse with a median flow of $0.69m^3/s$. Winton Stream supports brown trout and native fish populations. However, it is noted that the stream is not popular for recreation and public access to the stream is limited. Upstream and downstream of the discharge, ANZECC 1992 guideline levels for primary contact recreational activities are exceeded. The site is fenced and the site is appropriately sign posted and secured by two locked gates.

Due to the location and well-maintained condition of the oxidation pond and weeded channels, it is considered that the non-contact recreational attributes of Winton Stream and environment are not significantly compromised by the discharge. The only noise emitted from the system is the operation of the aerators, which emit a very low level of sound.

Alternative Land Based Methods of Disposal

Further treatment and disposal of the oxidation pond effluent may be achieved by:

1. Land Treatment and Disposal Options
    - Slow rate infiltration disposal
    - Rapid infiltration disposal
2. Land Contact Treatment Options and Disposal to Surface Water
    - Constructed Wetland
    - Weeded Channels
    - Overland Flow

3. Other Treatment Options and Disposal to Surface Water
   - Trickling filters
   - Rotating biological contactors
   - Sand filters
   - Activated sludge processes.

However, the other treatment options and disposal to surface water are not within the scope of this report which is investigating alternative land-based disposal methods.

Due to unsuitable soil and groundwater conditions rapid infiltration was not considered suitable so was not investigated further. The following table summarises the analysis of the remaining options.

Factor	Slow Rate Treatment & Disposal	Floating Aquatic Plants	Constructed Wetland Treatment	Overland Flow
Area (ha)	27	1.7-2.5	1.2-4	5
Storage (m^3)	10,000	Nominal	Nominal	Nominal
Management	Foliage harvest	Foliage harvest	Foliage care	Foliage harvest
Structures	Inlet & outlet Wet weather storage Irrigation system Recirculation facility	Inlet & outlet Ditch formation	Inlet & outlet Channel formation	Inlet & outlet Land levelling Recirculation facility
Effluent Quality	Highest	Variable	Variable	Variable
Capital Costs	\$645,000 + *Land Cost* (Drip Application) \$367, 000 + *Land Cost* (Sprinkler Application)	Not Estimated	\$270,000 - \$644, 000 + *Land Cost*	\$383,000 + *Land Cost*
Operation & Maintenance Costs	\$24,000/yr		\$14,000	\$17,000
Issues to be resolved	• Cost and location of land • Soil suitability • Wet weather storage requirements • Operation and control system • Public health issues with sprinkler application • Design basis (ie hydraulic or nitrogen controlled)	Further investigation needed to determine performance of locally available plants and cost of system.	• Cost and location of land • Need for liner • Wet weather storage requirements (if any) • Design basis (ie hydraulic or nitrogen controlled)	• Cost and location of land • Degree of treatment • Operation and control system • Wet weather storage requirements (if any)

The indicative costs did not include:

- Investigation, planning and design fees
- Purchase of land
- Additional pumping costs if land treatment site is not adjacent to oxidation pond
- Cost of storage facilities (needed for land disposal option)
- Contract administration and commissioning
- GST.

Of the four options and based on the available information, a constructed wetland is considered a feasible option. The cost of a wetland is estimated to be between $270,000 and $644,000 plus the cost of land and a lining system (if required). Where a lower degree of treatment is acceptable the lower cost would apply and, conversely, where a high degree of treatment is required the higher cost will apply. An approach to keep costs down initially would include:

- Proposing that a lower effluent quality is acceptable in winter when stream flows are higher
- Staging wetland construction and monitoring performance, and, if needed, adding further wetland 'modules'.

Slow rate treatment and land disposal would provide the highest degree of land-based treatment. However, there are significant issues to address before feasibility of this option can be compared with the wetland option. These issues particularly include the design irrigation basis (ie hydraulic control or nitrogen control), the availability and cost of land, the type of soils at a selected site (land area requirements may increase with certain soils) and volume of storage required (which may necessitate raising oxidation pond banks or constructing a new pond). The high inflow and infiltration into the Winton sewerage poses greater requirements for land disposal than with the other disposal options.

With overland flow there are also significant issues to address before the feasibility of the option can be compared with the wetlands option. These issues are particularly the availability of suitable land and the acceptability of effluent quality.

The operational costs of the land disposal and overland flow options will be higher than the wetlands option because they have:

- Mechanical equipment and pump supplies
- Control requirements to change effluent application areas
- Land management requirements, probably involving stock.

For budgeting purposes, it would be appropriate to adopt the estimated costs for the wetland option plus the amounts for land cost.

The recommended process to determine which treatment system is preferable is to:

1 Consult on process to date and confirm objectives

2 Undertake the site investigation and other investigation requirements

3 Options re-calculation and confirmation based on new information

4 Decide on the preferred treatment and disposal system

5 Confirm the action plan.

Investigation requirements will include:

- Identify possible sites and land availability
- Soil and groundwater site investigation
- Topographic survey
- Climatic analysis to determine:
  - Storage requirements
  - Effluent variability during cold weather
- Flood risk and associated mitigation requirements (if any)
- Analyse recorded flows in more detail and determine storage requirements (for the land disposal option only).
- Preliminary design.

The decision criteria, which will be used to determine the preferable option, include:

- Land availability and cost
- Development and operational costs
- Performance objectives (effluent quality)
  - Environment Southland
  - Affected parties
  - District Council.

1. Introduction

1.1 Purpose

The purpose is to secure long-term resource consents, with appropriate conditions, for the discharge of treated sewage from the Winton sewage treatment plant.

1.2 Scope

A resource consent was granted on 11 November 1998 for a term of 5 years. Condition 15 of the consent required the consent holder to:

> *" (a) By 1 June 2001, investigate and report, to the Council and submitters to the application, on:*
>
> *(i) the effectiveness of the effluent treatment improvements;*
>
> *(ii) the effect of the discharge on the environment; and*
>
> *(iii) alternative land-based methods of disposal;*
>
> *(b) By 1 December 2001, develop an action plan to implement any improved or alternative effluent treatment or disposal systems, after consultation with the submitters to this application."*

This report has been prepared to address Condition 15.

1.3 Watershed Management

The quality of the water in Winton Stream is affected by both point source discharges, such as the discharge from Winton Sewage Treatment Plant, and non-point discharges such as discharges from drains. A holistic approach to water quality management is achieved through understanding the relative effects of all discharges and managing them accordingly. This is termed watershed management.

A watershed management approach may be appropriate for the Winton Stream. Watershed management is a systems approach to water quality protection whereby all activities in a catchment that contribute to the degradation of the water quality are examined. This includes examining both the characteristics and quantity of all of the flows entering the watercourse including point and non-point discharges from such activities as dairy discharges, fertilisers, municipal sewage treatment dischargers, industrial discharges etc.

By identifying the base water quality and what sources are significant contributors and by prioritising improvement efforts, water quality can be protected to a better degree. A better understanding of what is causing the effects on the environment can be gained.

Watershed management would be relevant in the Winton situation as the effluent discharge is upstream from the water supply source and there are numerous other discharges affecting the water quality both upstream and downstream of the discharge at Winton. This approach would allow the discharge from the oxidation pond and weeded channel to be put into context with other discharges into the stream and allow the Council to determine where efforts could best be made to improve water quality in the Winton Stream.

2. Background

The Winton oxidation pond was built in 1962 and services the township of Winton. In the past, a clarigester and drying beds were utilised as part of the sewage treatment. However, these suffered operating problems and it was found that the oxidation pond provided suitable treatment on its own. The clarigester and drying beds were decommissioned.

The oxidation pond discharges treated wastewater into two planted channels. After travelling the length of the channels, the effluent is discharged into Winton Stream. A diagram showing the layout of the existing system can be seen in Appendix A and photographs of the site in Appendix B.

A permit to discharge oxidation pond treated sewage at a maximum rate of 700m^3/day to Winton Stream expired on 23 May 1995.

The Southland District Council (the Council) lodged an application, in December 1997, to renew the discharge permit. However, during the pre-hearing meeting on 1 September 1998 submitters raised the following issues:

- the proposed consent period of 15 years was considered too long and opposed by most submitters
- the discharge was contrary to iwi policy as it effects the mana and mauri of the waterway
- the discharge is upstream of a major water supply abstraction point for Invercargill City (Branxholme Treatment Plant)
- macro-invertebrate monitoring should be included in the proposed monitoring but should occur in late winter/spring or autumn
- water quality monitoring should be concentrated in summer low flow periods and should include faecal coliform monitoring
- concern about the proposed mixing zone of 1 kilometre was expressed.

The Council then modified the consent application to:

- reduce the term of consent to 5 years
- include resource consent conditions that state:
  - by 3½ years into the consent period the consent holder shall investigate and report on the effectiveness of proposed treatment improvements, effect of the discharge on the environment and alternative land-based methods of disposal
  - by 4 years the consent holder shall have consulted with the original submitters and developed an action plan to implement any further upgrade that has been agreed to and submitted a resource consent application
- include downstream monitoring of the Winton Stream, to be undertaken on the true right bank at a point 100m downstream of the discharge (it was reassessed that the discharge would become fully mixed across the stream within 100m).

After the submitters gave their approval to these modified conditions, the discharge permit was granted on 11 November 1998.

The discharge consent was granted for a period of 5 years to allow the assessment and development of alternative oxidation pond effluent treatment and disposal options that would address the concerns about water quality effects on the Winton Stream. The discharge permit allows the discharge of oxidation pond treated sewage effluent at a dry weather flow rate of up to 525m^3/day and at a wet weather flow rate of up to 1600m^3/day into Winton Stream.

Part of the resource consent application involved making improvements to the treatment system in order to improve the quality of the final discharge. These included:

- that the planted channels be loaded simultaneously, not alternately, as was the case
- that more vegetation be established in the channels
- that a screen be placed at the outlet of the oxidation pond
- that re-fencing be undertaken to improve grazing, litter control and access for maintenance.

Condition 15 of the resource consent states that:

"The consent holder shall:

(a) By 1 June 2001, investigate and report, to the Council and submitters to the application, on:

(i) the effectiveness of the effluent treatment improvements;

(ii) the effect of the discharge on the environment; and

(iii) alternative land-based methods of disposal;

(b) By 1 December 2001, develop an action plan to implement any improved or alternative effluent treatment or disposal systems, after consultation with the submitters to this application."

The Council has commissioned MWH New Zealand Ltd to assist with addressing the requirements of Condition 15 of the resource consent.

3. Effectiveness Of Effluent Treatment Improvements

3.1 Improvements Made

The following improvements have been made:

- Additional flax planting was undertaken in 1998. The plantings in the northern channel appear to be larger and better established than in the southern channel
- The planted channels are now loaded simultaneously. Modification to achieve this was carried out in February 1999
- A baffle-type screen was installed on the pond outlet in February 1999
- The farmer (lessee) has erected some temporary electric fencing which prevents stock from accessing the channels.

3.2 Analysis of Monitoring Data

Appendix C (Table 1 and Graphs C1 to C8) shows the monitoring undertaken at Winton Stream outfall. Samples have been collected twice annually between November and March since March 1996 to present day (with the exceptions listed below) and tested for different parameters. Table 3.2 shows the parameters and comments on the trends in the results.

Table 3.2 Trends in Monitored Parameters at Winton Stream Outfall

Parameter	Comment
BOD_5	• General trend of increasing concentrations • Higher variability in results since 7/03/99
Dissolved Oxygen (DO)	• General trend of decreasing DO concentration (indicating higher organic loadings) to 7/03/99 • From 7/03/99 trend of increasing DO concentration and DO variability
Ammoniacal Nitrogen	• Uniform average concentration to 7/03/00 then decreased average and decreased variability
Suspended Solids	• General trend of increasing concentration • Possible reduction in concentration indicated from 7/03/00
Temperature	• General uniform average temperature • Decrease temperature variability since 7/07/98
Conductivity	• Generally uniform average conductivity, with low spike in 1998
Total Phosphorus (from 4 March 1999)	• Generally uniform average with high spike in March 2000
Faecal Coliform (from 4 March 1999)	• Generally uniform average count with high count in March 1999

The graphs and the Table 1 indicate that there has been no obvious improvement in any of the monitored parameters after the improvements were made. Ammoniacal nitrogen, temperature and conductivity results are relatively constant over the monitoring period. Total suspended solids, dissolved oxygen and BOD_5 results have shown an increased variability and generally appear to have

increased. Faecal coliform and total phosphorus were not monitored prior to the resource consent being granted so the effect of the improvements on these parameters to the outlet channel can not be assessed.

3.3 Complaints

The Council reports that no odour complaints have been received regarding the oxidation ponds and the discharge outlet.

3.4 Conclusions

The monitoring results at the outfall after the improvements do not show any discernible improvement in effluent quality over the monitoring results prior to improvements being made. Thus it is concluded that the improvements made to the channels and operation were not effective in improving effluent quality. No official complaints were received regarding the oxidation ponds and the discharge.

4. Environmental Effects of Discharge

4.1 Overview of Potential Effects

The current discharge to the Winton Stream could potentially effect:

- water quality downstream
- aquatic ecology downstream
- air quality of surrounding area in terms of odour
- recreational stream use
- general amenity value
- Maori values.

4.2 Effluent and Water Quality

Appendix D (Table 2 and Graphs D1 to D7) shows the water quality monitoring results 5 metres upstream of the discharge and 100 metres downstream of the discharge outfall from May 1996 to January 2001. Resource Consent Condition 10 states that the minimum standards for Class D waters shall apply and be maintained beyond 100 metres from the point of discharge in the Winton Stream. The Standards for Class D Waters states:

"The quality of Class D waters shall conform to the following requirements:

a) *The natural water temperature shall not be changed by more than 3 degrees Celsius.*

b) *The acidity or alkalinity of the waters as measured by the pH shall be within the range of 6.0 to 9.0 except when due to natural causes.*

c) *The water shall not be tainted so as to make them unpalatable, nor contain toxic substances to the extent that they are unsafe for consumption by farm animals, nor shall they emit objectionable odours.*

d) *There shall be no destruction of natural aquatic life by reason of a concentration of toxic substances.*

e) *The natural colour and clarity of the waters shall not be changed to a conspicuous extent.*

f) *The oxygen content in solution in the waters shall not be reduced below 5 milligram per litre."*

The dissolved oxygen monitoring results (refer to Graph D1) do not show any significant differences between the upstream and downstream waters. On all but one downstream sampling event, the results comply with the Class D Water Standard that the oxygen content in solution in the waters shall not be reduced below 5 milligrams per litre. The exception was 3 milligrams per litre recorded on 7 May 1996 and all sampling events since have been within the Class D Standards

The pH monitoring results (refer to Graph D2) do not show significant differences between the upstream and downstream results. On all but one sampling occasion the results were within the required Class D Water Standard range of 6.0 to 9.0. The exception was on the 18 September 1996

where the recorded pH was 9.2 however the upstream value was 9.3, therefore the elevated pH can not be attributed to the Winton effluent discharge.

The temperature monitoring results (refer to Graph D3) do not show a significant difference between the upstream and downstream results. On all sampling occasion the results were within the required Class D Water Standard of the natural water temperature not being changed by more than 3 degrees Celsius.

The ammoniacal nitrogen monitoring results (refer to Graph D4) show that there is a definite increase in the downstream ammoniacal nitrogen levels as compared to the upstream values. However, all readings comply with Condition 12 of the consent that the concentration does not exceed the tabled values at the appropriate pH and temperature.

The dissolved reactive phosphorous results (refer to Graph D5) show a significant increase in the downstream dissolved reactive phosphorous levels compared with the upstream levels. The indicative concentration range for the protection of aquatic ecosystems is 10 to 100 micrograms per litre for total phosphorus (ANZECC guidelines).

The faecal coliform monitoring results (refer to Graph D6) from the 4 Mar 1999 to the 7 February 2001 sampling period show a definite increase of the faecal coliform levels downstream of the discharge. The results also show the influence of other source(s) on faecal coliform counts in the stream (refer spike in March 2000).

The conductivity monitoring results (refer to Graph D7) show increases in the conductivity of the downstream water.

In summary, the pH, dissolved oxygen and temperature parameters of the Winton Stream do not appear to have been adversely affected by the discharge. The ammoniacal nitrogen, dissolved reactive phosphorous, faecal coliforms and conductivity levels do appear to have increased. However, the ammoniacal nitrogen levels do comply with the resource consent requirements. The dissolved reactive phosphorous, faecal coliforms and conductivity levels do not have a quantitative range of concentration level to comply with, in the discharge consent.

4.3 Effects on Aquatic Ecology

Two investigations of the Winton Stream have been commissioned by the Council and carried out by Southland Fish and Game Council. These were undertaken in summer 1994 and winter 1994. The first report, in summer, indicated that the discharge was not having an adverse effect on the macro-invertebrate population in the stream. The samples were collected when there was a dense mat of periphyton covering the bed of the stream. There was no obvious difference between upstream and down stream in terms of macro-invertebrate fauna abundance or diversity.

The second report, in winter 1994, suggested that the discharge was having an adverse effect as indicated by the presence of a large number of small red worms downstream and their absence upstream. The results given in the reports indicate that the effect may be seasonal.

The water quality monitoring shows that the downstream faecal coliforms, ammoniacal nitrogen, conductivity and dissolved reactive phosphorous concentrations are elevated compared to the upstream concentrations. Therefore the discharge is likely to be having an effect on the aquatic ecology.

However, since these reports in 1994 no further macro-invertebrate testing has been undertaken to determine the effect of the discharge on the aquatic ecology in Winton Stream. Thus, the current effect of the discharge on the aquatic ecology of the stream is not known. Irregular single macro-invertebrate sampling events are unlikely to illustrate effects conclusively.

4.4 Effects on Air Quality

Operational site visits have indicated that the intensity and degree of offensiveness of odours produced by the Winton Oxidation pond is low. The two aerators located in the pond may contribute to preventing the generation of odours. Council's records indicate that no official complaints regarding odour have been received about the oxidation pond, weeded channels or outfall since the resource consent was granted in 1998. Thus, it is assumed that offensive or objectionable odours have not been produced beyond the site boundary.

4.5 Effects on Recreational Stream Use

Winton Stream is a moderately small watercourse with a median flow of $0.69m^3/s$. Winton Stream has been straightened in the past, and then modified to re-establish a natural meander pattern. The stream supports brown trout and native fish populations. However, it is noted that the stream is not popular for recreation and public access to the stream is limited. Upstream and downstream of the discharge, ANZECC 1992 guideline levels for primary contact recreational activities are exceeded.

The site, including the pond and the planted channels, is fenced and the site is appropriately sign posted and secured by two locked gates.

4.6 Effects on General Amenity Value

Generally it is considered that, due to the level of treatment, the location and well-maintained condition of the oxidation pond and weeded channels, the non-contact recreational attributes of Winton Stream and environment are not significantly compromised by the activity and the discharge.

The only noise emitted from the system is the operation of the aerators, which emit a very low level of sound.

5. Alternative Land Based Methods of Disposal

5.1 Introduction

Many of the submitters to the resource consent application (in particular Arai Te Uru Eel Management, Southern Public Health, Forest and Bird, Southland Fish and Game Council and Department of Conservation), requested that land based disposal be further investigated. As a result, resource consent condition 15 requires that alternative land based methods of disposal be investigated and reported upon.

In order to determine the most appropriate system of disposal, the following has been undertaken:

1. Identify issues which will have an impact on the type of system chosen
2. Characterisation of the site based on information currently known
3. Determine the design sewage flows and loads
4. Describe some of the possible options, their advantages and disadvantages
5. Analyse those options that appear most appropriate based on current information
6. Outline an investigation plan to determine what further information is needed to select the preferred effluent treatment and disposal system.

5.2 Issues Identified

The following issues have been identified as having an impact on the type of effluent treatment and disposal system that will be finally selected:

- Site characteristics including amount of available land, topography, soil and groundwater conditions
- Expected growth or decline of Winton township and associated sewage flows and loads
- Effects on the environment
- The expense of the proposed system in terms of capital and operational expenditure
- Operation and maintenance requirements
- Iwi and other submitters preferences
- Environment Southland's policies such as the Regional Effluent Land Application Plan which states:
  - ***Policy 4.2.2- Discharge to land***
    Utilise land treatment of effluent and sludge where this can be undertaken in a sustainable manner and without significant adverse effects.
  - ***Policy 4.2.3 – Avoid where practicable, remedy or mitigate adverse effects on water***
    Avoid where practicable, remedy or mitigate adverse effects on water quality, water ecosystems and water potability from effluent and sludge discharges onto or into land.
  - ***Policy 4.2.4 – Precautionary approach***

Adopt a precautionary approach to the discharge of effluent and sludge onto or into land where there are uncertainties regarding adverse effects.

5.3 Characterisation of Site Based on Currently Known Information

5.3.1 Cadastral Site Location

The Winton Oxidation Pond, with its two aerators, is located approximately 2km south of Winton Township on Lot 1, DP 5815 Block 1, Winton Hundred. The area of land owned by the Southland District Council, at the oxidation pond site is 8.0173ha.

5.3.2 Soils and Topography

From published information (Soil Map of the South Island, New Zealand and Soil Bureau Bulletin No. 27) and field observations, the area is underlain by Gley Recent Soils of the Makarewa soil set, overlying outwash gravels. Generally, the Makarewa soil set comprise sandy loams to clay loams, around 0.30m thick, derived from underlying gravel. The gravel comprises poorly sorted, sub-rounded top rounded clasts, up to 0.25m across, in a rather tight silty, locally sandy, matrix. The gravel clasts are generally hard but towards the surface they become progressively weathered so that within the upper 1 m they have largely disintegrated into a sandy clay. Permeability of the gravels is generally low but layers of freer draining gravel form minor aquifers.

With respect to permeability of the soils underlying the site, the following assessments are made (Gunn, 1994):

- sandy loams to clay loams have moderate to slow drainage
- the sandy clay within the upper 1m is slowly draining
- the underlying gravel is free to rapid draining.

The topography of the site is that of a relatively flat flood plain.

However, this assessment of the soil conditions will require confirmation through a specific site investigation including soil profile logs from test pits.

5.3.3 Groundwater and Hydrology

In shallow excavations on the site, groundwater was observed at around 1.20 m below the ground surface. This is probably associated with a minor, shallow, perched aquifer. A more significant aquifer exists at approximately 4 m below the site, and is probably recharged by Winton Stream.

5.3.4 Vegetation

The site vegetation consists mainly of exotic grasses, with a row of pine trees to the East of the oxidation pond. The weeded channels are approximately 100m long and have been planted with flaxes to effect further treatment of the effluent before it is discharged to the Winton Stream.

5.3.5 Climate

The mean rainfall from 1965 to 1980 was 839mm per annum at the Winton climate station. Rainfall has been slightly varied throughout each year during the period of record (1963-1980), with between 8 to 13 days per month where rainfall exceeded 1mm or more. February experienced, on average, only 8 days of rainfall exceeding 1mm or more. May on the other hand experienced, on average, 13 days where rainfall exceeded 1mm or more. The range of mean monthly rainfall ranged from an average of 50mm in February to 93mm in May (New Zealand Meteorological Service).

Air temperatures between 1965 and 1980 ranged from a minimum of –6.8°C to 31.6°C. Average monthly minimum temperatures ranged from –4.2°C in July to 3.1°C in January and average monthly maximum's ranged from 14.8°C in July to 28.4°C in January over the same period.

Ground frost occurred approximately 118.1 days a year on average from 1965 to 1980. The majority of these fell between June to August. Over the same period, air frosts occurred around 40.9 days a year on average. These tended to occur between June to August.

Mean sunshine hours recorded at Winton for the period 1964 to 1980 were 1707 hours. The mean monthly sunshine hours over this period ranged from 93 hours in May to 192 hours in December.

Over the period of 1965 to 1980 there was, on average, 3.3 days of snow per year and 6 days of hail (New Zealand Meteorological Service, *Summaries of Climatological Observations to 1980*).

There was no evaporation data available from the Winton climate station.

5.4 Expected Flows and Loads

5.4.1 Population

The population of Winton was estimated, based on the 1996 Census, at 2191 persons. Based on 1991 census information, the population in 2016 is projected to be in the range of 1692 to 2300 persons *(Statistics New Zealand)*.

5.4.2 Estimated Flows

The average dry weather flow entering the oxidation pond was estimated by assuming a daily wastewater flow allowance of 230 litres/person/day. The peak wet weather flow was estimated using a peaking factor of 4 on the average dry weather flow.

1996 Winton Population (2191)
Average Dry Weather Flow 504 m^3/day
Peak Wet Weather Flow 2016 m^3/day

Highest projected Winton population for the year 2016 (2300 persons)
Average Dry Weather Flow 529 m^3/day
Peak Wet Weather Flow 2116 m^3/day

The resource consent is for a maximum discharges into Winton Stream of treated oxidation pond effluent of 525m^3/day at dry weather flow and 1600m^3/day at wet weather flow. The oxidation pond will attenuate incoming flows to some extent.

5.4.3 Monitored Flows

Flow monitoring data, from the period July 1994 to October 2000, shows that the average daily flow was 715m^3/day. The maximum recorded flow was 6470m^3/day. Observations of the data show:

- High wet weather flows (the peaking factor has been greater than 4)
- Periods of no records
- The average daily flow (wet and dry weather) is approximately 1.4 times the estimated average dry weather flow
- During dry summer periods the flow is typically between 300 to 700m^3/day
- During wet weather periods the flow is typically greater than 1000m^3/day.

From these observations the following is concluded:

- Condition 2 of the resource consent, allowing the discharge of oxidation pond treated sewage effluent of up to 525m^3/day and wet weather flow of up to 1600m^3/day into Winton stream, has been exceeded
- A change in resource consent Condition 2 is needed as the flow is exceeding the permitted rate
- Inflow and infiltration into the sewerage appears to be an issue, particularly in winter
- Inflow and infiltration will influence the design and costs of the disposal options.

5.4.4 Loads

Based on the monitoring data from the outlet of the planted channels (from March 1996 to February 2001), the ranges of constituents expected at the outlet of the planted channel, and therefore at the inlet to a new disposal system, are given in Table 5.4.3.

Table 5.4.4 Current Effluent Concentrations from Monitoring Data at Outfall (Mar 1996 to Feb 2001)

Constituent	Unit	Range	Average
BOD_5	(g/m^3)	23-86	45.00
Dissolved Oxygen	(g/m^3)	0.13-13.69	7.40
Total Phosphorus	(g/m^3)	7.0-24*	11.00*
Ammoniacal Nitrogen	(g/m^3-N)	8.8-22.0	14.97
Total Suspended Solids	(g/m^3)	39-396	140.00
Conductivity	(mS/cm@25°C)	0.052-0.628	0.47
Faecal Coliforms**	(CFU/100ml)	7,000-260,000*	-
Temperature	(°C)	5-21.7	14.00

* Based on data from Mar 1999 to Feb 2001

** Faecal coliform monitoring measured in MPN/100ml and CFU/100ml so unable to average.

The estimated loads can be determined from the concentrations given in Table 5.4.3 and the estimated and recorded flows.

5.5 Possible Options

5.5.1 Introduction

Further treatment and disposal of the oxidation pond effluent may be achieved by:

1. Land Treatment and Disposal Options
    - Slow rate infiltration disposal
    - Rapid infiltration disposal
2. Land Contact Treatment Options and Disposal to Surface Water
    - Constructed Wetland
    - Weeded Channels
    - Overland Flow
3. Other Treatment Options and Disposal to Surface Water
    - Trickling filters
    - Rotating biological contactors
    - Sand filters
    - Activated sludge processes.

This report concentrates on the land treatment and disposal options and land contact treatment and disposal to surface water options. The other treatment options and disposal to surface water were not considered because:

- Condition 15 requires investigation and reporting on alternative **land-based** methods of disposal
- The current treatment system is considered to be adequate
- Any other treatment option is likely to add to any upgrade costs (ie it may not avoid the need for a land-based method).

5.5.2 Descriptions of Land Treatment and Disposal Options

5.5.2.1 Slow Rate Infiltration

Slow rate land application is a soil-based treatment method designed to apply intermittently un-chlorinated primary or secondary treatment effluent at a controlled rate to a vegetated soil surface of moderate to slow permeability. The effluent is applied via sprinklers, drip irrigation or flooding of furrows. Flooding is not recommended as past experience has shown uneven application of the

effluent and variable performance. Further filtration of the effluent is generally required prior to application by drip irrigation.

Following application, the effluent infiltrates the land surface and percolates through the soil profile to the groundwater table. Effluent constituents are removed in the soil matrix by filtration, adsorption, ion exchange, precipitation, microbial action and plant uptake.

Part of the water is lost to evaporation and plant transpiration. Organics are removed by soil adsorption and biochemical oxidation. Nitrogen is removed primarily by crop uptake but denitrification can also be significant. Chemical immobilisation and plant uptake are mechanisms of phosphorous removal. Metals, certain toxic organics and pathogens are also effectively removed.

A tail water return system is usually provided to contain and recycle effluent runoff that results from excessive application or precipitation. It consists of a collection pond, pump and return pipeline. A storage reservoir must also be provided for adverse weather conditions, crop cultivation and harvesting and emergencies *(USEPA Wastewater Treatment/Disposal for Small Communities)*.

Advantages of slow rate infiltration include:

- Can produce the highest treatment levels of the land application methods
- Well suited for disposal of treated sewage from rural communities and seasonal industries.

Disadvantages of slow rate infiltration include:

- Its application and the degree of treatment provided are limited by climate and nutrient requirements of the vegetation. Climate affects the growing season and will dictate the period of effluent application and storage requirements
- Application must be suspended during wet periods or frozen soil conditions
- Comparatively large areas of land are required
- Flooding by furrows application is not recommended as effluent distribution is uneven and performance is varied
- Further filtration of the effluent is generally required prior to application by drip irrigation and this can increase costs
- Spray and drip irrigation equipment may be expensive.

Site requirements are as follows:

- Suitable soils include loamy sands to clay loams and coarser texture soils such as sands. These coarser soils can accept higher application rates and do not retain water, which may be important where vegetation with low moisture tolerance is used
- Unsuitable soils include finer texture clays, which do not drain well. These soils tend to retain water for long periods which may make vegetation management more difficult
- A minimum unsaturated depth to ground water of greater than 1m is required
- Unsaturated depth to groundwater greater than 1m may be necessary for deep-rooted crops
- Slopes less than 15% on cultivated land and less than 40% on forested land
- Flood-prone areas should be avoided.

5.5.2.2 Rapid Infiltration

Rapid infiltration is a method of land application that typically consists of a series of earthen basins with exposed soil surfaces designed for a repetitive cycle of loading, infiltration/percolation and drying.

Rapid infiltration depends on a relatively high rate of effluent infiltration into the soil and percolation through an unsaturated soil zone before discharging to groundwater. Its application is primarily limited by the hydraulic conductivity of the soils and secondly by the degree of treatment considered acceptable before effluent reaches groundwater.

Advantages of rapid infiltration include:

- Very favourable removal of conventional effluent parameters, including ammonia
- Simple to operate
- Minimum operator intervention
- Less land area than other land application methods
- May be operated year round.

Disadvantages of rapid infiltration include:

- Potential groundwater impacts from nitrate nitrogen
- Limited by site, soil and groundwater characteristics.

Site requirements for its application include:

- Near level topography as cut and fill construction can adversely affect the permeability of the surface soils and add to the cost of the project
- Unsaturated soil depths of greater than 3m are preferred, with a minimum depth of 2m required in order to provide sufficient treatment and avoid ground water mounding
- Uniform soils with permeability of 25 millimetres per hour or more
- Suitable soil types include sand, sandy loams, loamy sands and sandy gravels
- Unsuitable soil types include fine-textured soil such as silt and clay loams or very coarse sand and gravels
- Use of oxidation ponds with high concentrations of algae should be avoided.

5.5.3 Description of Land Contact Options and Disposal to Surface Water

5.5.3.1 Constructed Wetlands:

Constructed wetlands are a land contact method of treatment, which may be used prior to a point discharge to surface water.

There are two different types of constructed wetlands characterised by the flow path of the water through the system. The first is called a free-water surface (FWS) wetland. In free-water surface constructed wetlands the effluent flows through a shallow "pond" planted with emergent aquatic plants such as bulrushes, reed and sedges. The depth of the water is generally less than 1m deep.

The second is called a sub-surface flow (SF) wetland. Sub-surface flow wetlands consist of approximately 300mm or more of permeable media such as rock gravel or coarse sand that supports the root system of emergent vegetation. The water in the bed or channel flows below the surface of the media (USEPA *Wastewater Treatment/Disposal for Small Communities*).

Both types of constructed wetland typically include a barrier to prevent groundwater contamination beneath the bed or channel. Barrier materials range from compacted clay to membrane liners. A number of different methods have been used to control the depth of water in the system.

Effluent is treated as it flows through the vegetation or media by attached bacteria and by physical and chemical processes such as filtration adsorption and plant uptake. Quality of effluent entering constructed wetlands can range from septic tank effluent to secondary effluent. However, sub-surface flow wetlands are not recommended for use after oxidation ponds because of problems with algae (USEPA *Constructed Wetlands Treatment of Municipal Wastewaters*, 2000).

Advantages of constructed wetlands include:

- Low construction cost
- Passive system readily managed by small community with operation and maintenance personnel
- Generally attractive system with secondary ecological benefits in terms of wildlife habitat enhancement
- May be more acceptable to iwi.

Disadvantages include:

- Lack of generally agreed-upon design factors
- Sometimes problems with mosquitos, waterfowl, wetland plant establishment and weed control
- Still requires an eventual discharge to surface water.

Reported issues with wetlands in New Zealand include:

- Bird wildlife eating new wetland growth and inhibiting development of foliage
- Foliage die-off caused by toxic constituents in effluent
- Mosquito nuisance
- Low musty odour levels.

Site requirements for constructed wetlands include:

- Level to slightly sloping uniform topography with slopes usually less than 5% slope

- Slowly permeable soils of <5mm/h to minimise percolation losses
- Suitable soil types include clays, clayey loams and silts
- Wetland should be located outside flood plains.

5.5.3.2 Floating Aquatic Plants

Floating aquatic plant systems are similar in concept to free surface wetlands system except the plants are floating species such as water hyacinth and duckweed. These systems have been used overseas however, to our knowledge have not been used in New Zealand. Water hyacinth would not be suitable for use in Southland, due to the cooler climate. However, duckweed or other natives such as red pond weed *(Potamogeton cheesemanii)* or mud pond weed *(Potamogeton suboblongus)* may be possible options. Use of these native plants would require further research to determine their performance in a floating aquatic plant system.

The water depth is typically deeper than wetland system ranging from 0.5 to 1.8 m. Overseas, the removal of BOD and total suspended solids is generally good with lesser efficiencies demonstrated for nutrients, metals and pathogens.

The duckweed covers the water surface and limits the growth of algae and BOD removal is the result of biological activity similar to that in facultative ponds. Suspended solids are removed as the surface mat of plants blocks the sunlight and enhances sedimentation by creating quiescent conditions. Nitrogen is removed by microbial nitrification-denitrification and by plant uptake and harvesting. In duckweed systems denitrification will occur readily, however nitrification requires an input of oxygen. Plant uptake and harvest remove phosphorous. Pathogens are removed by natural die-off, sedimentation, predation, adsorption and exposure to ultraviolet light.

Advantages of floating aquatic system include:

- Generally attractive system with secondary ecological benefits in terms of wildlife habitat enhancement
- May be more acceptable to iwi.

Disadvantages include:

- Sometimes problems with mosquitos, waterfowl, wind action and plant establishment
- Water hyacinth would not be suited to the cooler climate and is not allowed in New Zealand. Further research would need to be undertaken regarding the use of duckweed and native plants in floating aquatic plant systems in New Zealand conditions
- Still requires an eventual discharge to surface water.

Site requirements are similar to constructed wetlands.

5.5.3.3 Overland Flow

Overland flow is a land application method of effluent treatment with a point discharge to a surface water. The technology consists of a series of uniformly sloped vegetated terraces with an effluent distribution system located at the top of the terrace and a runoff collection channel at the bottom.

Facilities for wastewater storage during wet or freezing weather is generally required. In overland flow, effluent is applied intermittently across the top of the terraces and allowed to sheet flow over the vegetated surface to the runoff collection channel. The system is not designed for soil percolation though some may occur.

Treatment is achieved through sedimentation, filtration and biochemical activity as the effluent flows through the vegetation on the terraces slopes.

Algae removal is not consistent because many algal cells are buoyant or mobile and resist removal by sedimentation or filtration. Biological films attached on the plant and soil surfaces degrade the organics. Nitrogen is removed though biological denitrification but some plant uptake may occur. Phosphorus may be partially removed by soil adsorption and plan uptake. Overland flow is not effective in pathogen removal. As treatment is dependent on the active biomass and vegetation, the terraces are operated on wet/dry cycles and applications are ceased during freezing periods.

Advantages of overland flow include:

- Relatively simple and inexpensive to operate
- Applicable to soils with low permeability
- Not restricted by relatively high groundwater in soils of low permeability.

Disadvantages of overland flow include:

- Still requires eventual discharge to surface water
- Application is restricted during wet weather and limited when temperatures remain below freezing
- Application rates may be restricted by the type of vegetation grown
- Steeply sloping or flat terrain is not well suited
- Disinfection of pathogens may be required
- The use of facultative or oxidation ponds that generate high algae concentration is not recommended prior to overland flow.

Site requirements for its application include:

- Terrace slopes should be between 2 to 8% and relatively uniform, with sufficient length to provide adequate travel time for treatment
- North-facing slopes are preferred in cold climates to extend the operating season
- Soils with low permeability are preferred.

5.6 Analysis of Options

5.6.1 Site Characteristics

Table 5.6.1 shows the required site characteristics of each of the options. All of the options, with the exception of rapid infiltration, appear to be suitable for the oxidation pond site. Rapid infiltration appears not a suitable option because of the high groundwater level and the unsuitable soils observed in the upper part of the soil profile. Thus, the rapid infiltration has not been investigated further.

5.6.2 Other Factors

Table 5.6.2 shows a comparison of the other relevant factors of the remaining options. Performance figures have not been included for floating aquatic plant systems as these have not, to our knowledge, been used in New Zealand conditions. Further investigation would be needed to determine the performance characteristics of these systems in New Zealand.

5.6.3 Indicative Costs

Table 5.6.3 shows a comparison of the estimated costs of the remaining options. Further information about the assumptions and costs is given in Appendix E. Again due to their lack of use in New Zealand, the indicative cost for floating aquatic plant systems has not been included.

Table 5.6.1 Comparison of Options: Site Characteristics

Characteristics	Land Treatment and Disposal Options		Land Contact and Disposal to Surface Water Options		
	Slow Rate	**Rapid Infiltration**	**Floating Aquatic Plants**	**Constructed Wetland**	**Overland Flow**
Climatic Conditions	Storage often needed for cold weather and during precipitation[3]	Possibly modify operation in cold weather, particularly if ground is frozen	Storage may be needed for cold weather[1] Protection against wind action may be required	Storage may be required for cold weather[1]	Storage may be needed for cold weather and during precipitation[2]
Depth to Groundwater	0.9-1.2m minimum[1]	2m minimum, 3 m preferred[1]	Not critical[1]	Not critical	0.3-0.6 minimum[1]
Slope	Less than 15% on cultivated land, less than 40% on forested land[1]	Not critical. (prefer level topography as excessive slopes require much earthworks)[3]	Usually less than 5%[1]	Usually less than 5%[1] For free water surface wetlands slopes of 0 to 3% are preferrred[2]	Uniform slopes of 1-8% preferred[1]
Vegetation	Suitable vegetation available	Suitable vegetation available	Water hyacinth cannot be used in New Zealand. Duckweed and native pond weeds may be suitable	Suitable vegetation available	Suitable vegetation available
Soil Permeability	Moderately slow to moderately rapid 5-50mm/hr (loamy sands to clay loams) [1]	Rapid At least 25mm/hr or more (sand, sandy loams, and sandy gravels)[1]	Slow to moderate <5mm/h most desirable[1]	Slow to moderate For free surface wetlands: <5mm/hr	Slow to moderate <15mm/hr preferred (clays, silts and soils with impermeable barriers) but can be used on soils 15-50mm/h[1]
Suitability of Site	**Possibly suitable**	**Not suitable due to site soils and the required unsaturated depth to groundwater.**	**Possibly suitable but requiring further investigation into the performance of locally available floating plants.**	**Possibly suitable**	**Possibly suitable**

Notes

1. Metcalf and Eddy, 1992
2. Crites and Tchobanoglous Small and Decentralized Wastewater Management Systems
3. EPA Wastewater Treatment/Disposal for Small Communities

Table 5.6.2 Comparison of Options: Other Factors

Characteristic	Land Treatment and Disposal Option	Land Contact and Disposal to Surface Water Options		
	Slow Rate	**Floating Aquatic Plants**	**Constructed Wetland**	**Overland Flow**
Preferred Pre-treatment	Primary treatment or greater. Further filtration of effluent is required if application is to be by drip irrigation.	Primary treatment, short detention time aerated ponds or equivalent. Oxidation pond effluent with high algae levels is not suitable.	Primary treatment or short detention time aerated ponds or equivalent[1] Sub-surface wetlands are not recommended for use after oxidation ponds.	Oxidation pond effluent with high algae levels is not suitable unless special design and operational procedures are followed[2]
Past Experience Comments	Effluent application by flooding is not recommended and has not been considered further.	These systems have been used overseas but not locally in New Zealand.	Constructed wetlands have been used successfully in New Zealand conditions	Overland flow systems have been used successfully in New Zealand conditions
Expected Effluent Quality				
BOD_5	<5 mg/L [1*]	*These systems have not been used in New Zealand. Further investigation in to the use and performance of duckweed and native pondweeds would be required.*	<10 mg/L [1]	<15 mg/L [2]
Total Suspended Solids	<5 mg/L [1*]		<30 mg/L [1]	<25 mg/L [2]
Total Nitrogen	<8 mg/L – dependent upon vegetation[1*]		<8 mg/L [1]	<8 mg/L [2]
Total Phosphorous	<0.3 mg/L[1*]		<6 mg/L [1]	<6 mg/L [2]
Faecal Coliforms	>99%[3*]		Insufficient information	Minimal removal occurs when secondary effluent is applied[2]
Required Land Area **(Indicative only – refer to Notes for assumptions used)**	27 ha (limiting factor is nitrogen loading)[4*]	1.7 ha (limiting factor is hydraulic loading)[6] 2.5 ha (limiting factor is BOD)[6] *(Based on overseas designs using duckweed and water hyacinth systems)*	1.2 ha (BOD limiting factor)[7] 4 ha (Nitrogen limiting)[7]	5 ha[8]

Characteristic	Land Treatment and Disposal Option	Land Contact and Disposal to Surface Water Options		
	Slow Rate	Floating Aquatic Plants	Constructed Wetland	Overland Flow
Operation & Maintenance Requirements	Vegetation management including soil tillage. planting, harvesting, nutrient control, pH adjustment, tail-water return system management, storage control and, sodium and salinity control[3] *	Vegetation management including planting, frequent harvesting and disposal. Other requirements include sludge management and pest control eg mosquitos[1]	Inspect weekly including inlet and outlet inspection and flow recording. Sidewall maintenance and vegetation management.	Harvesting of cover crop, maintenance of distribution and collection systems and pest control. Periodic mowing is necessary to maintain healthy growth of grass. Mosquitos and weed control may be necessary[3]

Notes:

* For sprinkler and drip irrigation application not flooding by furrows

1. Metcalf and Eddy, 1992
2. Crites and Tchobanoglous Small and Decentralized Wastewater Management Systems
3. EPA Wastewater Treatment/Disposal for Small Communities
4. Based upon a nitrogen loading rate of <150kg/ha/year, average flow of 715m^3/day and average ammoniacal nitrogen concentration of 15g/m^3 and does not include allowances for evaporation and precipitation.
5. Based upon Table 9.22 duckweed floating aquatic plant system design in Crites and Tchobanoglous with hydraulic loading of 517m^3/ha.d and average flow of 715m^3/day
6. Based upon Table 9.22 duckweed floating aquatic plan system design in Crites and Tchobanoglous with maximum BOD loading of 28 kg/ha.d, BOD effluent concentration of 86mg/L and average flow of 715m^3/day.
7. Based on Table 9.9 Typical design criteria for free water surface wetlands from Crites and Tchobanoglous, expected average flow of 715m^3/day and a water depth of 300mm. Using a retention time of 11 days for nitrogen removal and BOD loading rate of 60kg/ha/day from USEPA, Constructed wetlands Treatment of Municipal Wastewaters, 2000.
8. Based upon Crites and Tchobanoglous facultative pond maximum effluent loading of 0.10m^3/m.h, average flow of 715m^3/day, application period of 8 hours per day and a slope length of 50 metres.

Table 5.6.3 Comparison of Options: Indicative Cost

Characteristic	Land Treatment and Disposal Option	Land Contact and Disposal to Surface Water Options		
	Slow Rate	Floating Aquatic Plants	Constructed Wetland	Overland Flow
Approximate Cost – Indicative only and depends upon flows, loadings, site characteristics and final design				
Capital Costs (excl. GST)[1] (refer to Appendix E for further information on assumptions and costs)	Drip Application $645,000 (for 27 ha) + *Land Cost* Sprinkler Application $367, 000 (for 27 ha) + *Land Cost*	*These system have not been used in New Zealand, further investigation into the cost and performance of duckweed and native pondweeds would be required*	$265,000 (for 1.2 ha) + *Land Cost* $644, 000 (for 4 ha) + *Land Cost*	$383,000 (for 5 ha) + *Land Cost*
Operation and Maintenance Costs (excl. GST)	$24,000/yr (Sprinkler and Drip Application)		$14,000/yr	$17,000/yr

Note [1]These costs exclude:

- Investigation, planning and design fees
- Purchase of land
- Additional pumping costs if land treatment site is not adjacent to oxidation pond
- Cost of storage facilities
- Contract administration and commissioning
- GST.

5.6.4 Summary of Analysis

Table 5.6.4 summarises and compares the requirements of the options.

Table 5.6.4 Summary of Analysis

Factor	Slow Rate Treatment & Disposal	Floating Aquatic Plants	Constructed Wetland Treatment	Overland Flow
Area (ha)	27	1.7-2.5	1.2-4	5
Storage (m^3)	10,000	Nominal	Nominal	Nominal
Management	Foliage harvest	Foliage harvest	Foliage care	Foliage harvest
Structures	Inlet & outlet Wet weather storage Irrigation system Recirculation facility	Inlet & outlet Ditch formation	Inlet & outlet Channel formation	Inlet & outlet Land levelling Recirculation facility
Effluent Quality	Highest	Variable	Variable	Variable
Capital Costs	\$645,000 + *Land Cost* (Drip Application) \$367, 000 + *Land Cost* (Sprinkler Application)	Not Estimated	\$270,000 - \$644, 000 + *Land Cost*	\$383,000 + *Land Cost*
Operation & Maintenance Costs	\$24,000/yr		\$14,000	\$17,000
Issues to be resolved	• Cost and location of land • Soil suitability • Wet weather storage requirements • Operation and control system • Public health issues with sprinkler application	Further investigation needed to determine performance of locally available plants and cost of system.	• Cost and location of land • Need for liner • Wet weather storage requirements (if any)	• Cost and location of land • Degree of treatment • Operation and control system • Wet weather storage requirements (if any)

5.7 Conclusion

Of the four options and based on the available information, a constructed wetland is considered a feasible option. The cost of a wetland is estimated to be between $270,000 and $644,000 plus the cost of land and a lining system (if required). Where a lower degree of treatment is acceptable the lower cost would apply and, conversely, where a high degree of treatment is required the higher cost will apply. An approach to keep costs down initially would include:

- Proposing that a lower effluent quality is acceptable in winter when stream flows are higher
- Staging wetland construction and monitoring performance, and, if needed, adding further wetland 'modules'.

Slow rate treatment and land disposal would provide the highest degree of land-based treatment. However, there are significant issues to address before feasibility of this option can be compared with the wetland option. These issues particularly include the design irrigation basis (ie hydraulic control or nitrogen control), the availability and cost of land, the type of soils at a selected site (land area requirements may increase with certain soils) and volume of storage required (which may necessitate raising oxidation pond banks or constructing a new pond). The high inflow and infiltration into the Winton sewerage poses greater requirements for land disposal than with the other disposal options.

With overland flow there are also significant issues to address before the feasibility of the option can be compared with the wetlands option. These issues are particularly the availability of suitable land and the acceptability of effluent quality.

The operational costs of the land disposal and overland flow options will be higher than the wetlands option because they have:

- Mechanical equipment and pump supplies
- Control requirements to change effluent application areas
- Land management requirements, probably involving stock.

For budgeting purposes, it would be appropriate to adopt the estimated costs for the wetland option plus the amounts for land cost.

In order to address the issues it will be necessary to:

- Consult with affected parties
- Identify possible sites, check land availability and obtain specific soil and groundwater information
- Analyse recorded flows in more detail and determine storage requirements (for the land disposal option only)
- Confirm design basis, particularly for land disposal.

5.8 Decision Criteria

Decision criteria include:

- Land availability and cost
- Development and operational costs
- Performance objectives (effluent quality) of:
  - Environment Southland
  - Affected parties
  - District Council.

5.9 Investigation Requirements

Investigation requirements include:

- Identify possible sites and land availability
- Soil and groundwater site investigation
- Topographic survey
- Climatic analysis to determine:
  - Storage requirements
  - Effluent variability during cold weather
- Flood risk and associated mitigation requirements (if any)
- Analyse recorded flows in more detail and determine storage requirements (for the land disposal option only).
- Preliminary design.

5.10 Where to From Here?

The recommended process is to:

1 Consult on process to date and confirm objectives

2 Undertake the site investigation and other investigation requirements

3 Options re-calculation and confirmation based on new information

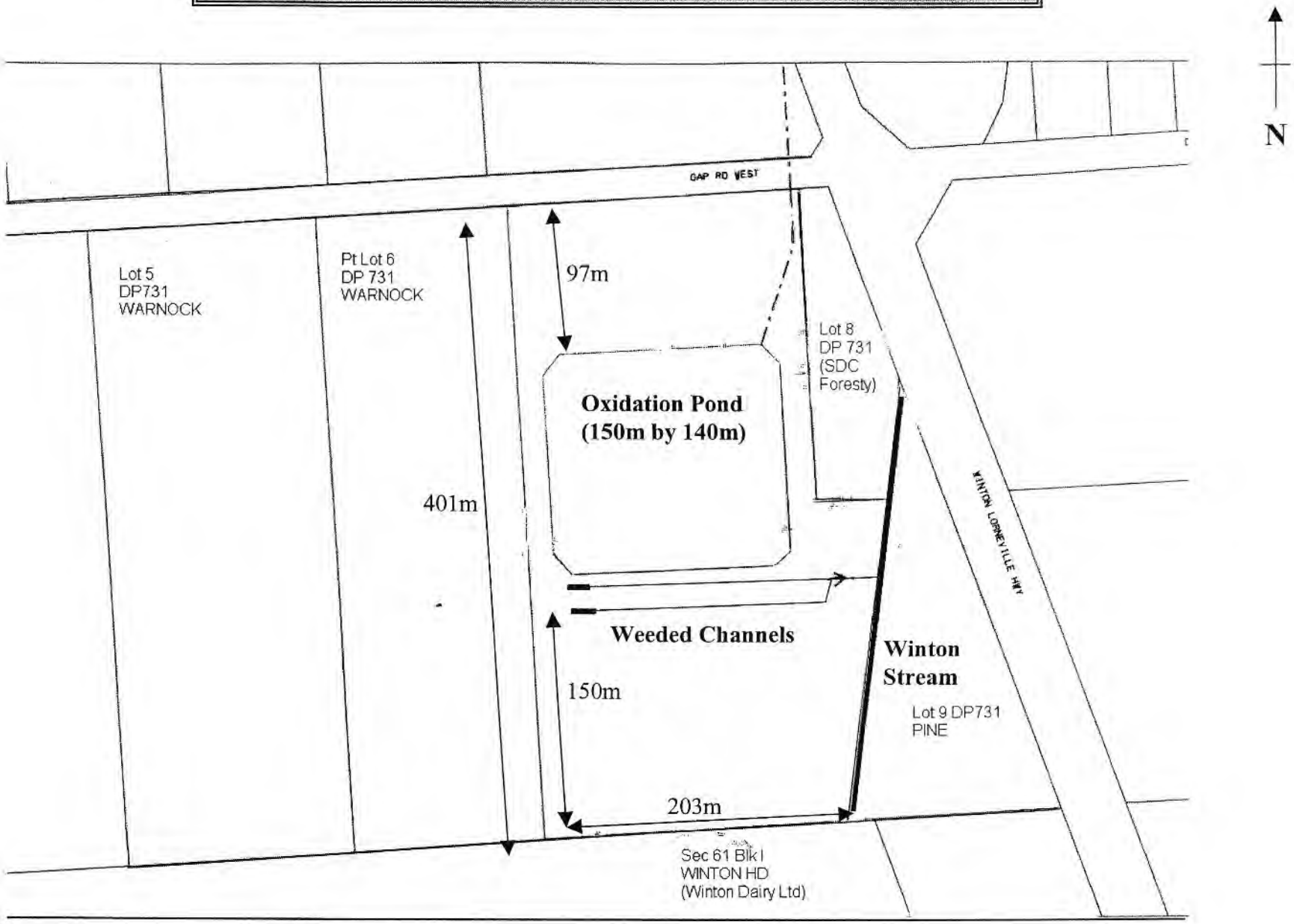
4 Re-estimate costs of development and operation

5 Decide on the preferred treatment and disposal system

6 Confirm the action plan.

Appendix A: Layout of Oxidation Pond Site

Layout of Winton Oxidation Pond Site



Appendix B: Photographs of Site

MWH
MONTGOMERY WATSON HARZA

31 STAFFORD STREET
PO BOX 4, DUNEDIN,
NEW ZEALAND

FACSIMILE 64-3-477 0616
TELEPHONE 64-3-477 0885

Project No. 8 0 1 / 4 7 3 1 7 -1 9

Date: 1 May 2001 Prepared By: Rima Lee

Description: Winton Oxidation Pond and Weeded Channels

Oxidation Pond
Looking NW Over the Outlet from the SW Corner of the Pond

Oxidation Pond
Looking North West from SE Corner of Pond

MWH
MONTGOMERY WATSON HARZA

31 STAFFORD STREET
PO BOX 4, DUNEDIN,
NEW ZEALAND

FACSIMILE 64-3-477 0616
TELEPHONE 64-3-477 0885

Project No. 801/47317-19

Date: 1 May 2001 Prepared By: Rima Lee

Description: Winton Oxidation Pond and Weeded Channels

Oxidation Pond
Looking North from the SE Corner of Pond

Weeded Channels
Looking East from West End of Channels

MWH
MONTGOMERY WATSON HARZA

STAFFORD STREET
BOX 4, DUNEDIN,
W ZEALAND
'SIMILE 64-3-477 0616
.EPHONE 64-3-477 0885

Project No. | 8 | 0 | 1 | / | 4 | 7 | 3 | 1 | 7 | -1 | 9 |

Date: 1 May 2001 Prepared By: Rima Lee

Description: Winton Oxidation Pond and Weeded Channels

Weeded Channels
Looking SW from Half Way Along the Weeded Channels

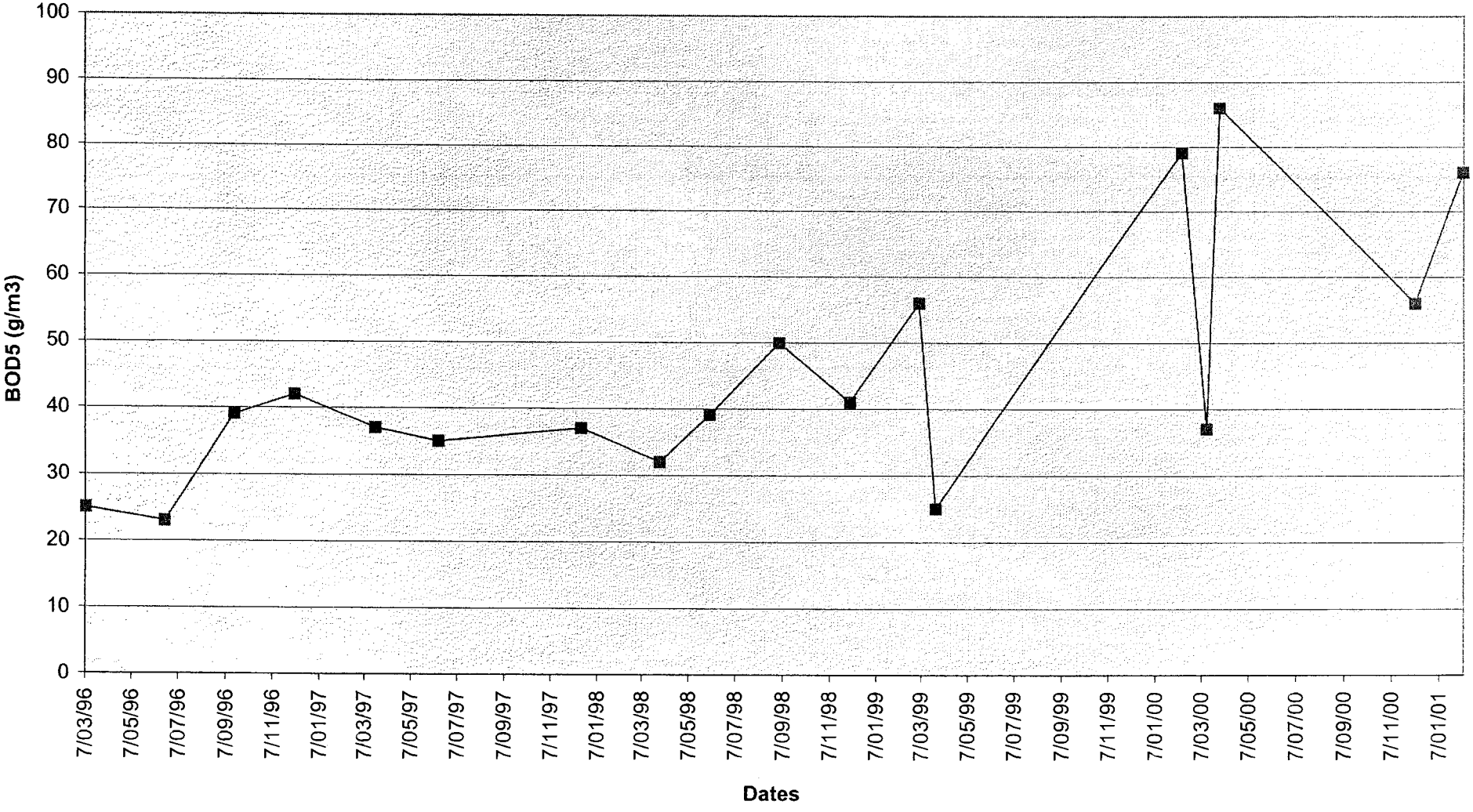
Weeded Channels
Looking West along the Channels from the East End

Appendix C: Monitoring Results at Outfall and Graphs C1 to C8

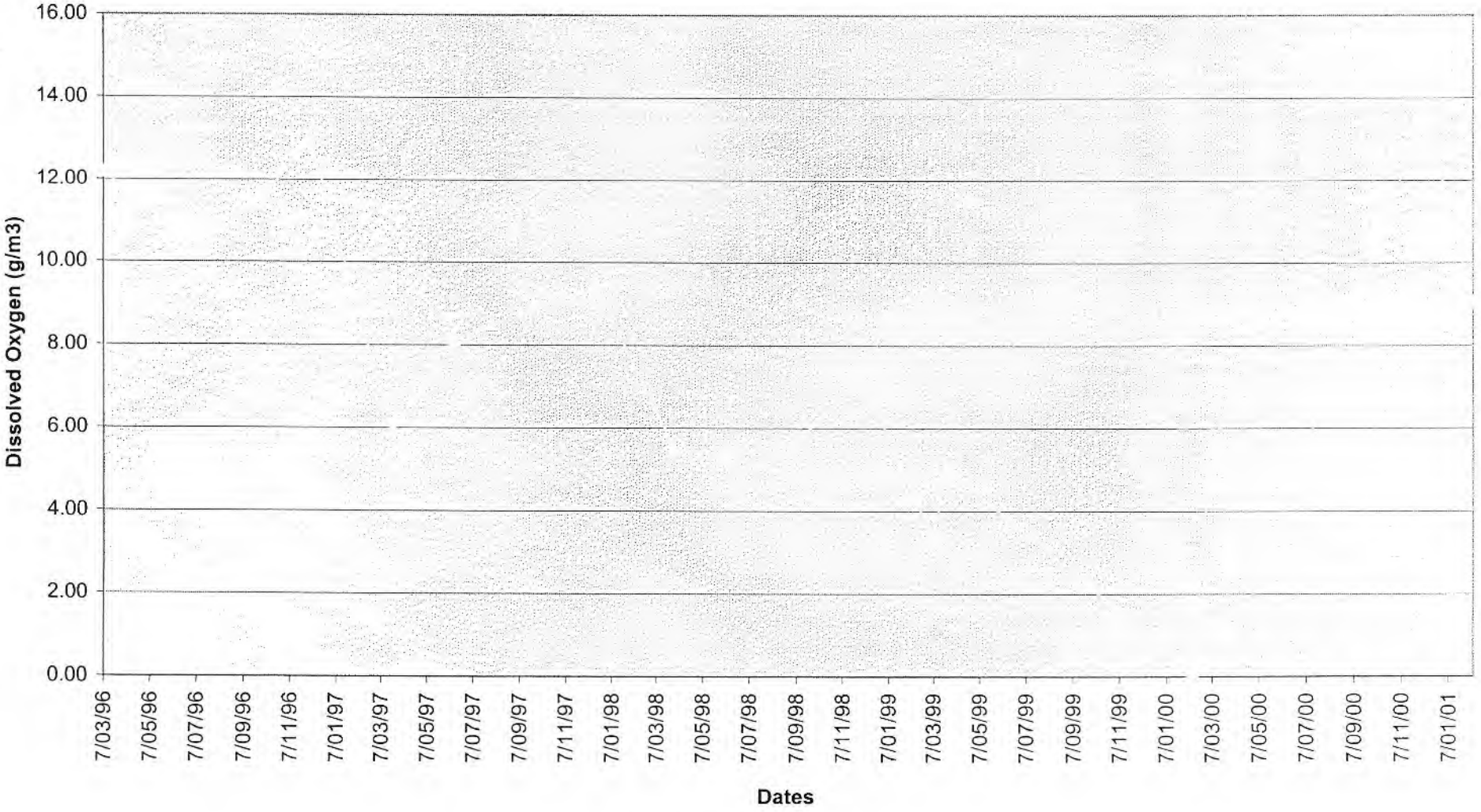
Table 1 Monitoring Results at the Outfall March 1996 to February 2001

Date sampled	BOD_5	DO	Total P	Ammoniacal N	TSS	Temp	Cond	FC	units
	g/m3	g/m3	g/m3	g/m3 - N	g/m^3	°C	mS/cm@25°C		
7-Mar-96	25	12.20	-	20.0	41	21.7	0.605	-	-
19-Jun-96	23	10.60	-	13.0	39	5.2	0.413	-	-
18-Sep-96	39	11.30	-	11.0	220	14.4	0.440	-	-
6-Dec-96	42	12.90	-	16.0	130	17.6	0.490	-	-
21-Mar-97	37	5.90	-	20.0	60	14.1	0.540	-	-
12-Jun-97	35	8.10	-	17.0	80	9.6	0.477	-	-
17-Dec-97	37	9.40	-	14.0	160	20.2	0.428	-	-
30-Mar-98	32	5.50	-	11.0	100	12.5	0.377	-	-
3-Jun-98	39	5.30	-	22.0	80	5.0	0.052	-	-
2-Sep-98	50	5.60	-	15.0	140	7.6	0.458	-	-
3-Dec-98	41	7.20	-	10.0	200	15.0	0.490	-	-
4-Mar-99	56	3.35	9.9	21.1	187	17.5	0.628	260000	MPN/100mL
25-Mar-99	25	5.00	7.5	22.0	57	14.6	0.548	28000	CFU/100mL
10-Feb-00	79	0.13	24.0	8.8	230	20.0	0.429	7000	CFU/100mL
13-Mar-00	37	7.60	-	12.0	160	13.0	0.484	57000	CFU/100mL
30-Mar-00	86	0.41	11.2	11.7	396	16.0	0.508	9000	CFU/100mL
7-Dec-00	56	13.69	8.8	13.1	97	18.5	0.487	30000	CFU/100mL
7-Feb-01	76	9.07	7.0	11.8	134	11.6	0.527	30000	MPN/100mL
Average	45	7.40	11	14.97	140	14	0.47	-	

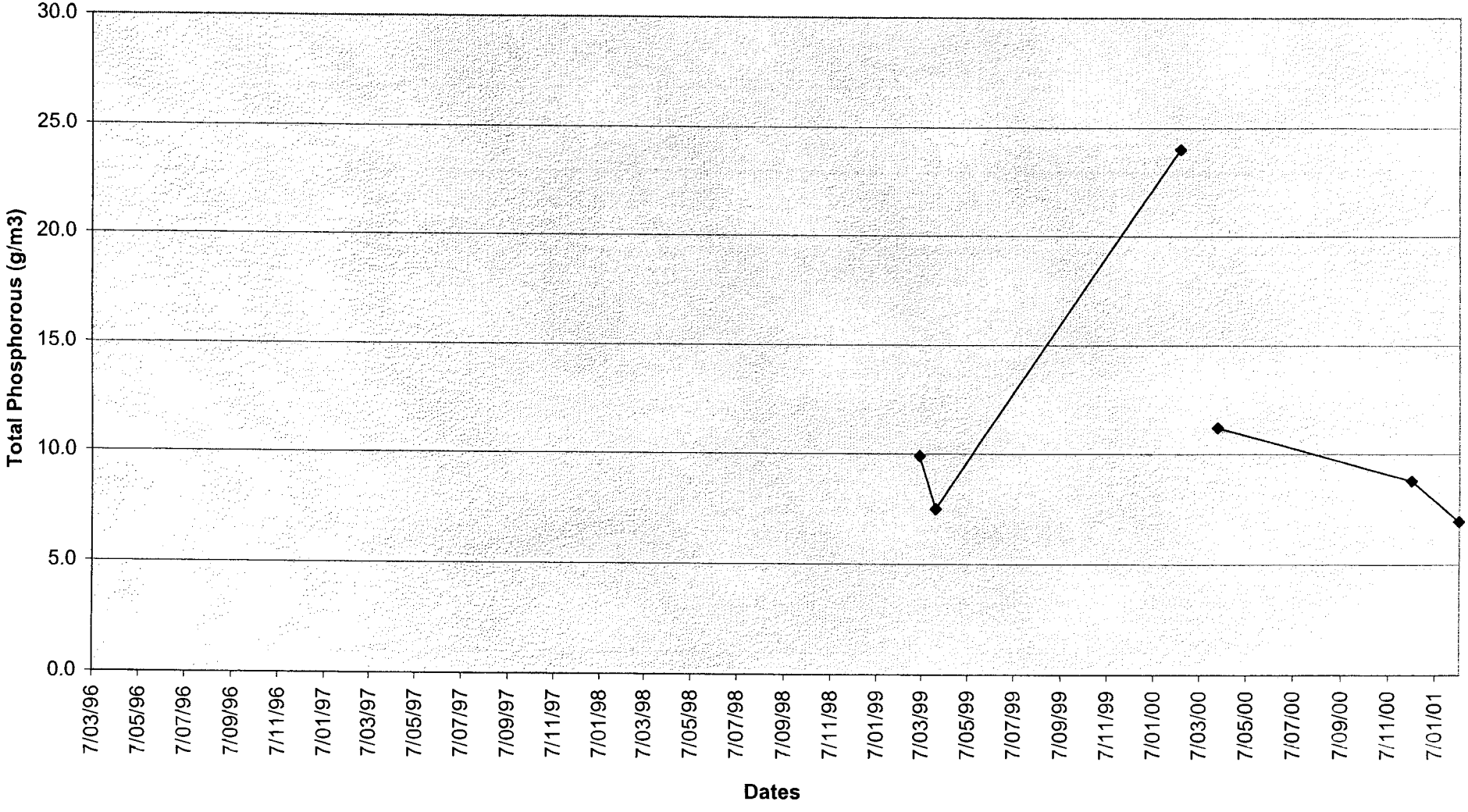
Graph C1: BOD5 Monitoring Results



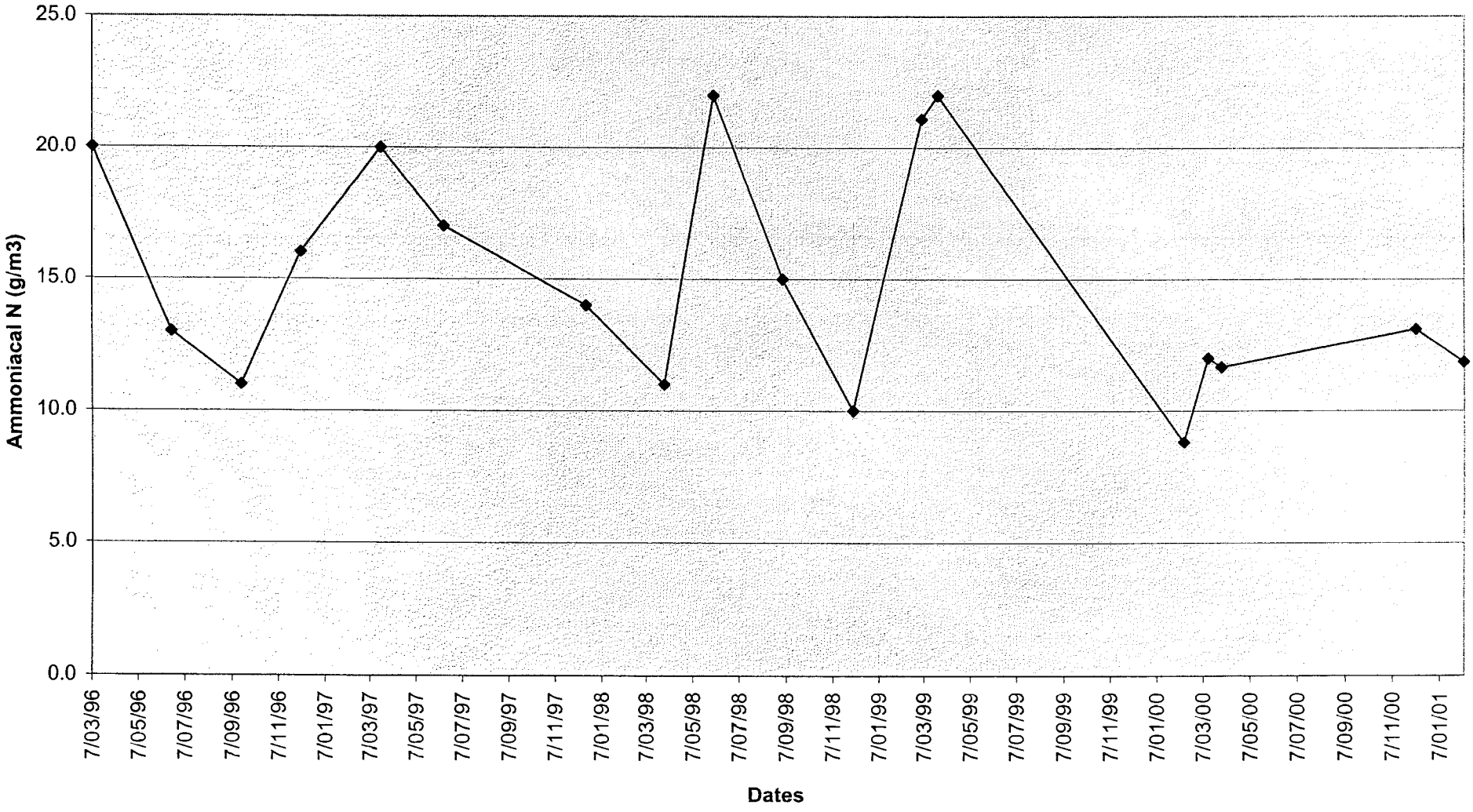
Graph C2: Winton Outfall Monitoring Results - Dissolved Oxygen



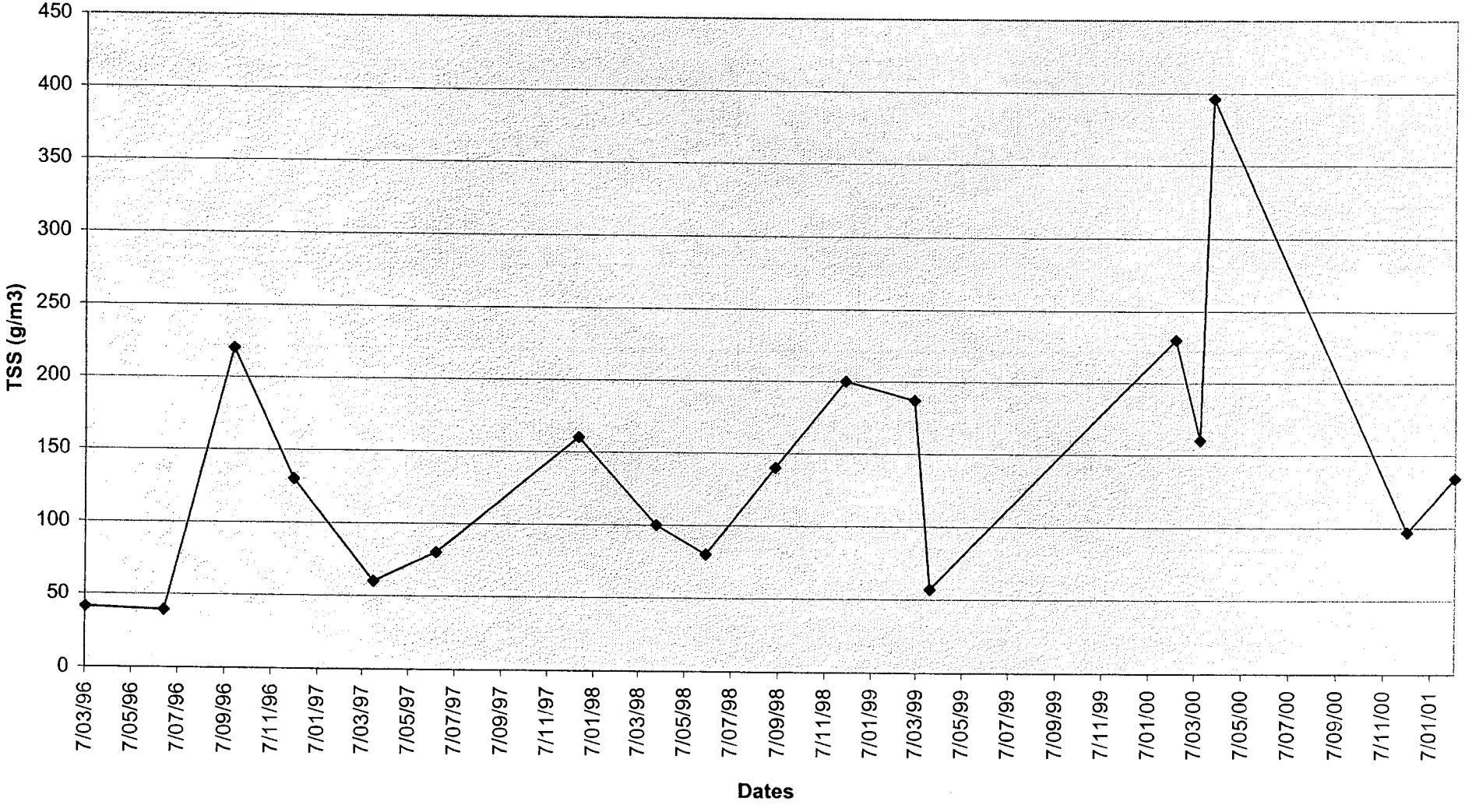
Graph C3: Winton Outfall Monitoring Results - Total Phosphorous



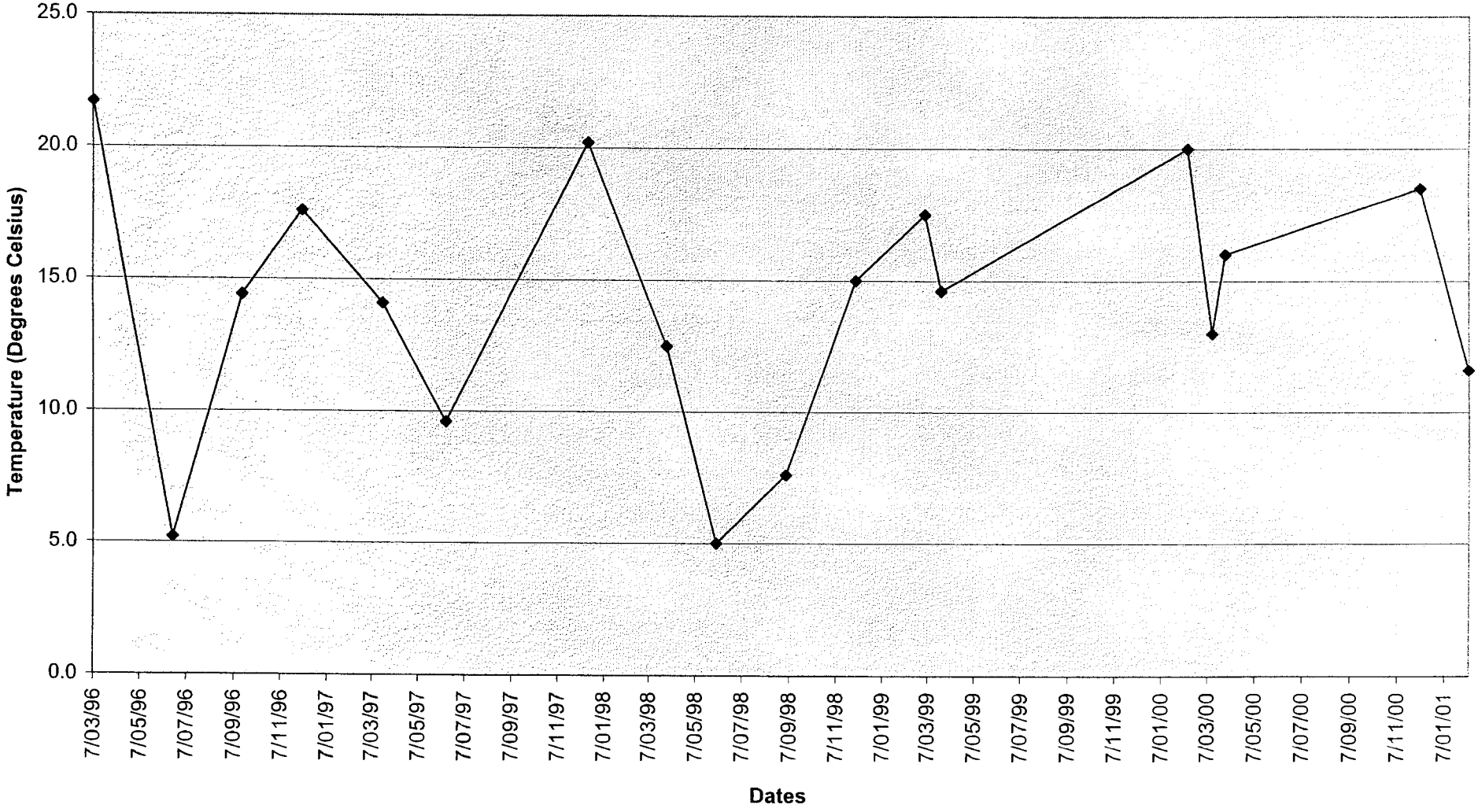
Graph C4: Winton Outfall Monitoring Results - Ammoniacal Nitrogen



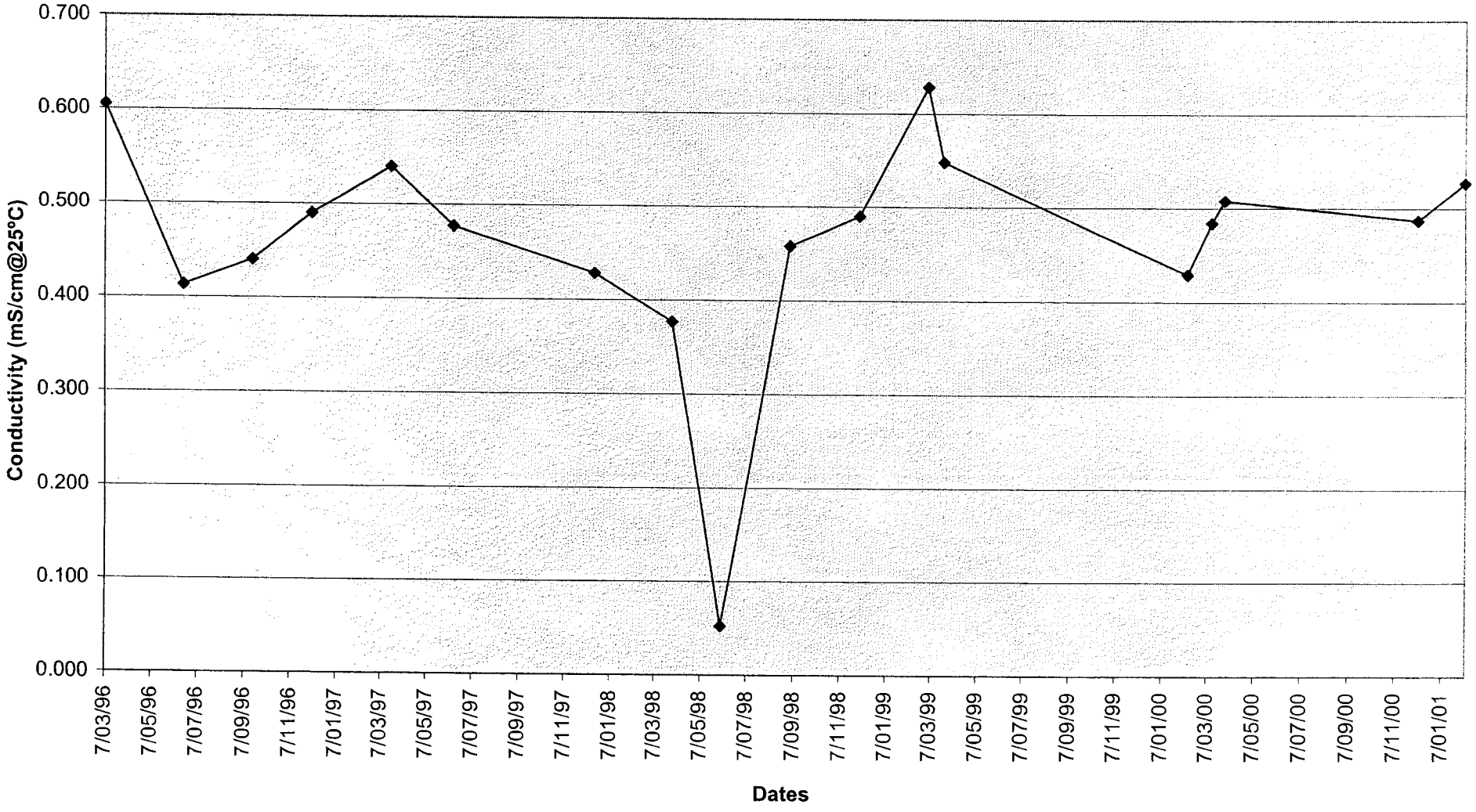
Graph C5: Winton Outfall Monitoring Results - Total Suspended Solids



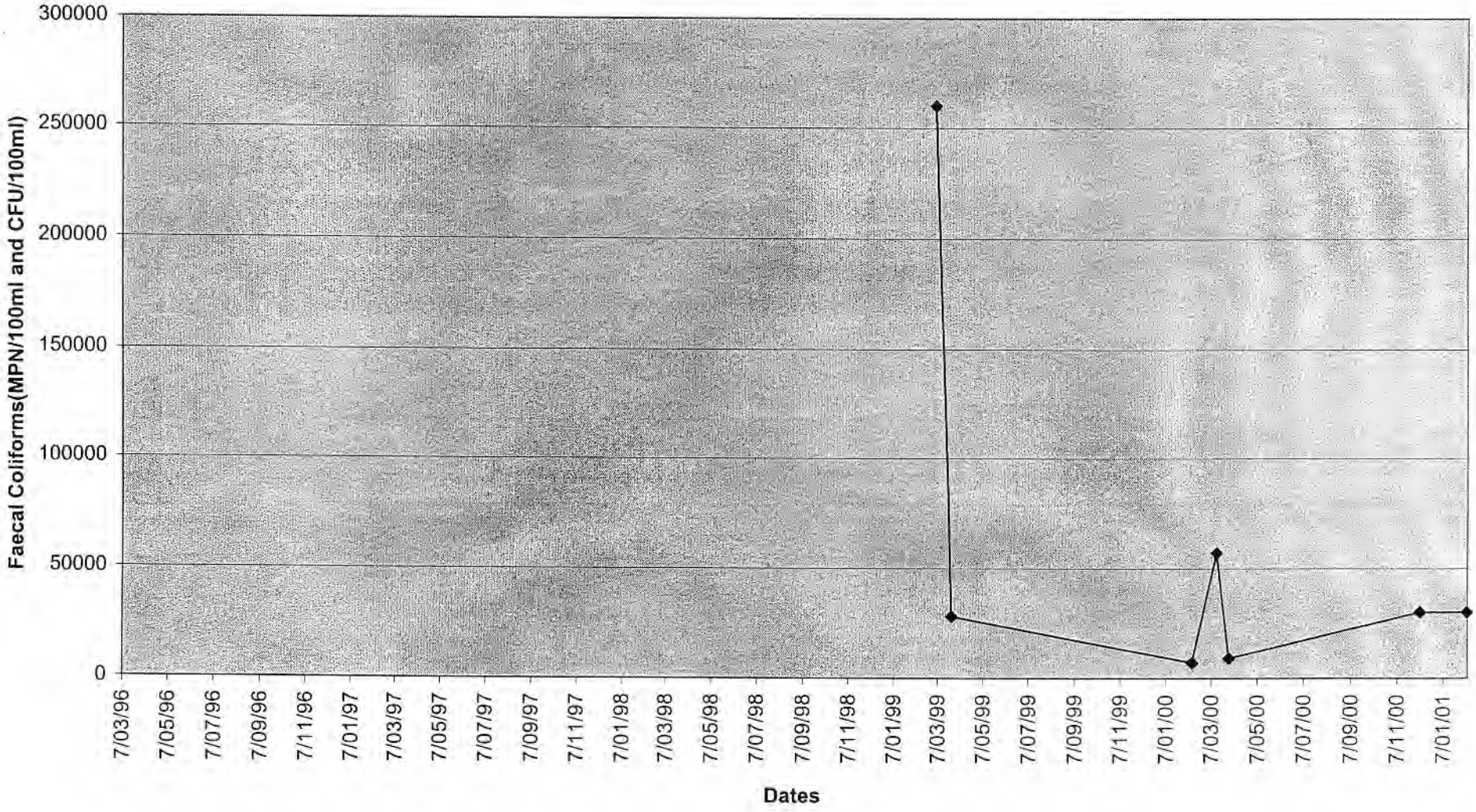
Graph C6: Winton Outfall Monitoring Results - Temperature



Graph C7: Winton Outfall Monitoring Results - Conductivity



Graph C8: Winton Outfall Monitoring Results - Faecal Coliform

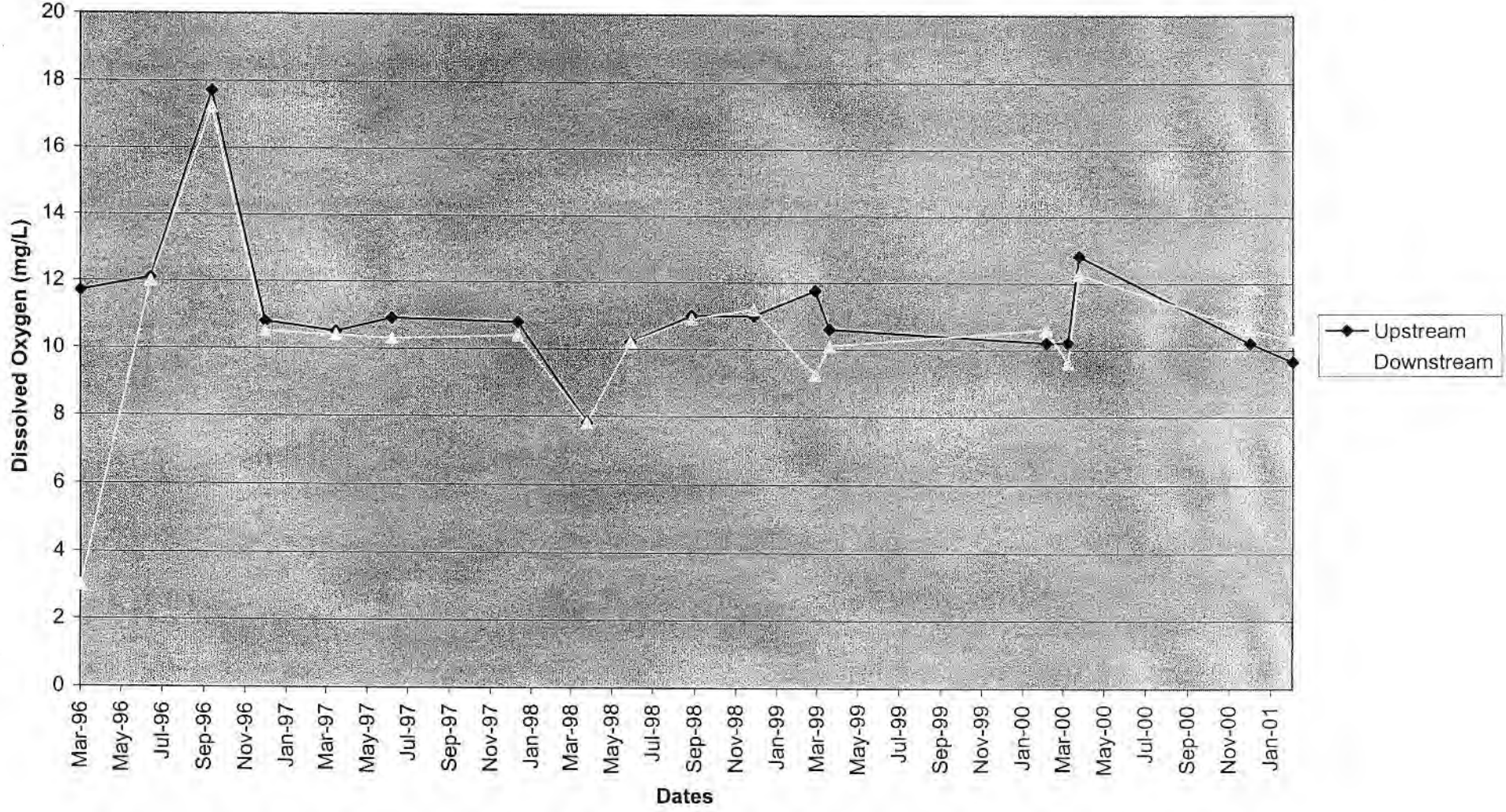


Appendix D: Monitoring Results for Winton Stream and Graphs D1 to D7

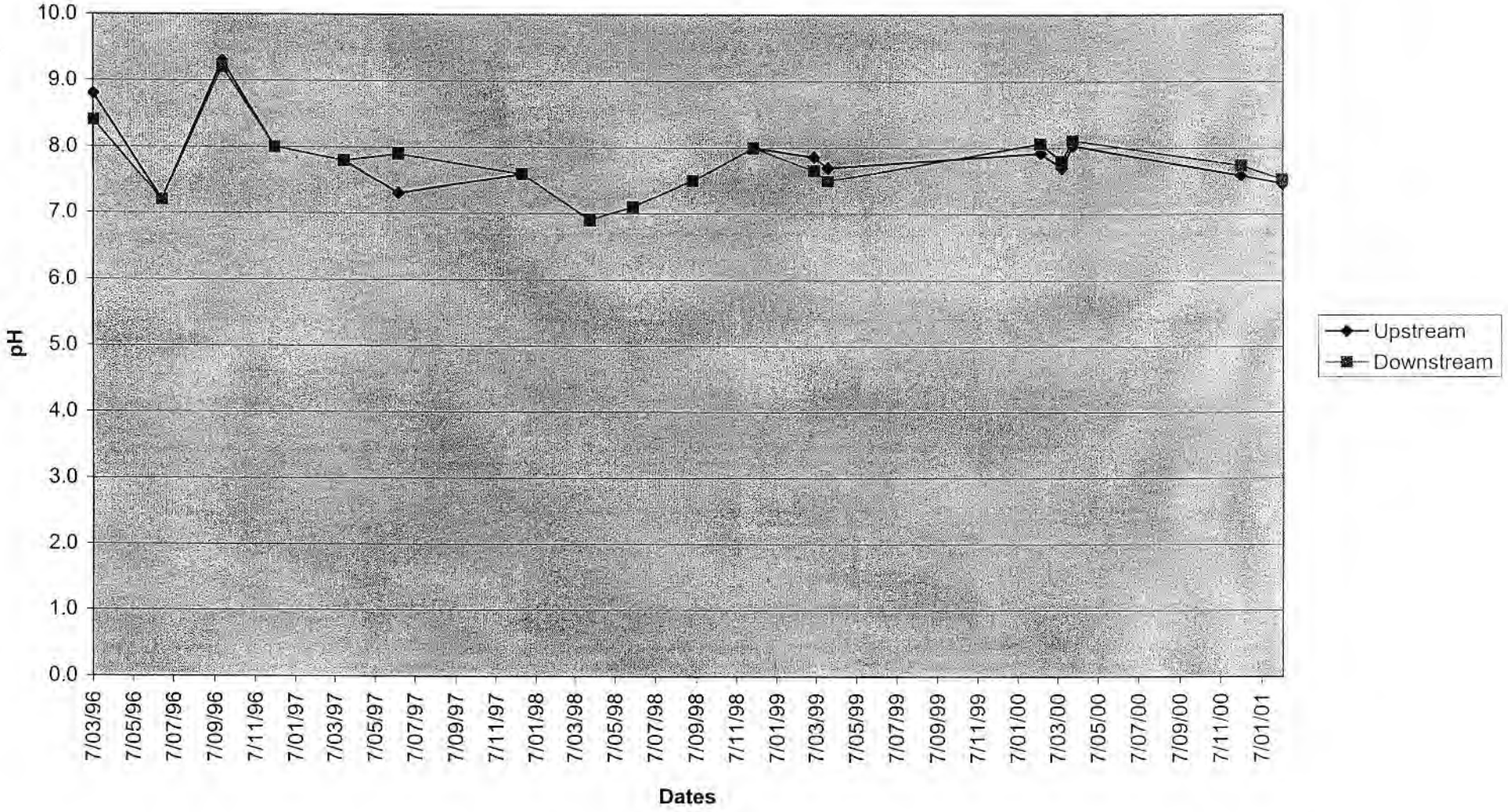
Table 1 Monitoring Results at for Winton Stream March 1996 to February 2001

Date sampled	DO (mg/L)		D.R. P (mg/L)		Ammoniacal N (mg/L – N)		pH		Temp (°C)		Cond		Faecal Coliforms (CFU/100m)L	
Site	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
7-Mar-96	11.70	3.00	0.014	0.540	0.016	1.800	8.8	8.4	17.9	18.5	0.202	0.239	-	-
19-Jun-96	12.10	12.00	0.023	0.050	0.048	0.220	7.2	7.2	4.1	4.2	0.175	0.177	-	-
18-Sep-96	17.70	17.20	0.013	0.230	0.012	0.710	9.3	9.2	13.0	12.9	0.205	0.220	-	-
6-Dec-96	10.80	10.50	0.026	0.460	0.028	1.800	8.0	8.0	14.5	14.7	0.199	0.223	-	-
21-Mar-97	10.50	10.40	0.031	0.026	0.021	0.360	7.8	7.8	15.0	15.0	0.169	0.179	-	-
12-Jun-97	10.90	10.30	0.045	0.620	0.015	2.400	7.3	7.9	13.1	13.1	0.211	0.248	-	-
17-Dec-97	10.80	10.40	0.028	0.110	0.041	0.480	7.6	7.6	9.4	9.4	0.208	0.215	-	-
30-Mar-98	7.80	7.80	0.068	0.120	0.080	0.180	6.9	6.9	11.4	11.4	0.188	0.190	-	-
3-Jun-98	10.20	10.20	0.028	0.065	0.077	0.310	7.1	7.1	5.8	5.8	0.204	0.208	-	-
2-Sep-98	11.00	10.90	0.018	0.088	0.028	0.290	7.5	7.5	6.3	6.4	0.198	0.197	-	-
3-Dec-98	11.00	11.20	0.025	0.510	0.010	0.820	8.0	8.0	13.0	13.5	0.207	0.231	-	-
4-Mar-99	11.76	9.24	0.057	0.822	0.004	6.000	7.9	7.7	14.5	14.5	0.255	0.354	610	51,000
-Mar-99	10.60	10.10	0.041	0.250	0.020	0.820	7.7	7.5	12.9	12.9	0.171	0.187	2,700	3,600
-Feb-00	10.20	10.60	0.042	0.141	0.010	0.530	7.9	8.1	19.0	19.0	0.194	0.203	390	2,000
13-Mar-00	10.20	9.60	0.055	0.650	0.059	1.700	7.7	7.8	11.8	12.0	0.169	0.222	19,000	34,000
30-Mar-00	12.82	12.26	0.123	0.288	0.010	0.660	8.0	8.1	15.0	15.0	0.221	0.232	340	2,000
7-Dec-00	10.19	10.62	0.067	0.316	0.040	0.530	7.6	7.7	17.5	18.0	0.194	0.208	420	1,200
7-Feb-01	9.64	10.28	0.004	0.815	0.010	1.830	7.5	7.5	11.5	11.4	0.226	0.269	290	2,700
Average	11.11	10.37	0.039	0.339	0.029	1.19	7.76	7.778	12.539	12.650	0.20	0.22	3392.86	13785.71

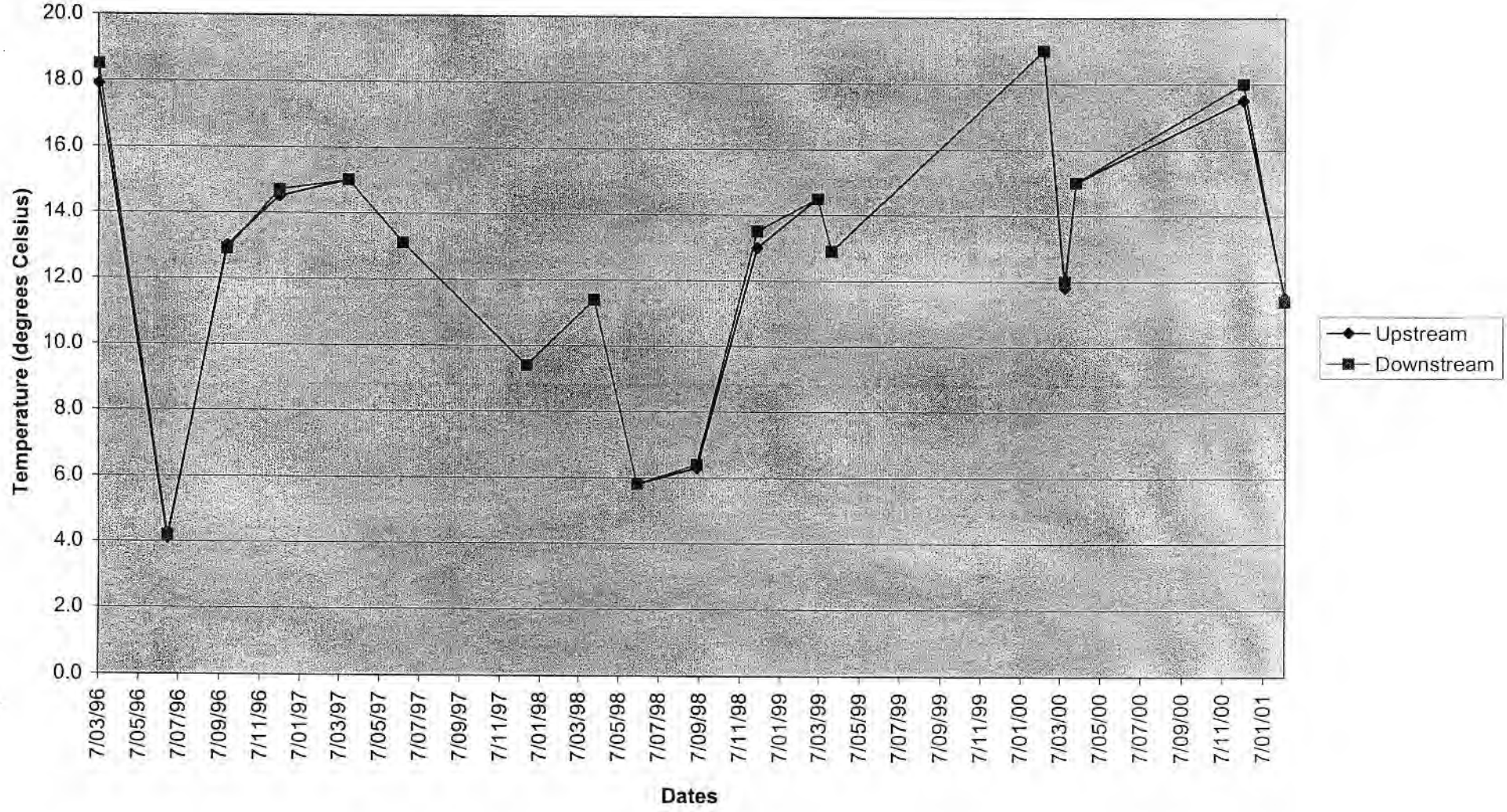
Graph D1: Winton Stream Monitoring Results - Dissolved Oxygen



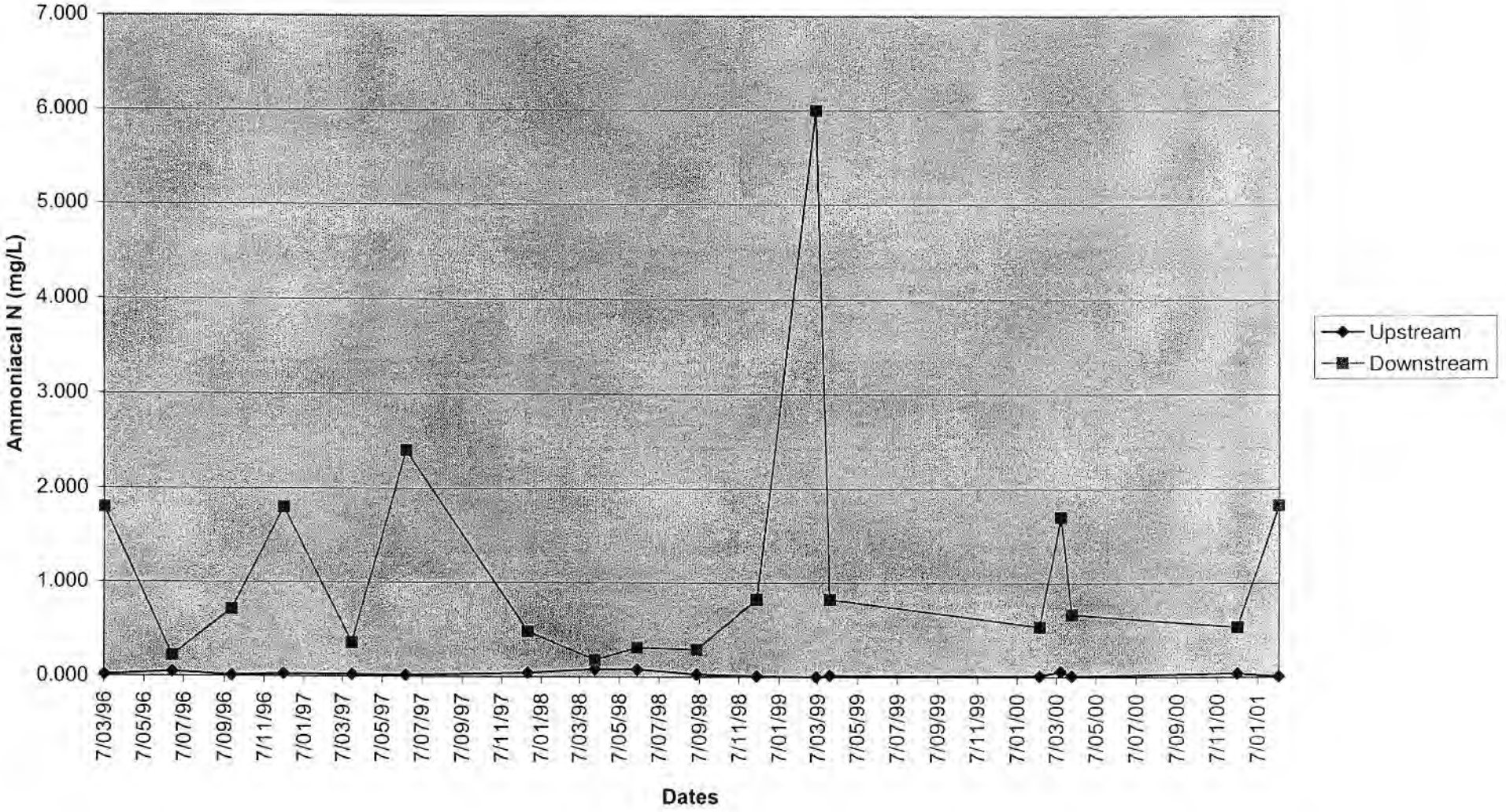
Graph D2: Winton Stream Monitoring Results - pH



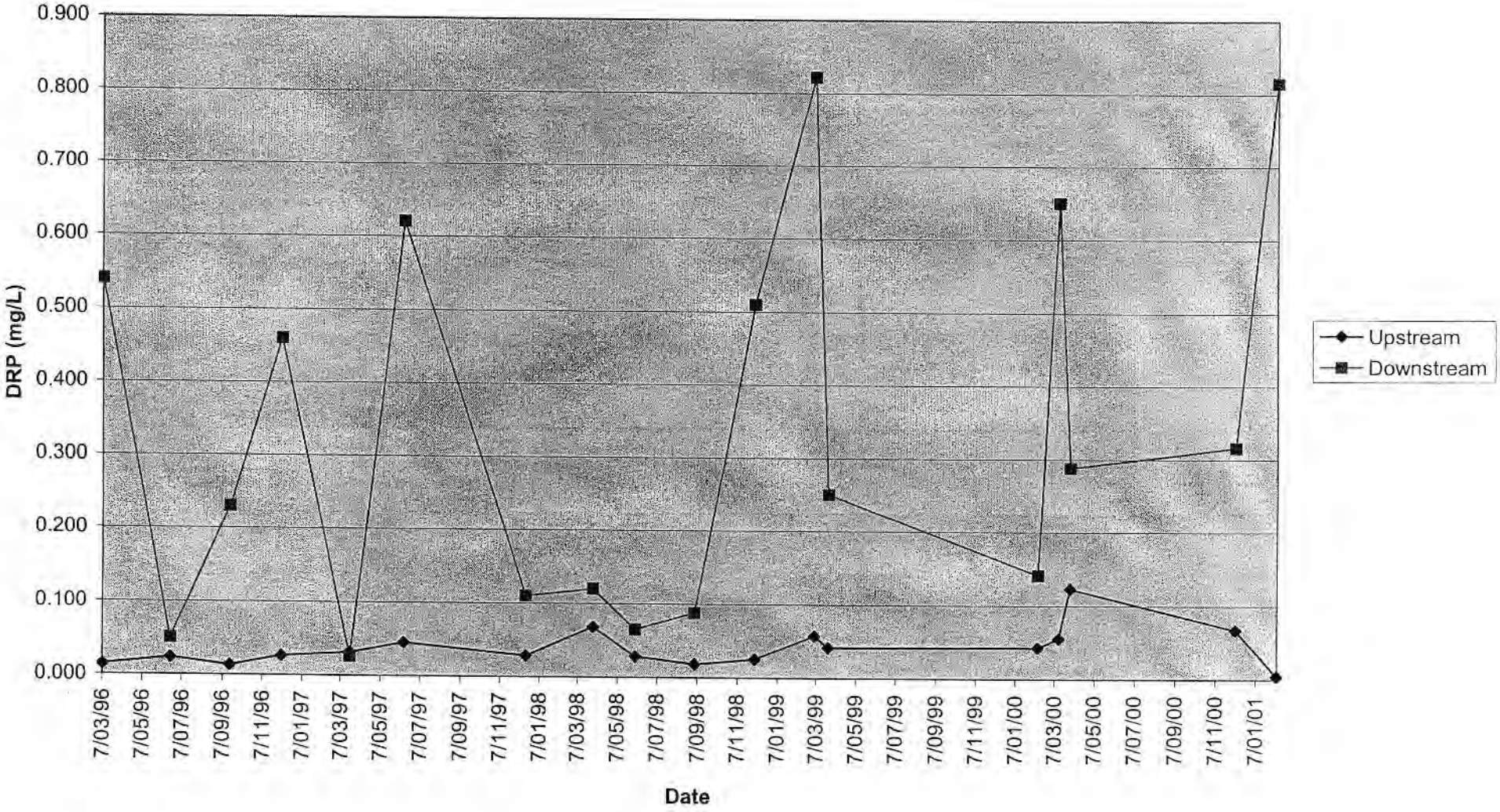
Graph D3: Winton Stream Monitoring Results - Temperature



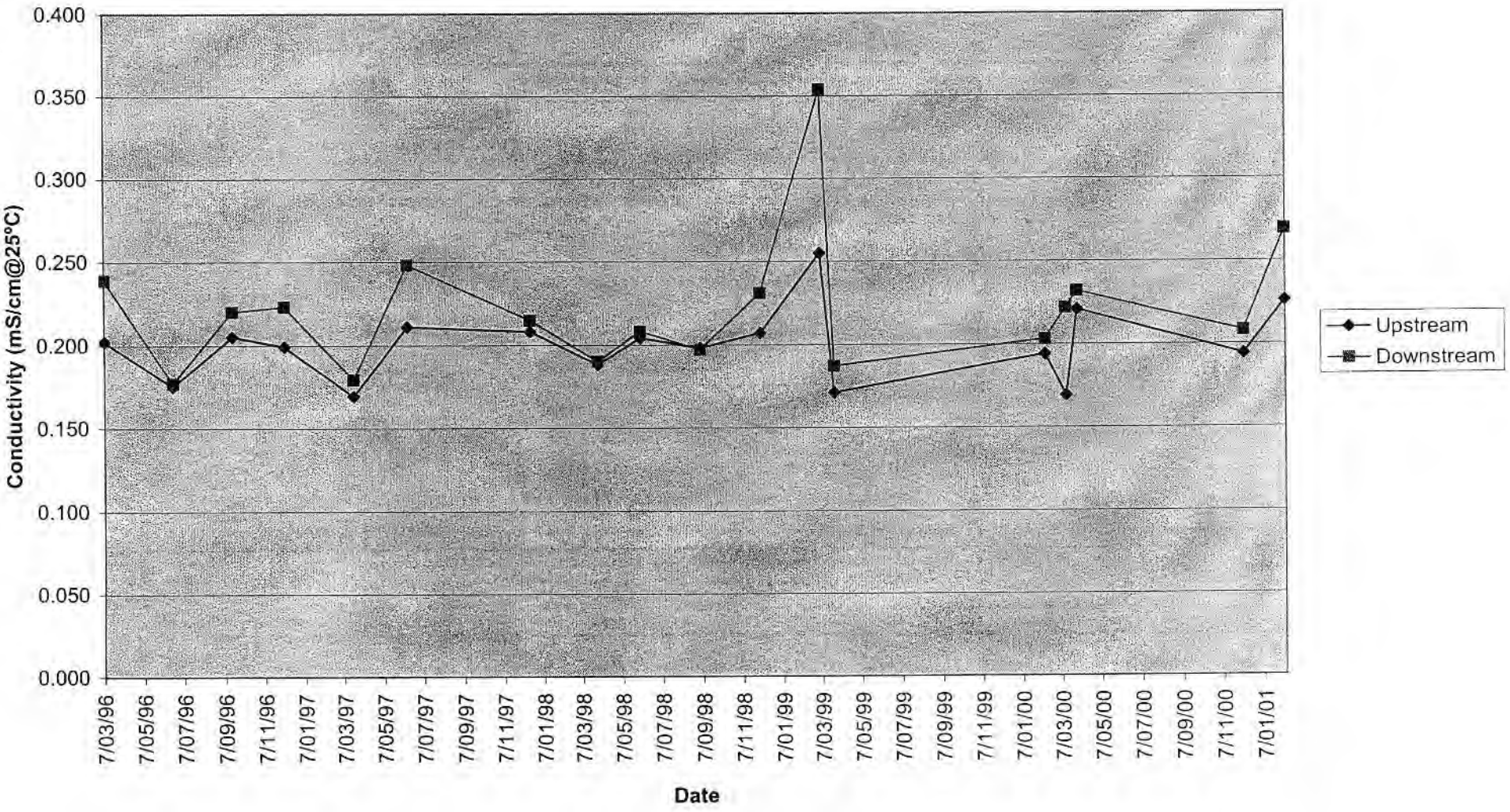
Graph D4: Winton Stream Monitoring Results - Ammoniacal Nitrogen



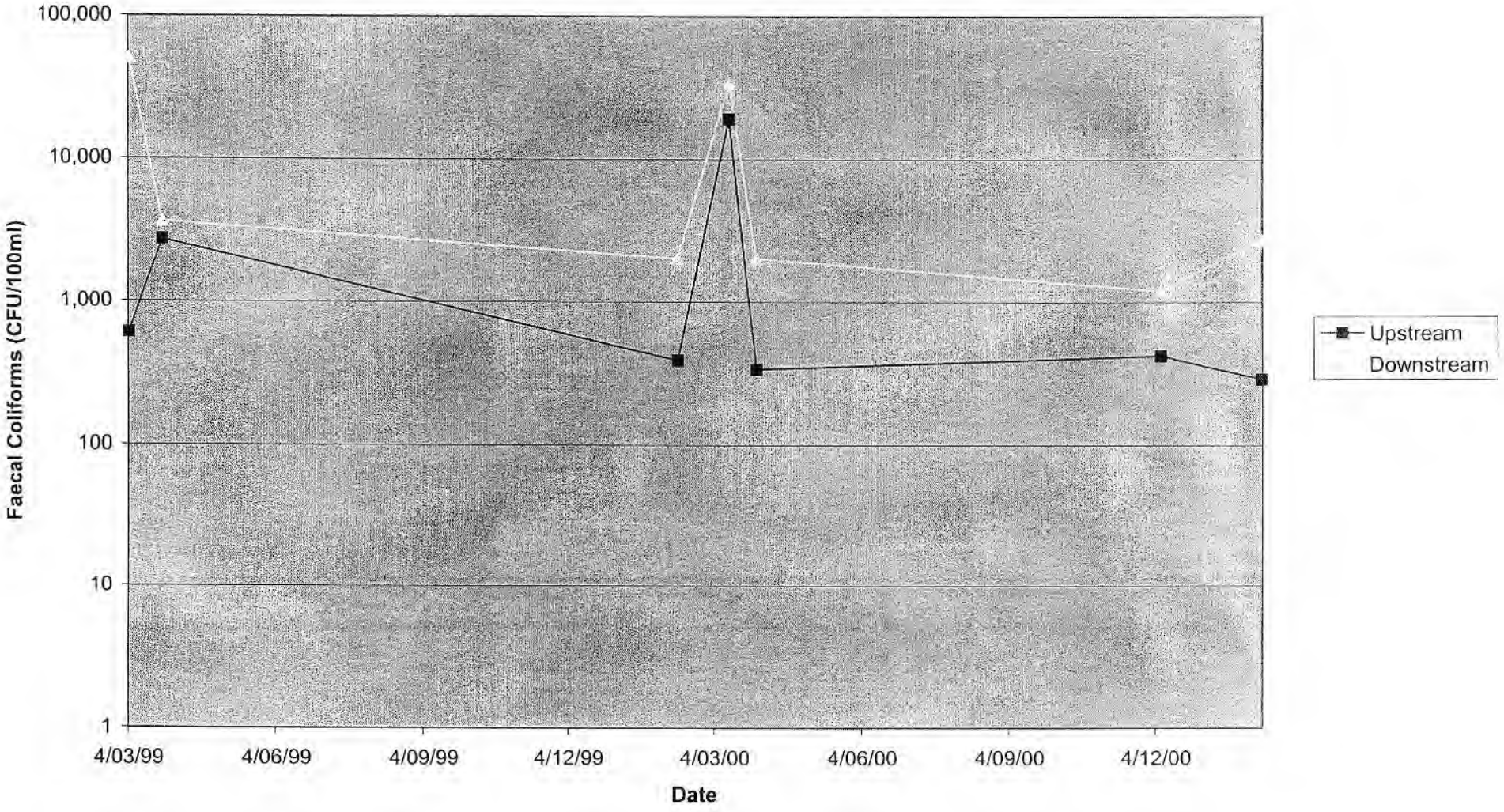
Graph D5: Winton Stream Monitoring Results - Dissolved Reactive Phosphorous



Graph D7: Winton Stream Monitoring Results - Conductivity



Graph D6: Winton Stream Monitoring Results - Faecal Coliform



Appendix E: Assumptions Used in Indicative Cost Estimates

Assumptions in Indicative Cost Estimates

Introduction

An outline of the costs included and excluded from the indicative cost estimates in Table 5.6.3 and Table 5.6.4 are listed below. A list of the assumptions used in these cost estimates for the different options are also outlined.

General

The indicative costs listed in Table 5.6.3 and 5.6.4 include the following:

- Preliminary and General of 15% of Capital Works
- Contingency of 30%
- Capital works costs including:
  - Earthworks
  - Fences/signage
  - Pumps/pump stations/control and electric's
  - Pipework and valves
  - Drainage/collection ditches
  - Individual features of the treatment system such as plants, inlet/outlets, sprinklers, drippers and filtration units
- Operation and maintenance costs including:
  - Staff
  - Maintenance Supplies
  - Electricity
  - Pump and Pipework Maintenance
  - Monitoring and Lab work.

The indicative costs listed in Table 5.6.3 and 5.6.4 do not include the following:

- Land Purchase
- Site Investigation, Planning and Design
- Contract Administration and Commissioning
- Any additional effluent storage facilities required
- GST.

Slow Rate Treatment and Disposal Costs

The indicative cost estimate for both application methods assumes that:

- Pump station will be required
- Power is available at site

Appendix C - Water Quality Standards - Rule 3 of the Proposed Regional Fresh Water Plan for Southland

Water quality shall be managed to meet the standards listed below, after reasonable mixing of any contaminant or water within the receiving water and disregarding the effect of any natural perturbations that may affect the water body:

1. The water shall not be altered in those characteristics that have a direct bearing upon cultural or spiritual values.
2. Temperature of the waters shall not be changed by more than 2°C or altered to exceed 20°C daily maximum temperature.
3. There shall be no measurable pH change and/or discharge of a contaminant into water that results in a loss of biological diversity or a change in community composition.
4. There shall be no desirable biological growths, including sewage fungus or excessive filamentous green algae.
5. Oxygen in solution in waters shall not be reduced below 6.5 mg/l.
6. Visual clarity shall not be decreased by more than 33% and turbidity shall not increase by more than 33%.
7. Waters shall not be rendered unsuitable for bathing by the presence of contaminants and indicators of health risk should not increase by more than 20%.
8. The water shall not be rendered unsuitable of stock drinking water.
9. Fish and other aquatic organisms shall not be rendered unsuitable for human consumption by the presence of contaminants.
10. Waters and bed sediments shall not contain contaminants at levels that would potentially harm the health of humans, domestic animals, including stock, or aquatic life.
11. Waters shall not emit any objectionable odours.

Appendix D – Response from Submitters to the *"Condition 15 Report"*

Fish & Game
NEW ZEALAND

12 March 2003

Peter Greenwood,
Southland District Council,
PO Box 903,
Invercargill

Dear Peter,

MWH Report - Winton Sewage Options.

The Southland Regional Council has forwarded the above report to us for comment. We appreciate the opportunity to provide comment and have input at this stage.

The report is a good summary of the options available for Winton Sewage disposal to land and a significant first step toward meeting condition 15 of the Resource Consent for the Winton Sewage Scheme.

We have carefully read the report and generally support the findings and the recommendation which favours the Constructed Wetland Treatment option, as the most suitable option for the given set of physical parameters. We note MWH recommends undertaking further site investigations before confirming and finalizing the preferred treatment and disposal option. We also support this recommendation as the physical parameters of the site need to be more fully understood to ensure they are suitable for Constructed Wetland Treatment.

The Report provides a summary of effluent quality at the point of discharge to the Winton Stream and information on the effects of the discharge on the Winton Stream. This is of particular interest to Fish and Game Southland and the most important aspect of the report. From the data and the analysis it is essential that the option chosen for further treatment of the effluent results in a lowering of NH4 (given the relatively high pH of the Winton Stream), DRP and Conductivity levels and Faecal Coliform counts in the Winton Stream.

Table 5.6.2 (pg21) of the report compares the Expected Effluent Quality for the 4 treatment options considered. If the Constructed Wetland becomes the final preferred option, it seems logical that these expected effluent quality (or similar) figures ultimately become performance standards in a Resource Consent against which the performance of the system can be measured. We think this is important from a compliance point of view and will provide long term guarantees to improve the water quality of the Winton Stream. Performance standards need to be carefully considered and established now, prior to deciding on the best treatment option and prior to finalizing the design of the treatment system. We see this as being an essential first step in this whole process.

Southland Region
159 North Road, PO Box 159, Invercargill, New Zealand. Telephone (03) 215 9117 Facsimile (03) 211 0066

Further on the comparison of Expected Effluent Quality for the 4 treatment options considered. It appears that the biggest unknown factor in terms of achieving a higher quality discharge to the Winton Stream is the ability of Constructed Wetland Treatment to reduce Faecal Coliform levels. It would be worthwhile trying to get a better handle on this issue to ensure the wetland design is optimized to reduce FC counts prior to discharging to the Winton Stream.

We note the report (pg16) says one of the issues experienced in NZ with wetlands is that of "wildlife eating new wetland growth and inhibiting development of foliage". We are also aware that the presence of wildlife on such wetlands can contribute to the Faecal Coliform count of the discharge from the wetland. We suggest that it is possible to manage these issues through careful selection of plant species for the wetland (those that are unpalatable to wildlife) and by managing water levels and vegetation (type and density) in the wetland to discourage wildlife from using it. We are happy to provide further advice on such matters if required.

Table 5.6.2 also provides detail about the area of wetland required, based on a number of assumptions. We are unclear about why a range of sizes is given and would like to see this clarified and the assumptions that wetland design size is based on, ratified for the Winton set of circumstances.

We would like to congratulate the SDC on the progress being made toward the land-based disposal of Winton effluent. We look forward to seeing the results of the next phase of the investigation, i.e. the site investigations and the preliminary design work and to having further input to the process.

Thank you for the opportunity to comment.

Yours sincerely,

Jan Riddell.

cc: S. West
Environment Southland,
Private Bag 90116
Invercargill

FOREST & BIRD

ROYAL FOREST AND BIRD PROTECTION SOCIETY OF NEW ZEALAND INC

Royal Forest & Bird Protection Society of NZ Inc
C/- Southland Branch
P O Box 1155
Invercargill
17 March, 2003

Southland District Council
P O Box 903
Invercargill.

Attn: Mr Peter Greenwood

Dear Sir,

Re: Winton Sewage - consideration of alternatives

I have received a copy of the reports on alternative discharge for the Winton Sewage and would like to make the following comments.

1. As the current condition required an action plan for implementation by December 2001, this report seems to be rather overdue.

2. The constructed wetland system may well be the best method but there is not enough information in the report. I think the Council could have expected more from such an investigation. Constructed wetlands are not a new treatment system. There are a number of such systems in operation and a little more investigation should have provided more information on how they would be expected to operate in Winton conditions. There should also be information available as to the qualities of the effluent discharge likely to be produced, particularly nutrient and coliform levels. A consent for a wetland discharge would be expected to set maximum allowable levels and the Council should require information from their consultants as to what levels would be expected before going too far into the planning phase.

3. It is not appropriate to save costs by lowering effluent quality at times of higher stream flow.

4. Staging construction and monitoring performance is a good idea as long as limits are set on discharge quality and the system meets the specification.

5. There may well be improvements needed in the future. The ideal would be that in time water quality in the Winton Stream could be improved and discharge quality may need to rise to meet the higher standards. In future other equipment may be needed such as UV treatment. These should be allowed for now as it may prove cheaper than changes later.

6. There seems to be a problem in Winton with stormwater incursion into the sewage system. This needs to be attended to or serious incursion could overload the whole system.

7. The key issue of design is to ascertain the required discharge quality and design the system to produce this. The designer should be able to outline the expected discharge quality. A report such as this should have outlined the likely discharge parameters that could be expected to be included in any discharge consent and then described systems that would meet these limits.

8. We would be interested to be kept updated with progress on this issue.

Yours sincerely,

Craig W Carson
Chairman, Southland Branch

E06/12

4 March 2003

TE WAKAHAUORA
Public Health South

C.E.		G.M Asset Mgmt	✓
C.E Venture Southland		G.M Customer & Fin. Serv.	
G.M Regulatory Services		Legal Executive	

Peter Greenwood
Asset Manager Water Services
Southland District Council
PO Box 903
Invercargill

Dear Peter

Winton Sewerage Consent Condition 15 – Proposed Action Plan : 52/4/23/11

Your letter dated 20 December 2003 in this regard has reference.

Public Health South has gone through the application and has a few comments with regard to the proposal.

- The option to establish a wetland seems sensible. Typically there would be a further decrease in faecal coliforms, depending on the performance of the oxidation ponds.
- It is hard to determine the performance of the oxidation ponds in winter when MWH is proposing a lower quality wastewater, as the summer results are not very good compared to the Guideline for the design, construction and operation of oxidation ponds (Ministry of Works and Development, Wellington, 1974) However, it should be noted that many ponds don't meet the criteria even when all the design parameters are OK.
- The proposal suggests lining of the wetland may not be required. Much more information on the soil and groundwater would be required. (Soil test results are not available). Typically wetlands are lined to prevent infiltration in winter and drainage in summer.
- Are there any private or community wells in the area that might be influenced by seepage from the wetland? Information of groundwater uses would assist any recommendation.
- Are the areas up and more specifically, downstream in the Winton Stream used for recreational purposes? How does the increased faecal coliforms influence these uses?
- The Winton Stream joins the Oreti River lower down. Branxholme takes its water from the Oreti a couple of kilometres downstream. How does this affect the water quality at the Branxholme intake?

As indicated, Public Health South does have a few concerns and would be interested in participating in this process.

Yours sincerely

Leon Myburgh
Health Protection Officer

BRANCHES
Dunedin 57 Hanover St, P O Box 5144 Moray Place tel +64 3 474 1700 fax +64 3 474 0221
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a service entity of HealthCare Otago Ltd

Appendix C

4Sight – Winton Wastewater treatment system – Biological Survey (August 2022)

SOUTHLAND DISTRICT COUNCIL
Te Rohe Pōtae o Murihiku

WINTON WASTEWATER TREATMENT SYSTEM BIOLOGICAL SURVEY

For Southland District Council

August 2022

REPORT INFORMATION AND QUALITY CONTROL

Prepared for:	Paul Reid Consents/Compliance Manager Southland District Council

Author:	Ben Ludgate Principal Ecologist	
Reviewer:	Ruth Goldsmith Principal Ecologist	
Approved for Release:	Ruth Goldsmith Principal Ecologist	

Document Name	R_SDC_Winton biological survey_V1.0 (Aug 2022).docx

Version History:	V1.0	3 August 2022

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1 INTRODUCTION

Southland District Council (SDC) have a discharge permit (Environment Southland (ES) consent 202026) authorising the discharge of treated sewage effluent from the Winton wastewater treatment system via a constructed wetland to Winton Stream.

Condition 9 (b) of the permit states:

9. During the months of January to March in the summer preceding each "Environmental Effects Review", as described in Condition 19, the consent holder shall undertake more intensive environmental monitoring than that required for the annual monitoring carried out in accordance with this resource consent. The methodology for this intensive monitoring shall be submitted to the consent authority for approval prior to the monitoring commencing. The monitoring shall include:

(b) the inclusion of a biomonitoring assessment focussing on assessing the effects of the discharge on the aquatic ecosystem. This shall include a study of macroinvertebrates and periphyton.

Condition 19 of the permit describes the requirements for the "Environmental Effects Review", which is to be undertaken three years after the grant of the resource consent, and thereafter every five years. The last "Environmental Effects Review" and associated biomonitoring assessment was completed in 2017, therefore the next review and biomonitoring assessment was required in 2022.

SDC engaged Ryder Environmental, now part of 4Sight Consulting, to undertake the required periphyton and macroinvertebrate survey in 2022. This report summarises the March 2022 biological survey.

2 SURVEY SITES

Sampling was undertaken at one site upstream and two sites downstream of the discharge point to Winton Stream (Figure 1). The upstream sampling site was located approximately 50 m upstream of the most upstream discharge point, while the downstream sampling sites were located at approximately 130 m and 500 m downstream of the most downstream discharge point. Downstream 2 was located upstream of a stock crossing point.

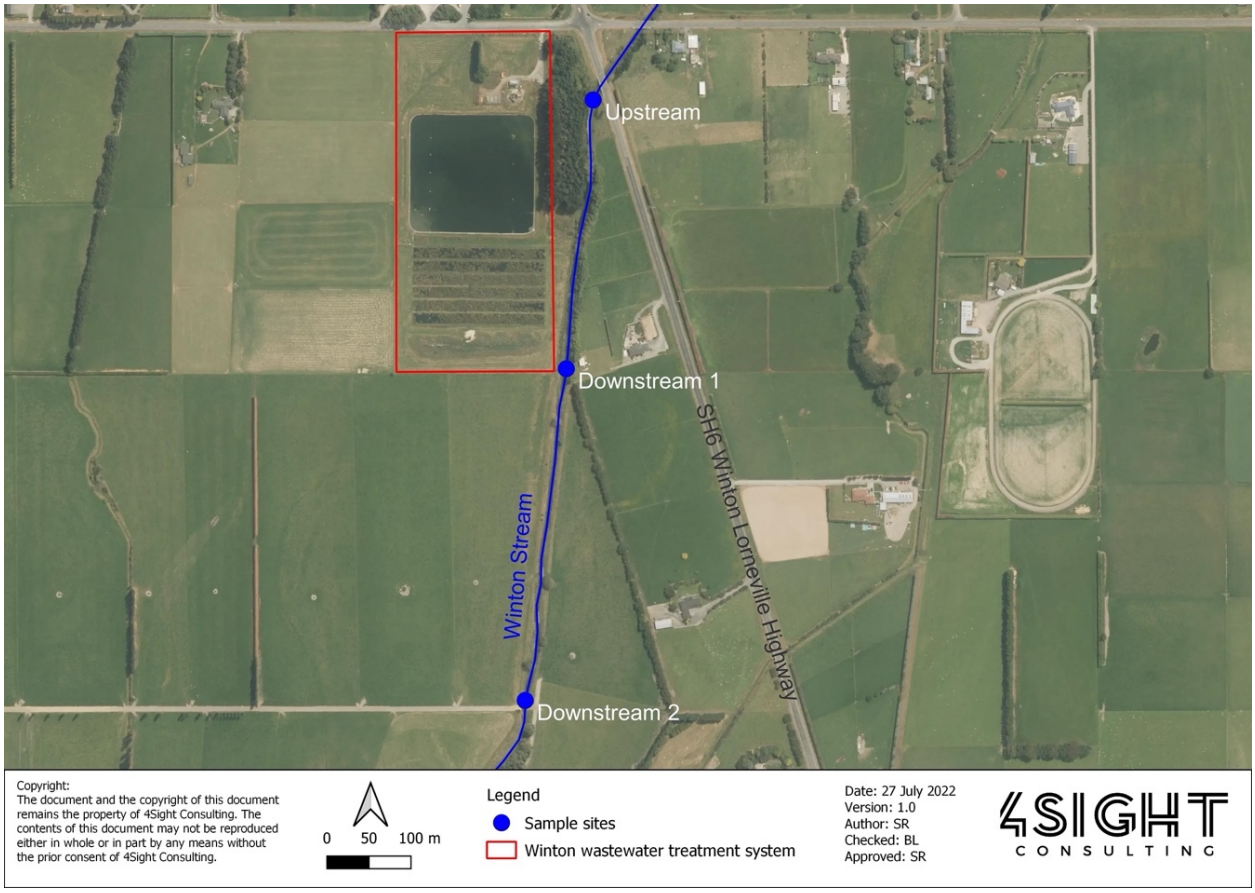

Figure 1: Map showing the location of Winton Stream survey sites, March 2022.

3 SURVEY AND ANALYSIS TECHNIQUES

3.1 General

In accordance with the requirements of the consent, the methodology used for this monitoring was agreed with ES (Ruth Williamson, Compliance Technical Officer, 28 February 2022).

The survey included assessments of water quality, sediment, periphyton, and benthic macroinvertebrates. SDC are required to undertake separate regular water quality assessments in Winton Stream, however the additional water quality assessments undertaken during this survey help characterise general conditions at the time of sampling and allow comparisons with relevant standards.

Winton Stream is classed in ES's Regional Water Plan for Southland (2014) and in ES's Proposed Southland Water and Land Plan (decision version, 4 April 2018), as a 'lowland hard bed' river. The relevant 'lowland hard bed' standards are outlined in Table 1.

The 'lowland hard bed' standards apply following reasonable mixing with the receiving waters. Condition 11 of the permit states:

For the purposes of this consent the zone of reasonable mixing in Winton Stream shall extend from 5 metres upstream of the outfall to 100 metres downstream of the outfall.

As such, the downstream sampling sites were located just outside the zone of reasonable mixing as defined in the permit.

Table 1: Standards for surface water bodies classified as 'Lowland hard bed' in ES's Regional Water Plan for Southland (2014) and in ES's Proposed Southland Water and Land Plan (decision version, 4 April 2018).

Parameter	Standards
Water temperature	Shall not exceed 23 °C. Shall not exceed 11 °C in trout spawning areas during May to September inclusive When the natural or existing water temperature is 16 °C or less: - The daily maximum ambient water temperature shall not be increased by more than 3 °C as a result of any discharge. If the natural or existing water temperature is above 16 °C: - The natural or existing water temperature shall not be exceeded by more than 1 °C as a result of any discharge.
pH	Shall be within the range 6.5 to 9. There shall be no pH change in water due to a discharge that results in a loss of biological diversity or a change in community abundance and composition.
Dissolved oxygen	Concentration of dissolved oxygen in water shall exceed 80% of saturation concentration.
Visual clarity	When the flow is below the median flow, the visual clarity of the water shall not be less than 1.6 metres, except where the water is naturally low in clarity as a result of high concentrations of tannins, in which case the natural colour and clarity shall not be altered.
Sediment cover	The change in sediment cover must not exceed 10%.
Bacterial or fungal slime growths	There shall be no bacterial or fungal slime growths visible to the naked eye as obvious plumose growths or mats. Note that this standard also applies to within the zone of reasonable mixing for a discharge.
Periphyton	For the period 1 November through to 30 April: - Filamentous algae of greater than 2 cm long shall not cover more than 30% of the visible stream bed. - Growths of diatoms and cyanobacteria greater than 0.3 cm thick shall not cover more than 60% of the visible stream bed. Biomass shall not exceed 35 grams per square metre for either filamentous algae or diatoms and cyanobacteria. Chlorophyll *a* shall not exceed 120 milligrams per square metre for filamentous algae and 200 milligrams per square metre for diatoms and cyanobacteria.
Macroinvertebrates	MCI shall exceed 90 and SQMCI shall exceed 4.5

3.2 Water quality

Water quality measurements were taken on site for temperature (°C), pH, dissolved oxygen (% and mg/L) and conductivity (µS/cm) using a calibrated handheld YSI Professional Plus multi-probe field meter. Water clarity was measured at each site using a WET Labs C-star 532 nm transmissometer, and turbidity was measured using a Hach

2100Q turbidimeter. Measurements were assessed against ES standards for 'lowland hard bed' water bodies (Table 1) and against water quality guidelines for New Zealand streams (e.g., ANZECC 1992).

3.3 Sediment cover

Sediment cover assessments were undertaken at each site according to Sediment Assessment Method 2 (SAM2): In-stream visual estimate of % sediment cover outlined in Clapcott *et al.* (2011). This provides for a semi-quantitative assessment of the surface area of the streambed covered by deposited sediment (<2 mm), with at least 20 readings made within a single habitat using an underwater viewer (e.g., bathyscope). Sediment cover data was assessed against ES standards for 'lowland hard bed' water bodies (Table 1).

3.4 Periphyton

3.4.1 Cover

Periphyton cover assessments were undertaken at each site using a modified version of "*Rapid Assessment Method 2 (RAM-2): Line transect – point method*" described by the Ministry for the Environment (MfE) (Biggs and Kilroy 2000). Four equally spaced intervals were calculated along a 10 m length of stream (or 5 x the stream width, whichever was the smaller). At each interval, the width of the stream able to be sampled (i.e., <0.6 m depth) was divided into five equally spaced points. At the first point across the transect an underwater viewer (e.g., bathyscope) was used to view the substrate and the percentage of the bed within the field of view covered by each periphyton cover category (i.e., thin, medium, and thick mats, short and long filaments) was estimated. This estimation continued across the stream width and repeated moving upstream.

Periphyton cover data was tabulated and assessed in accordance with MfE's New Zealand periphyton guidelines (Biggs 2000) (Table 2) and with ES standards for 'lowland hard bed' water bodies (Table 1).

Table 2: MfE periphyton guidelines for gravel/cobble streams (Biggs 2000). Maximum guideline values are averaged across the full width of the stream or river.

Instream value/variable	**Diatoms/Cyanobacteria**	**Filamentous algae**
Aesthetics/recreation (1 November – 30 April):		
Maximum cover of visible streambed	60% > 0.3 cm thick	30% > 2 cm long
Maximum AFDM (g/m^2)	N/A	35
Maximum chlorophyll *a* (mg/m^2)	N/A	120
Trout habitat and angling:		
Maximum cover of visible streambed	N/A	30% > 2 cm long
Maximum AFDM (g/m^2)	35	35
Maximum chlorophyll *a* (mg/m^2)	200	120

3.4.2 Biomass

Periphyton biomass was surveyed using "*Quantitative Method 1b (QM-1b): Scraping or brushing a sample from a defined area on the top of a stone*" described by MfE (Biggs and Kilroy 2000). A reference point was randomly chosen

in the middle of each site and the width of the river able to be sampled (i.e., <0.6 m depth) was divided into three equally spaced intervals. At each interval point a stone was randomly chosen, without visual inspection of the bed, and removed to the river bank. A defined area of the stone surface was scrubbed with a small brush into a tray and rinsed with river water. The contents of the tray were transferred into a sample container using river water to ensure all traces of periphyton were removed. The sample was stored in a chilly bin and transported to the laboratory.

In the laboratory, each sample was processed for two standard measures of biomass, chlorophyll *a* and ash-free dry mass (AFDM), following the general methods described in the Biggs and Kilroy (2000) periphyton monitoring manual. These methods have been summarised below.

Each sample was homogenised and subsamples were filtered onto Microscience MS-GC 47 mm glass fibre filter. One filtered subsample was retained for chlorophyll *a* analysis, while a second subsample was filtered onto a pre-ashed and pre-weighed Microscience MS-GC 47 mm glass fibre filter for AFDM processing. The chlorophyll *a* filter, in a solution of 90% ethanol, underwent water bath immersion, overnight refrigeration and centrifuging before absorption readings were taken using a Shimadzu UV-1601 spectrophotometer, before and after acidification with 0.3 M HCl. From these readings the total amount of chlorophyll *a* was calculated using a standard formula (Biggs and Kilroy 2000) and scaled to the number of milligrams of chlorophyll *a* per m^2 of stream bed. The sample on the pre-ashed and pre-weighed AFDM filter was dried for 24 hours at 105 °C, cooled in a desiccator and weighed. The filter was ashed at 400 °C for 4 hours, cooled in a desiccator and then reweighed. Values were scaled to calculate milligrams of AFDM per m^2 of stream bed.

Chlorophyll *a* and AFDM can be combined to form a ratio (i.e., AFDM in mg/m^2 : chlorophyll *a* in mg/m^2) called the 'autotrophic index' (Biggs and Kilroy 2000). The autotrophic index is indicative of the proportions of the community composed of heterotrophic and autotrophic organisms. Autotrophic index values of 50–100 are characteristic of non-polluted conditions, whereas values greater than 400 are taken to indicate communities affected by organic pollution (Biggs and Kilroy 2000).

Periphyton biomass data was tabulated and assessed in accordance with MfE's New Zealand periphyton guidelines (Biggs 2000) (Table 2) and with ES standards for 'lowland hard bed' water bodies (Table 1).

3.5 Macroinvertebrates

3.5.1 Field collection

Benthic macroinvertebrates were sampled at each site according to "*Protocol C3: Hard-bottomed, Quantitative*" as described in MfE's 'Protocols for sampling macroinvertebrates in wadeable streams' (Stark *et al*. 2001). Samples were collected using a 0.04 m^2 Surber sampler with a 500 µm diameter mesh net. Three replicate samples were collected from each site. Sampling was undertaken within stony substrate habitats beneath moderate current. Samples were preserved in 70% ethanol for later identification.

3.5.2 Laboratory assessment

In the laboratory, samples were processed following "*Protocol 'P3: Full count with subsampling option*", outlined in Stark *et al.* (2001). Samples were sieved through a 500 µm sieve to remove fine material and residual ethanol. Contents of the sieve were then placed in a white tray and macroinvertebrates were identified under a dissecting microscope (10-40×) using criteria from Winterbourn *et al.* (2006).

Macroinvertebrate community health was assessed for each site by determining the following characteristics:

Number of invertebrates per m^2: The total number of individuals from all taxa groups per m^2 of riverbed.

Number of taxa: A measurement of the number of taxa present.

Number of Ephemeroptera, Plecoptera and Trichoptera (EPT) taxa, percentage of the total number of taxa comprising EPT taxa (% EPT taxa), and percentage of the total abundance comprising EPT taxa (% EPT abundance): These insect groups are the mayflies, stoneflies and caddisflies which are generally dominated by invertebrates that are indicative

of higher quality conditions. In stony bed rivers, these indexes usually increase with improved water quality and increased habitat diversity. Hydroptilidae (e.g., *Oxyethira*) were excluded from the calculation of these indices because this family is often associated with degraded habitats.

Macroinvertebrate Community Index (MCI) (Stark 1993): The MCI uses the occurrence of specific macroinvertebrate taxa to determine the level of organic enrichment in a stream. Taxon scores are between 1 and 10, 1 representing species highly tolerant to organic pollution (e.g., worms and some dipteran species) and 10 representing species highly sensitive to organic pollution (e.g., most mayflies and stoneflies). A site score is obtained by summing the scores of individual taxa and dividing this total by the number of taxa present at the site. These scores can be interpreted with quality classes (Table 3) and with ES standards for 'lowland hard bed' water bodies (Table 1). For example, a low site score (e.g., 40) represents 'poor' conditions and a high score (e.g., 140) represents 'excellent' conditions.

$$MCI = \left(\frac{\text{Sum of taxa scores}}{\text{Number of scoring taxa}} \right) \text{x } 20$$

Quantitative Macroinvertebrate Community Index (QMCI) (Stark 1985): The QMCI uses the same approach as the MCI, but weights each taxon score based on how abundant the taxon is within the community. Site scores range between 0 and 10. As for MCI, QMCI scores can be interpreted with quality classes (Table 3) and with ES standards for 'lowland hard bed' water bodies (Table 1).

$$QMCI = \sum_{i=1}^{i=S} \frac{(n_i \text{ x } a_i)}{N}$$

Where S = the total number of taxa in the sample, n_i is the number of invertebrates in the ith taxa, a_i is the score for the ith taxa, and N is the total number of invertebrates for the entire sample.

Table 3: Interpretation of macroinvertebrate community index values from Boothroyd and Stark (2000) (Quality class A) and Stark and Maxted (2007) (Quality class B).

Quality Class A	Quality Class B	MCI	QMCI
Clean water	Excellent	≥ 120	≥ 6.00
Doubtful quality	Good	100 – 119	5.00 – 5.99
Probable moderate pollution	Fair	80 – 99	4.00 – 4.99
Probable severe pollution	Poor	< 80	< 4.00

3.6 Data presentation and analyses

Data has been presented graphically as means +/- one standard error. A one-way Analysis of Variance (ANOVA) was used to test for differences between sites using the statistical software R version 4.0.2. Periphyton data was first transformed (cover data: arcsine square root transformation; biomass data: natural log transformation) and macroinvertebrate abundance data was first transformed (log x + 1) to meet the assumptions of normal distribution of data required for ANOVA. Where ANOVA tests indicated a significant difference between monitoring sites (i.e., $p<0.05$), Tukey post hoc testing was employed to determine which sites differed significantly from others.

4 RESULTS AND DISCUSSION

4.1 General

Sampling was undertaken on the 29th of March 2022. Weather conditions were fine and river flows were very low.

4.2 Survey site descriptions

Winton Stream was bordered by rank grass at each site, with willows shading the channel in some areas (Figures 2 to 4). Instream habitat comprised shallow runs and riffles, with bed substrate of gravels and small cobbles and some larger cobbles. Fine sediments were observed amongst the larger substrates across the channel at each site. There was evidence of recent disturbance of the bed and banks by a mechanical excavator, with the excavator moving throughout the study reach (tracks were evident along the river bed). There was also evidence of cattle within the stream, with pugmarks visible on the wetted bed at each site.

Figure 2: Upstream site, Winton Stream, March 2022.

Figure 3: Downstream site 1, Winton Stream, March 2022.

Figure 4: Downstream site 2, Winton Stream, March 2022.

4.3 Water quality

Water quality indicators were variable between the three survey sites (Table 4). Water temperatures were highest at the Upstream site and lowest at Downstream 1, and were all lower than 23°C, therefore meeting the ES standard for 'lowland hard bed' water bodies (Table 1).

pH levels were similar at all three sites and were within the range 6.5 to 9, as required by the ES standard for 'lowland hard bed' water bodies (Table 1), and typically cited as being appropriate for freshwater bodies of New Zealand (ANZECC 1992).

Dissolved oxygen saturation and concentrations were highest at the Upstream site and lowest at Downstream 1, with saturation at Downstream 1 not meeting the minimum standard of 80% specified by ES for 'lowland hard bed' water bodies (Tables 1 and 4). Saturation of 80% is also an acceptable minimum standard for lowland river environments and protects trout, which is the fish species most sensitive to low dissolved oxygen in New Zealand waters (Third Schedule of the Resource Management Act 1991, Dean and Richardson 1999). The low dissolved oxygen levels at Downstream 1 would be influenced by the discharge and by the very low flows at the time of sampling, reducing dilution and oxygenation of low dissolved oxygen water entering from the discharge.

Conductivity can provide a useful indicator of nutrient enrichment in freshwater environments. Conductivity levels were highest at Downstream 1, but were also high at the Upstream site, indicating background nutrient concentrations are likely to be high in the stream irrespective of the discharge (Table 4).

Water clarity was low, and turbidity high, at each site, with lower clarity (and higher turbidity) at both Downstream sites than Upstream (Table 4). The ES standard for water clarity for 'lowland hard bed' water bodies is '*When the flow is below the median flow, the visual clarity of the water shall not be less than 1.6 metres*'. While flow in Winton Stream is not monitored, flows at the time of sampling were very low and are expected to have been below median flow. Regardless, water clarity at each site, including the Upstream site, was less than 1.6 m. However, clarity was lower downstream of the discharge point indicating the discharge was influencing water clarity in the stream.

Table 4: Water quality in Winton Stream, March 2022.

Parameter	Upstream	Downstream 1	Downstream 2
Time	1350	1210	1120
Temperature (°C)	20.1	16.3	16.7
pH	7.86	7.50	7.63
Dissolved oxygen (%)	109.1	73.3	86.7
Dissolved oxygen (mg/L)	9.92	7.20	8.4
Conductivity (µS/cm)	239.1	308.8	293.5
Turbidity (NTU)	14.9	17.1	17.7
Clarity (m)	0.71	0.35	0.39

4.4 Sediment cover

Cover of the bed by deposited fine sediment (<2 mm) was high at all three sites, with mean cover of 98% Upstream, 78% at Downstream 1, and 64% at Downstream 2 (Figure 5). Sediment cover was statistically significantly higher Upstream than at both Downstream sites ($p<0.05$). While the ES standard for 'lowland hard bed' water bodies is for the change in sediment cover to not exceed 10%, and there was more than a 10% change in average sediment cover between each of the three sites, sediment cover decreased in a downstream direction, which is an improvement.

Sediment cover throughout the stream would have been heavily influenced by the recent excavator activities within the channel.

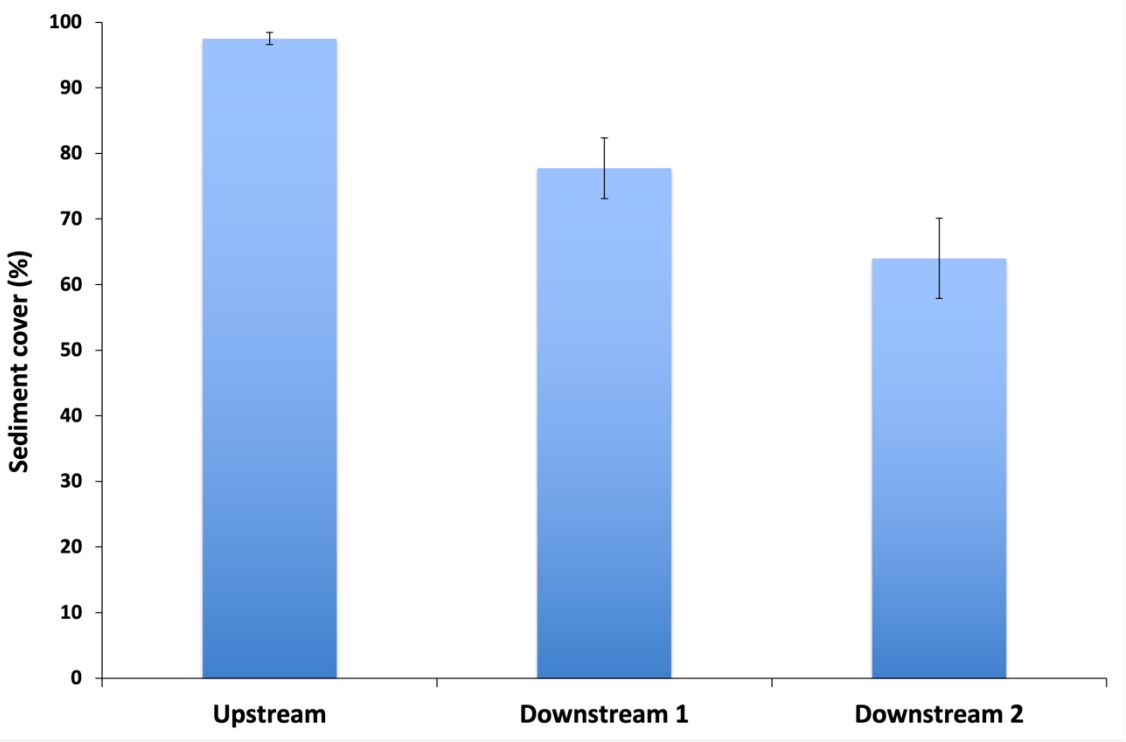

Figure 5: Percentage of the bed covered by deposited fine sediment (<2 mm) in Winton Stream, March 2022.

4.5 Periphyton

4.5.1 Cover

Assessments of periphyton communities revealed cover levels of algal mats and films and filamentous algae were low at all three sites (Figure 6). The highest cover was of short filamentous algae at Downstream 2, which along with long filamentous algae, was statistically significantly higher at Downstream 2 than at the other sites ($p<0.05$, Table 5). Despite these differences, cover of thick mats and long filamentous algae at each site was well below MfE (Biggs 2000) guideline levels and complied with ES standards for 'lowland hard bed' water bodies (Tables 1 and 2, Figure 6). There were no bacterial or fungal slime growths visible to the naked eye at any of the sites.

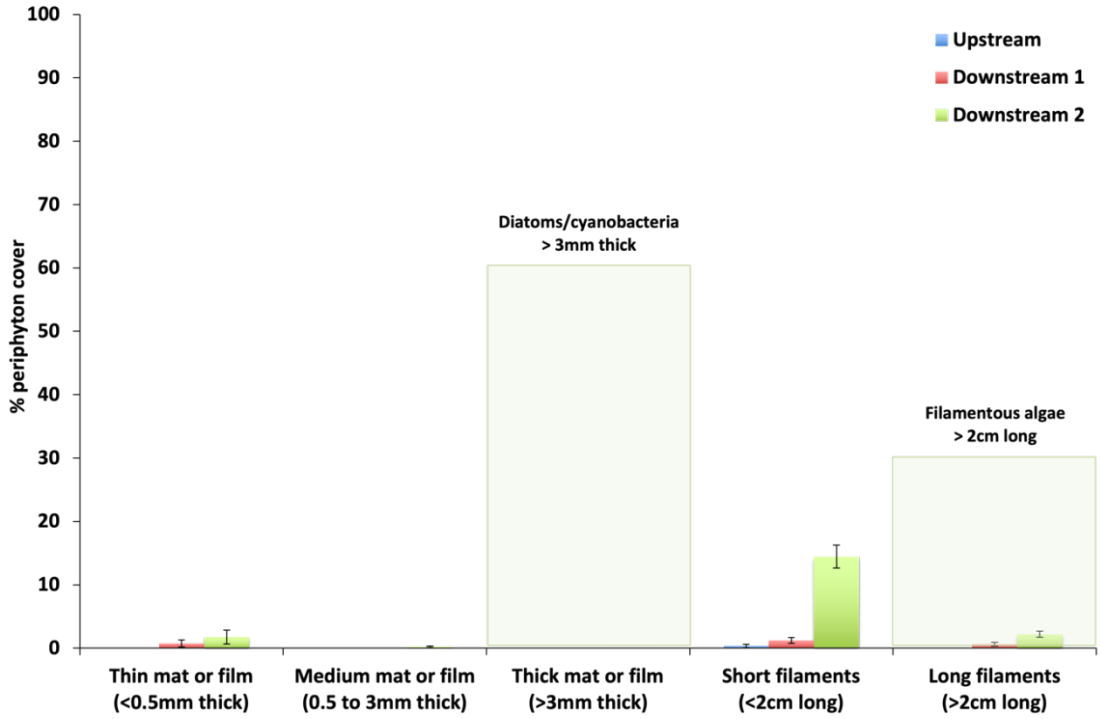

Figure 6: Average cover of the bed substrate by different types of periphyton in Winton Stream, March 2022 (mean +/- one standard error). Standards from MfE's New Zealand periphyton guidelines (Biggs 2000) (Table 2) and ES standards for 'lowland hard bed' water bodies (Table 1).

Table 5: Results of one-way ANOVA testing and post hoc interpretation for differences between sites for each of the periphyton cover categories, March 2022. Statistically significant differences between sites (i.e., p<0.05) are shown in bold.

Variable	F-value	p-value	Interpretation
Thin mat or film	1.60	0.21	No significant difference
Medium mat or film	2.11	0.13	No significant difference
Thick mat or film	-	-	No thick mats recorded
Short filaments	**89.09**	**<0.00001**	**Downstream 2 > Upstream and Downstream 1**
Long filaments	**14.99**	**<0.00001**	**Downstream 2 > Upstream and Downstream 1**

4.5.2 Biomass

Laboratory analysis of periphyton biomass revealed chlorophyll *a* levels were high at all three sites, with average levels exceeding filamentous algae levels from MfE's New Zealand periphyton guidelines (Biggs 2000) and ES standards for 'lowland hard bed' water bodies, and just exceeding the diatoms/cyanobacteria guidelines at both Downstream sites (Tables 1 and 2, Figure 7). Despite the high results, there were no statistically significant differences in chlorophyll *a* levels between sites (p>0.05, Figure 7, Table 6).

Average Ash Free Dry Mass (AFDM) levels increased in a downstream direction, with levels at all three sites lower than MfE's New Zealand periphyton guidelines (Biggs 2000) and ES standards for 'lowland hard bed' water bodies, although the average level at Downstream 2 was just below the guideline level (Tables 1 and 2, Figure 8). AFDM levels were statistically significantly lower at the Upstream site than at both Downstream sites ($p<0.05$, Table 6).

Average site values for the autotrophic index (AI), which is indicative of the proportions of the community composed of heterotrophic (e.g., bacteria, fungi) and autotrophic (e.g., algae) organisms, were less than 200 at all three sites (Figure 9). Autotrophic index values of 50–100 are characteristic of non-polluted conditions with little organic detritus (Biggs 1989) and healthy communities in unpolluted streams normally have values of 100–200 (Biggs and Kilroy 2000). Values greater than 400 are taken to indicate communities affected by organic pollution (Collins and Weber 1978, cited in Biggs and Kilroy 2000). The values from Winton Stream were generally low and indicative of healthy communities in unpolluted streams (Biggs and Kilroy 2000). There were no statistically significant differences in AI levels between sites ($p>0.05$, Figure 9, Table 6).

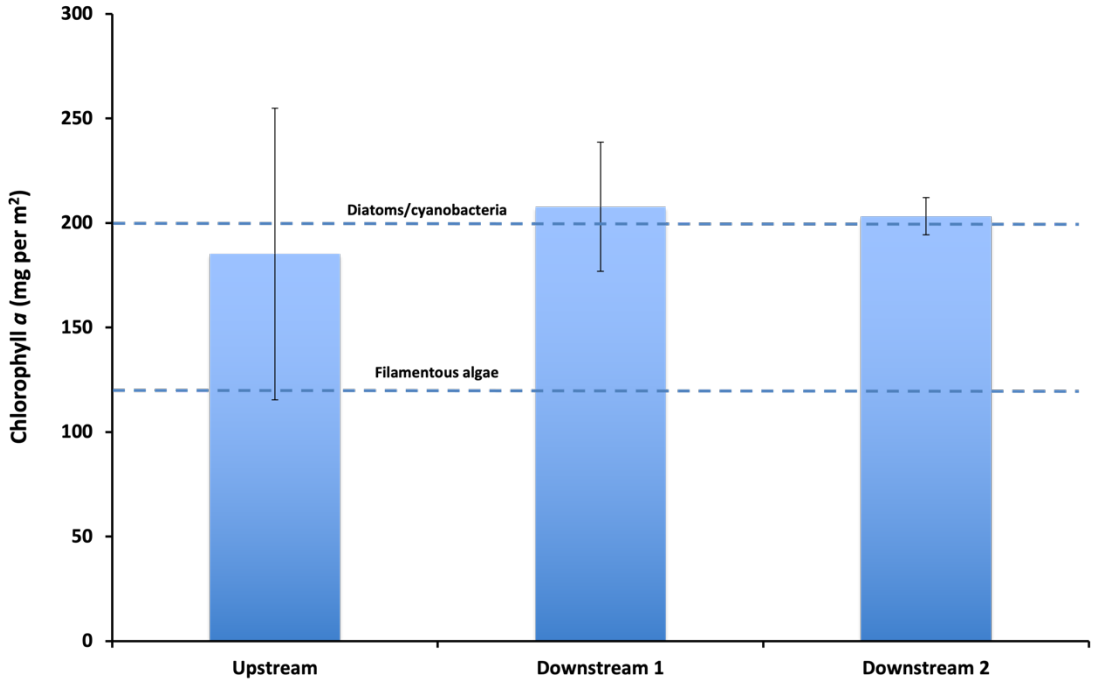

Figure 7: Periphyton biomass expressed as chlorophyll *a* in Winton Stream, March 2022 (mean +/- one standard error). Standards from MfE's New Zealand periphyton guidelines (Biggs 2000) (Table 2) and ES standards for 'lowland hard bed' water bodies (Table 1).

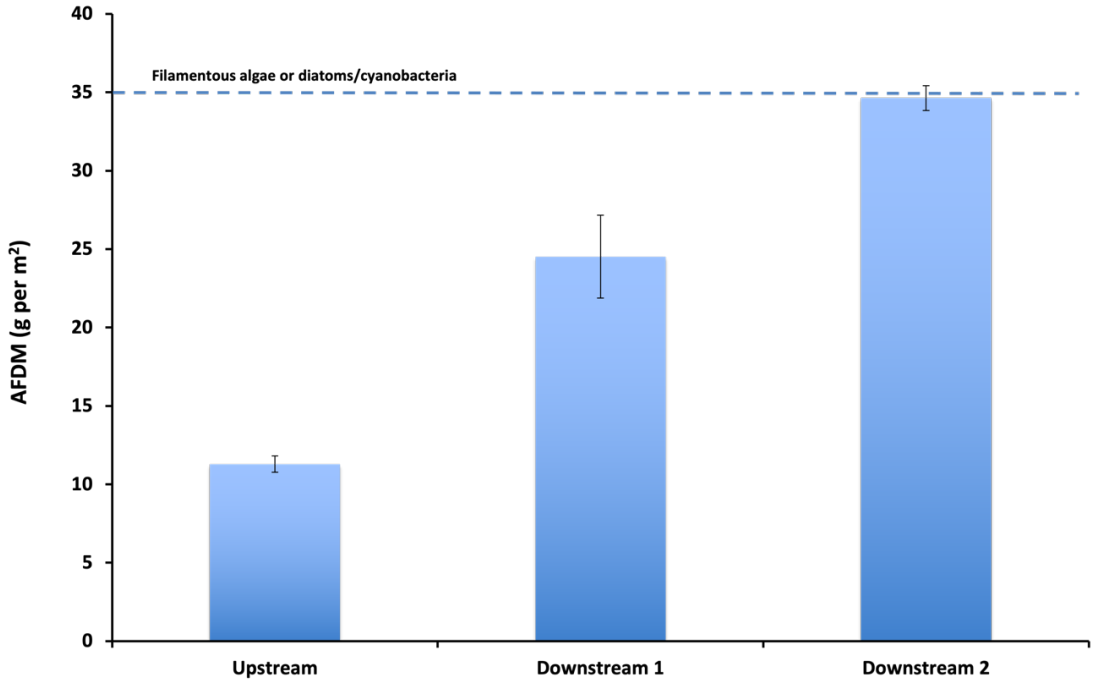

Figure 8: Periphyton biomass expressed as AFDM in Winton Stream, March 2022 (mean +/- one standard error). Standard from MfE's New Zealand periphyton guidelines (Biggs 2000) (Table 2) and ES standards for 'lowland hard bed' water bodies (Table 1).

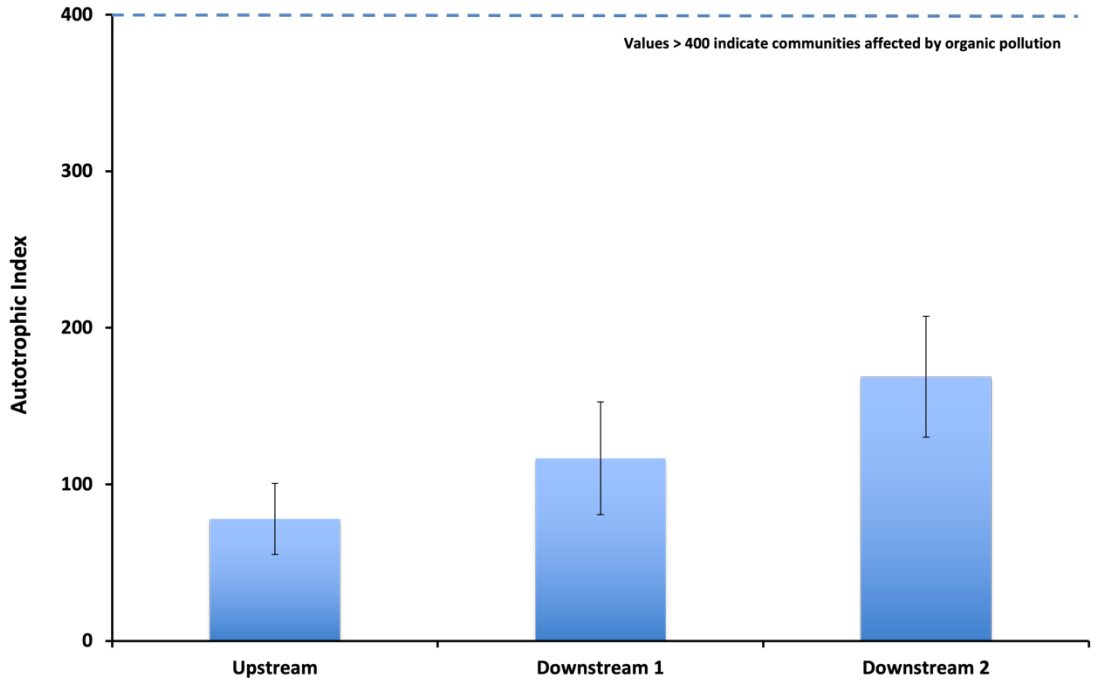

Figure 9: Periphyton biomass expressed as the autotrophic index (ratio of AFDM (mg per m^2): chlorophyll a (mg per m^2)) in Winton Stream, March 2022 (mean +/- one standard error). The blue dashed line indicates the level above which communities are starting to become impaired by organic pollution (Collins and Weber 1978, cited in Biggs and Kilroy 2000).

Table 6: Results of one-way ANOVA testing and post hoc interpretation for differences between sites for each of the periphyton biomass variables, March 2022. Statistically significant differences between sites (i.e., $p < 0.05$) are shown in bold.

Variable	F-value	p-value	Interpretation
Chlorophyll *a* (mg/m^2)	0.31	0.75	No significant difference
AFDM (g/m^2)	**10.62**	**0.01**	**Upstream < Downstream 1 and 2**
Autotrophic Index	1.88	0.25	No significant difference

4.6 Macroinvertebrates

Macroinvertebrate communities at the three sites in Winton Stream were dominated by Orthocladiinae midges and oligochaete worms, with *Potamopyrgus* snails also abundant (Table 7). Abundance of other taxa were generally low. Overall invertebrate densities increased in a downstream direction, however there were no statistically significant differences between sites ($p>0.05$, Table 8, Figure 10).

A total of 25 different invertebrate taxa were identified from the three sites, with a total of 22 taxa identified Upstream, 20 taxa from Downstream 1, and 19 taxa from Downstream 2 (Table 7). Overall taxonomic diversity at each site was therefore higher than the national median of 18 taxa per site, as determined by Scarsbrook *et al.* (2000) from samples collected from 66 sites throughout New Zealand. There were no statistically significant differences between sites in the number of taxa ($p>0.05$, Table 8, Figure 11).

A total of six different EPT taxa, which are insect larvae typically indicative of higher water quality (mayflies, stoneflies, and caddisflies, excluding Hydroptilidae (e.g., *Oxyethira*) which are often associated with degraded habitats), were identified from the three sites (Table 7). A total of six EPT taxa were identified Upstream, with five EPT taxa from Downstream 1 and Downstream 2. The total number of EPT taxa at each site was therefore lower than the median of eight taxa per site determined by Scarsbrook *et al.* (2000) from their national assessment. The average number of EPT taxa, percentage of the total number of taxa comprising EPT taxa (% EPT taxa), and percentage of the total abundance comprising EPT taxa (% EPT abundance), were low at each site, but decreased in a downstream direction (Figure 12 to 14). EPT metrics were statistically significantly higher at the Upstream site than at Downstream 2, with % EPT abundance also statistically significantly higher at the Upstream site than at Downstream 1 ($p<0.05$, Table 8).

Macroinvertebrate community health index (MCI) and quantitative MCI (QMCI) scores were all low, with average MCI scores indicative of 'poor-fair' quality conditions at the Upstream site and 'poor' quality conditions at both Downstream sites, while average QMCI scores for each site were indicative of 'poor' quality conditions, using the narrative terminology of Stark and Maxted (2007) (Tables 3 and 7, Figures 15 and 16). MCI scores were statistically significantly higher Upstream than at Downstream 2, while QMCI scores were statistically significantly higher Upstream than at both Downstream sites, and statistically significantly higher at Downstream 1 than at Downstream 2 ($p<0.08$, Table 8).

ES standards for 'lowland hard bed' water bodies include MCI scores shall exceed 90 and SQMCI scores shall exceed 4.5 (Table 1). QMCI site scores, as calculated from the quantitative Surber samples collected from Winton Stream, use the same scale as SQMCI and are therefore directly comparable with each other (Stark 1998), allowing direct comparisons between survey results and the SQMCI standard identified by ES. At each site surveyed in Winton Stream, average MCI site scores were considerably lower than 90 and average QMCI site scores were considerably lower 4.5, thereby not meeting ES's standards.

Table 7: Macroinvertebrate taxa found in Winton Stream, March 2022. Results are shown as number of individuals per sample (0.04 m^2).

		Upstream			Downstream 1			Downstream 2		
TAXON	**MCI score**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
CNIDARIA										
Hydra species	3			1						
COLEOPTERA										
Elmidae	6	13	51	24	7	10	11	3	14	7
CRUSTACEA										
Ostracoda	3	2	4	5	4	9		2	8	11
Paracalliope fluviatilis	5	4	2	7	50	13	3	2	9	3
DIPTERA										
Aphrophila species	5			1						
Chironomus species	1				11		5	13	27	35
Muscidae	3	2	1		1					
Orthocladiinae	2	230	74	54	61	135	302	174	300	390
Polypedilum species	3	1	1	1	11	16	15	3	25	20
Tanypodinae	5			1						
Tanytarsini	3	4	5	1	1	8		1	3	
EPHEMEROPTERA										
Deleatidium species	8	31	17	6	1	1	2	1	1	
MOLLUSCA										
Gyraulus species	3				2	2	6			
Physa / Physella species	3		6	2	29	45	16	1	14	9
Potamopyrgus antipodarum	4	125	74	51	45	118	91	12	81	66
Sphaeriidae	3	1			2	5		2	10	2
NEMATODA	3	1	1					1	2	1
OLIGOCHAETA	1	84	180	60	159	265	305	162	320	545
PLATYHELMINTHES	3				6	1	2		1	
TRICHOPTERA										
Hudsonema amabile	6	1	1	5		4	2		1	
Hydrobiosidae early instar	5		1							1
Hydrobiosis umbripennis group	5	15	14	11	1	12	8	1	5	2
Hydropsyche - Aoteapsyche group	4	4	9	1		2		1		
Oxyethira albiceps	2	1		4	5	8	2	2	27	16
Pycnocentria species	7	11	14	7	5	16	1			
Number of invertebrates (per sample)		530	455	242	401	670	771	381	848	1108
Number of invertebrates (per m^2)		13250	11375	6050	10025	16750	19275	9525	21200	27700
Number of taxa		17	17	18	18	18	15	16	17	14
Number of EPT taxa (excl. Hydroptilidae)		5	6	5	3	5	4	3	3	2
% EPT taxa (excl. Hydroptilidae)		29	35	28	17	28	27	19	18	14
% EPT abundance (excl. Hydroptilidae)		11.7	12.3	12.4	1.7	5.2	1.7	0.8	0.8	0.3
MCI score		80	84	83	72	79	79	70	72	66
QMCI score		3.0	3.0	3.2	2.5	2.4	2.0	1.7	2.0	1.7
Average MCI score			82			77			69	
Average QMCI score			3.1			2.3			1.8	

Table 8: Results of one-way ANOVA testing and post hoc interpretation for differences between sites for each of the macroinvertebrate metrics, March 2022. Statistically significant differences between sites (i.e., $p < 0.05$) are shown in bold.

Variable	F-value	p-value	Interpretation
Number of invertebrates per m^2	1.44	0.31	No significant difference
Number of taxa	1.24	0.36	No significant difference
Number of EPT taxa	**9.60**	**0.013**	**Upstream > Downstream 2**
% EPT taxa	**7.21**	**0.025**	**Upstream > Downstream 2**
% EPT abundance	**77.65**	**0.00005**	**Upstream > Downstream 1 and 2**
MCI score	**12.74**	**0.007**	**Upstream > Downstream 2**
QMCI score	**32.32**	**0.0006**	**Downstream 1 > Downstream 2** **Upstream > Downstream 1 and 2**

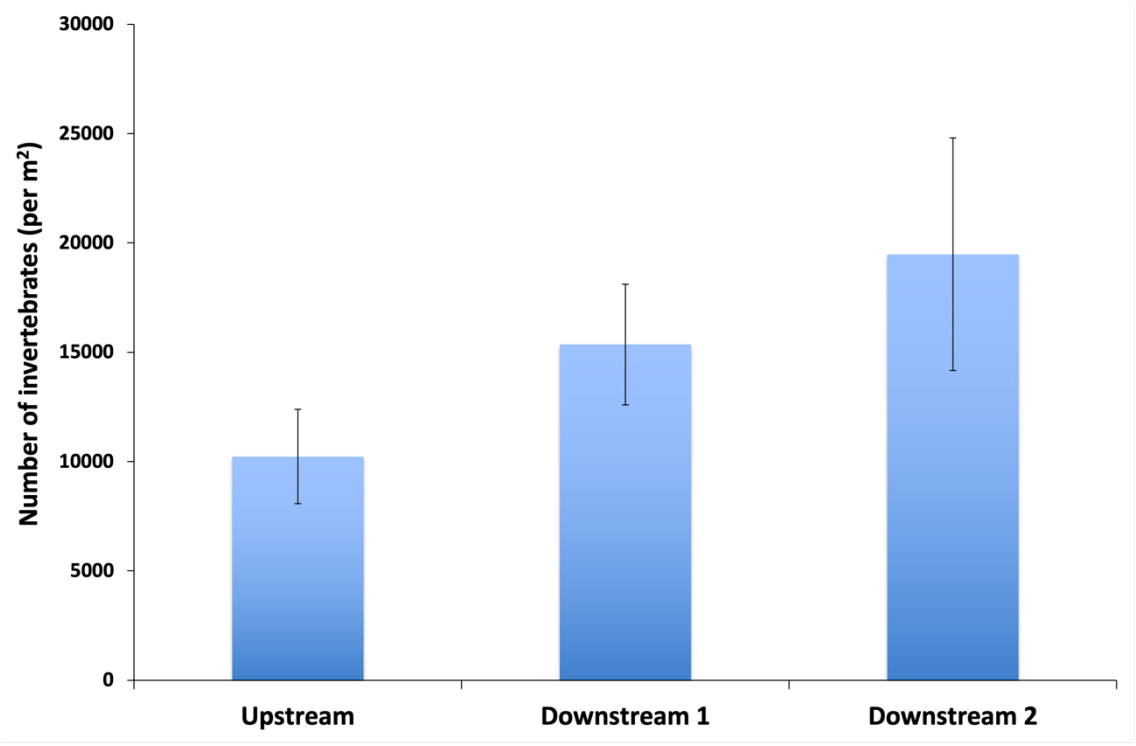

Figure 10: Average density of invertebrates (per m^2) for samples from Winton Stream, March 2022 (mean +/- one standard error).

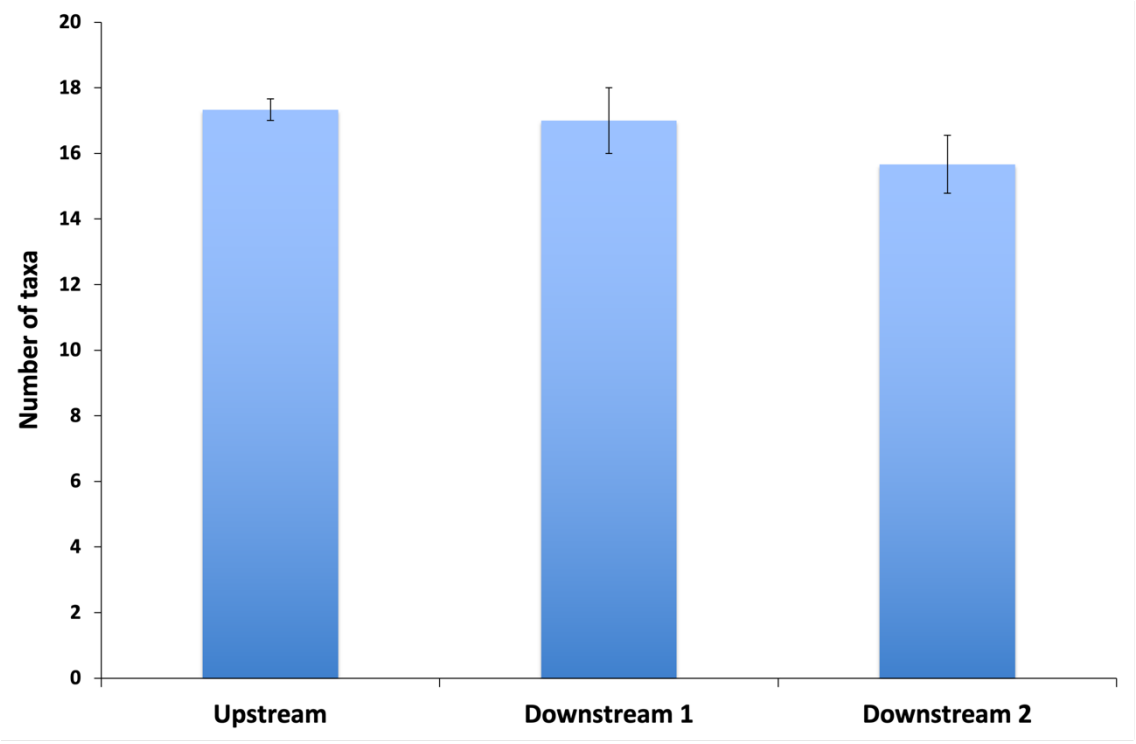

Figure 11: Average taxonomic diversity for samples from Winton Stream, March 2022 (mean +/- one standard error).

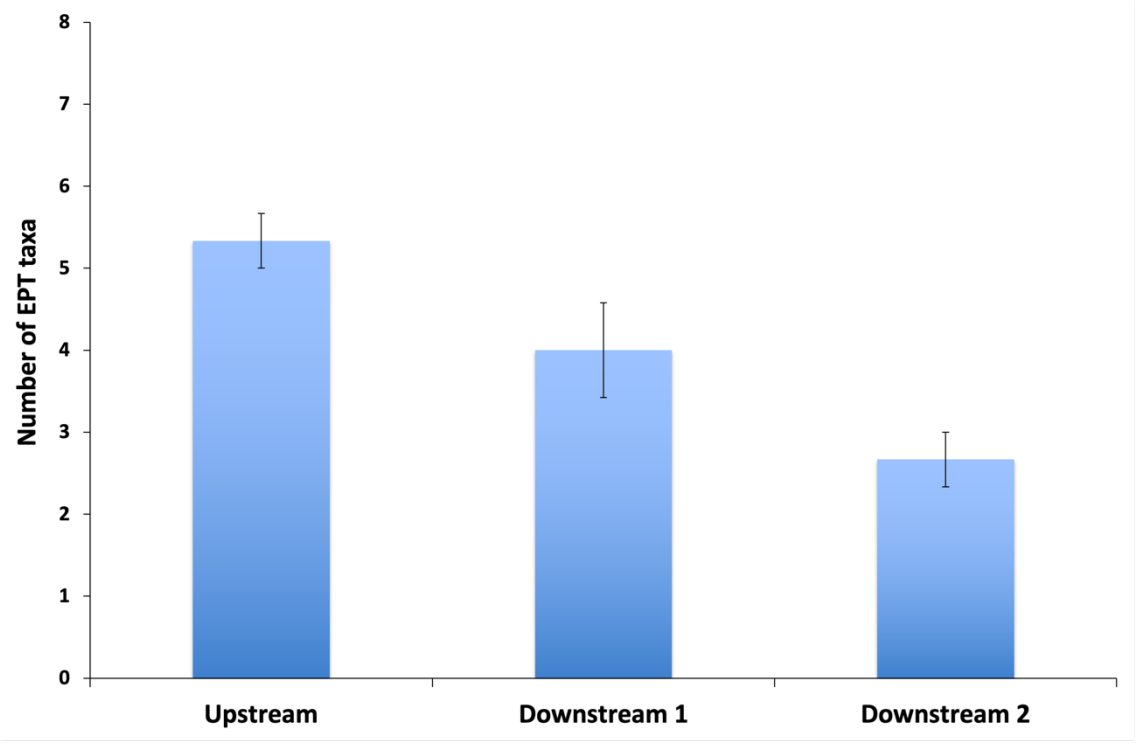

Figure 12: Average diversity of EPT taxa (excluding Hydroptilidae) for samples from Winton Stream, March 2022 (mean +/- one standard error).

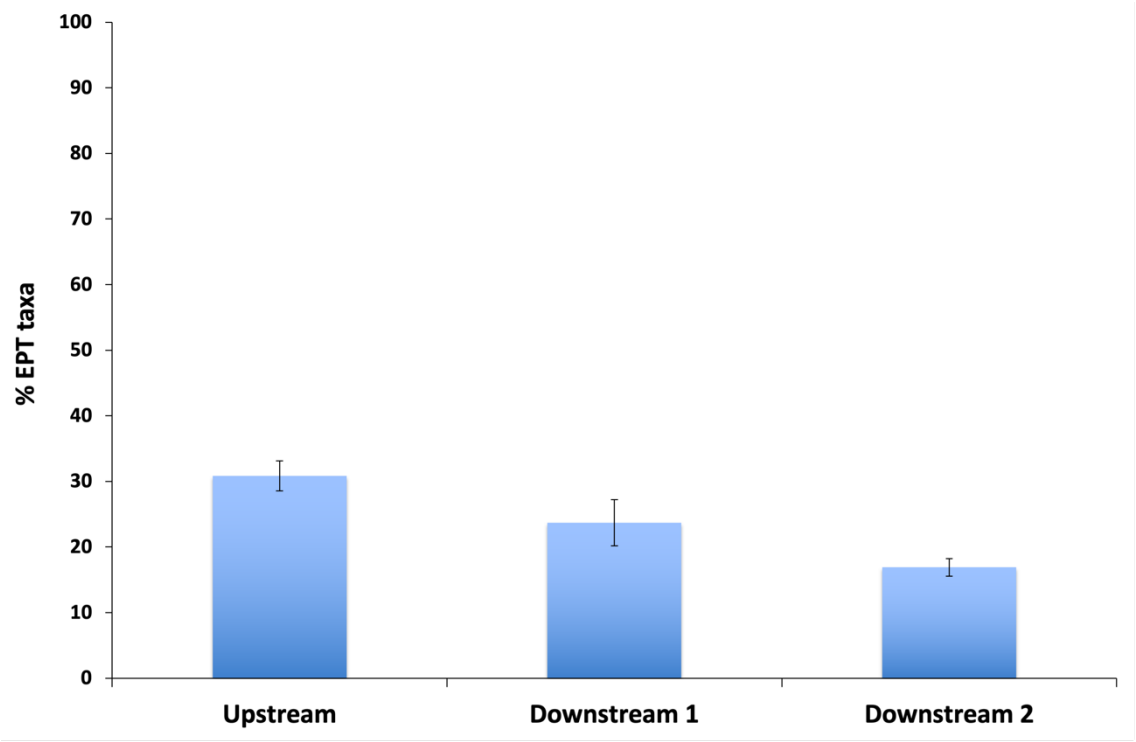

Figure 13: Average percentage of the total number of taxa comprising EPT taxa (excluding Hydroptilidae) for samples from Winton Stream, March 2022 (mean +/- one standard error).

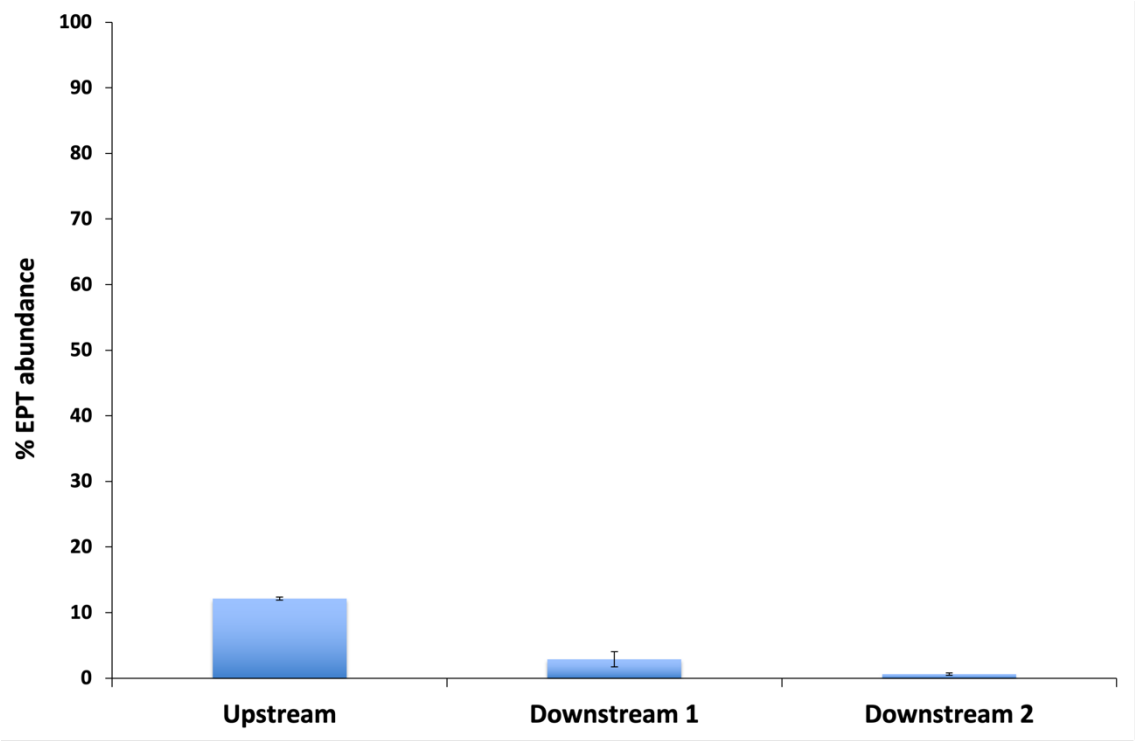

Figure 14: Average percentage of the total abundance comprising EPT taxa (excluding Hydroptilidae) for samples from Winton Stream, March 2022 (mean +/- one standard error).

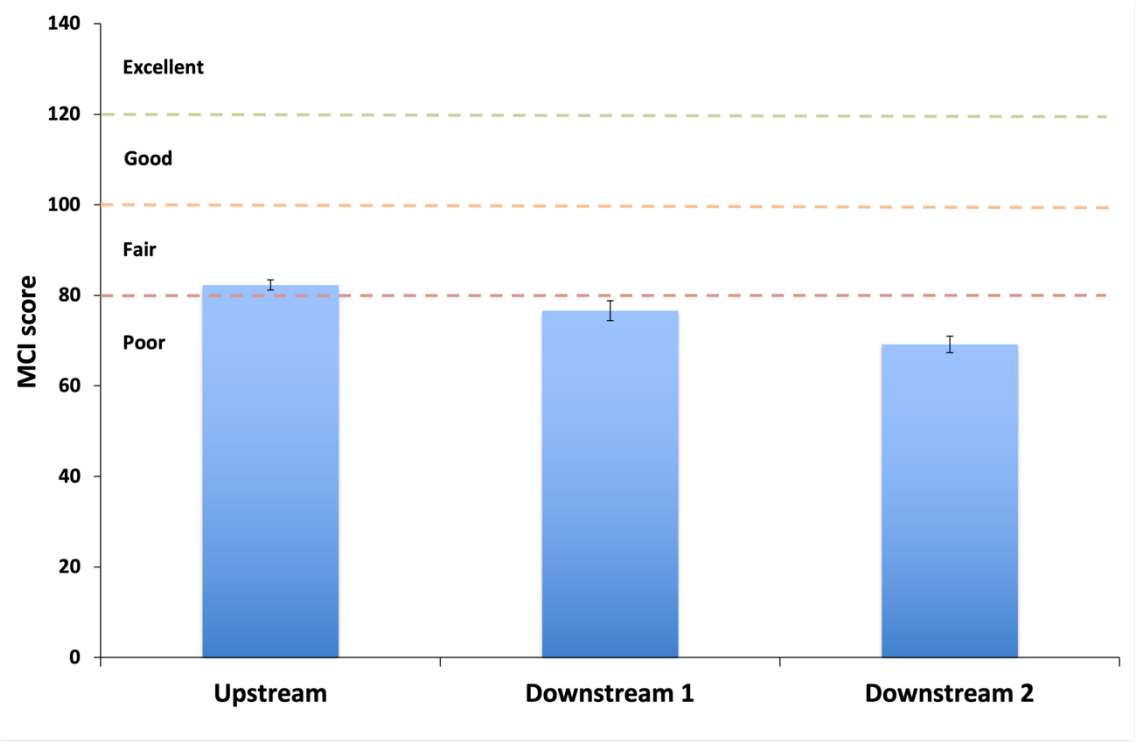

Figure 15: Average MCI scores for samples from Winton Stream, March 2022 (mean +/- one standard error). Quality classes defined by Stark and Maxted (2007).

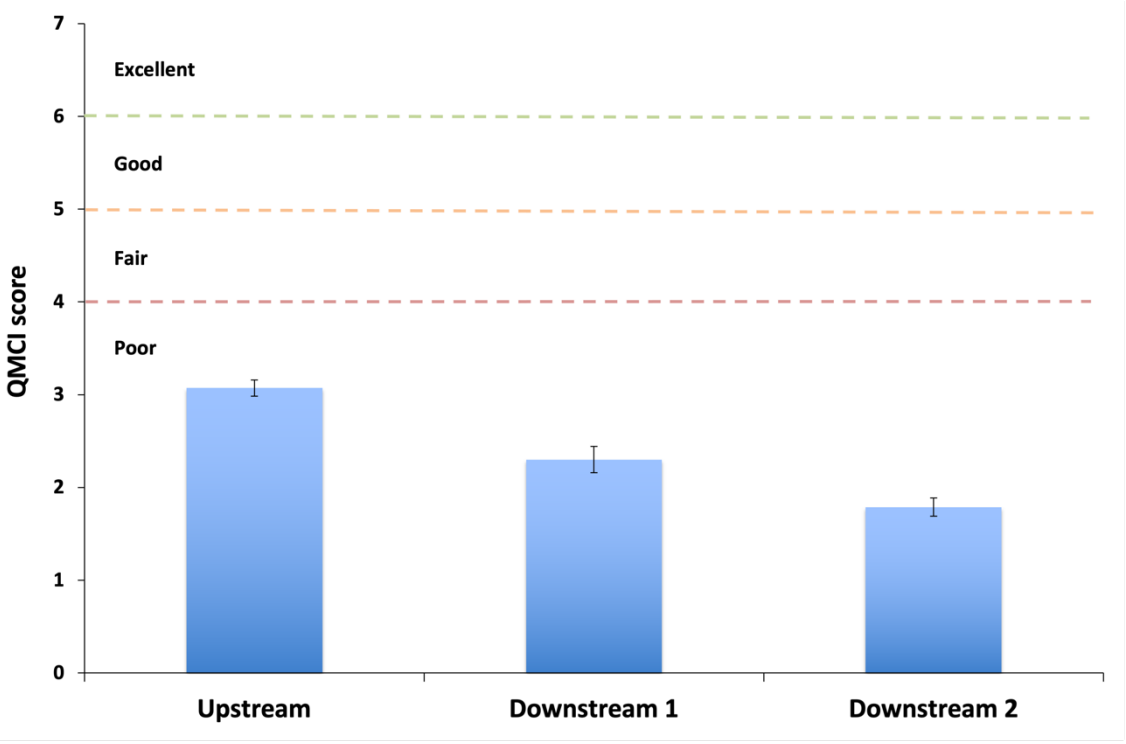

Figure 16: Average QMCI scores for samples from Winton Stream, March 2022 (mean +/- one standard error). Quality classes defined by Stark and Maxted (2007).

5 SUMMARY AND CONCLUSION

The March 2022 biological survey of Winton Stream in the vicinity of the Winton wastewater treatment system revealed generally poor quality communities throughout the study reach. The stream had been adversely affected by other activities within the channel, including excavator and cattle movements, with increased sediment deposition and disturbance of the bed evident throughout the stream. Sediment cover was highest at the Upstream site.

Water quality was poor, with high conductivity and low clarity throughout the stream, although clarity was lower downstream of the discharge point. The water was visibly discoloured at each site, with clarity at all sites lower than the ES standard for water clarity for 'lowland hard bed' water bodies. Dissolved oxygen levels were low downstream of the discharge point, with saturation at Downstream 1 not meeting the minimum ES standard of 80%. Due to the low river flows at the time of the survey, the dilution and mixing of the discharge would have been low, which would have increased the influence of the discharge on the water quality of the stream.

Periphyton communities had lower cover levels than MfE guideline levels and ES standards, however, cover of filamentous algae was highest at the most downstream site. Periphyton biomass, measured as chlorophyll *a*, was relatively high at each site, but there were no differences in average chlorophyll *a* levels between sites. AFDM levels increased downstream, however AFDM remained below guideline levels at all three sites. Autotrophic index values were relatively low at each site and were not indicating periphyton communities affected by organic pollution. There were also no bacterial or fungal slime growths visible to the naked eye at any of the sites. Overall, results indicated that the discharge may be having minor effects on periphyton communities of the river.

Benthic macroinvertebrate community health was poor throughout the stream, with communities dominated by taxa with low MCI taxon scores, indicating these taxa are tolerant of poor conditions. Midge larvae and worms dominated communities, with snails also abundant. Communities also included EPT taxa typically indicative of good water quality (EPT: mayflies, stoneflies, and caddisflies), such as *Deleatidium* mayflies, however abundance was low. Macroinvertebrate community health indices were low at each site, with scores for each site indicative of 'poor'

quality conditions, except MCI scores at the Upstream site where scores were only slightly higher and indicative of 'poor-fair' quality conditions. There were, however, statistically significantly higher scores found at the Upstream site than Downstream. Health index scores at all sites were lower than ES's 'lowland hard bed' macroinvertebrate community standards. Overall, despite the low-quality communities at each site, macroinvertebrate results indicated some influence of the discharge on the benthic invertebrate communities of Winton Stream.

In conclusion, results from the March 2022 survey indicate that the discharge from the Winton wastewater treatment system was adversely affecting aspects of the biological communities of Winton Stream. However, the very low river flows at the time of sampling, and the extraneous activities within the stream channel, would have contributed to the differences found between the sites.

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Appendix D

Te Ao Marama Inc

TE AO MARAMA INC.

16 May 2022

Southland District Council
Senior Projects Manager
Geoff.Gray@southlanddc.govt.nz

Tēnā Koe,

Attention: Geoff Gray – Manapouri and Winton Wastewater Treatment Plant Feedback

As per our previous discussions below I have outlined the feedback that Te Ao Marama on behalf of rūnanga has provided on both the future of the Manapouri and Winton Wastewater Treatment Options.

Manapouri

SDC have put the following two options to mana whenua for review:

1. To install a membrane plant at the current Manapouri Wastewater Plant and pump this to the Kepler SDI block.
2. To pump raw sewage to the Kepler Block, where a membrane plant will be installed to discharge to land.

Rūnanga are supportive of either option, rūnanga consider that the option that is chosen should reflect the lowest risk to the environment.

Winton

SDC have put the following options to mana whenua for review:

1. To discharge to land using sub-surface drip irrigation.
2. To pipe untreated sewage to Invercargill for discharge as per the Clifton Wastewater Treatment Plant.

Rūnanga have grouped these in terms of preference, the first being to discharge to land utilising land that is available within the district. It has been acknowledged that option 1 is significantly more expensive than option 2.

Therefore, rūnanga conditionally support option 2, in that consolidating wastewater treatment systems may be a good option for councils into the future. However, rūnanga have reservations about the Clifton Wastewater Treatment Plant which are below:

- The Plant is due to be reconsented in 2029.

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- Will a discharge to water still be relevant?
- Is the Wastewater Plant situated in the right place into the future?
- Will this activity provide for Te Mana o Te Wai?

Rūnanga are willing to discuss this more with both councils and to engage further around the chosen option and some of the design parameters.

Please be advised that this letter, does not provide a final decision from rūnanga and should be considered preliminary advice. When further information is available, rūnanga would welcome the opportunity to receive this information.

We trust the information contained within this letter is sufficient; however, should you wish to discuss any aspect further, please do not hesitate to contact me.

Nāhaku noa nā,

Stevie-Rae Blair
Iwi Environmental Advisor
Te Ao Marama Inc.

Cc Oraka Aparima Rūnaka
Waihōpai Rūnaka