122 Morven Ferry Development Wastewater Treatment Plant – Discharge to Air Assessment

Prepared for

Ridgeburn Limited

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Quality Control Sheet

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Limitations:

This report has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Ridgeburn Limited and others (not directly contracted by PDP for the work) including McKenzie & Co Limited and BPO Limited. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the report. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

This report has been prepared by PDP on the specific instructions of Ridgeburn Limited for the limited purposes described in the report. PDP accepts no liability if the report is used for a different purpose or if it is used or relied on by any other person. Any such use or reliance will be solely at their own risk.

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1.0 Introduction

Pattle Delamore Partners Limited (PDP) has been engaged by Ridgeburn Limited to prepare an odour assessment for a proposed wastewater treatment plant (WWTP) to support the Fast Track consent application for the Ridgeburn development. The purpose of this assessment is to assess potential air discharges as a result of the proposed WWTP and disposal field operations only and does not include any assessment of discharges to air (for example dust) from the wider development.

Ridgeburn Limited is proposing to construct a WWTP as part of its Ridgeburn residential and mixed-use development at 122 Morven Ferry Road, Arrow Junction, near Queenstown. The WWTP is proposed to be situated in the southern corner of the development above the Kawarau River.

The community scale WWTP and disposal fields are proposed to only provide for this new development. PDP's assessment is based on the WWTP and disposal fields described in this document. PDP has not assessed discharges to air from any additional processes or future expansion to the proposed operations.

2.0 Background

2.1 Proposed Development Plan

The Ridgeburn housing and commercial development aims to provide affordable and mid-market housing within the Queenstown area. The proposed location is at 122 Morven Ferry Road, shown in Figure 1. This lies six km to the south of Arrowtown and on its southern side lies less than 200 m from the Kawarau River. The land proposed for the development currently falls within a Rural General Zone[1].

[1] Queenstown Lakes District Council, *Queenstown Lakes Operative District Plan*, accessed November 2025, https://districtplan.qldc.govt.nz/operative/property/1333720/1203615/5079800/4984937/0/94.

Figure 1: Location of the Proposed Ridgeburn Development and WWTP

The proposed WWTP location is at the south-east corner of the development. The location of the proposed lots in the development including the WWTP are shown in Figure 2**.**

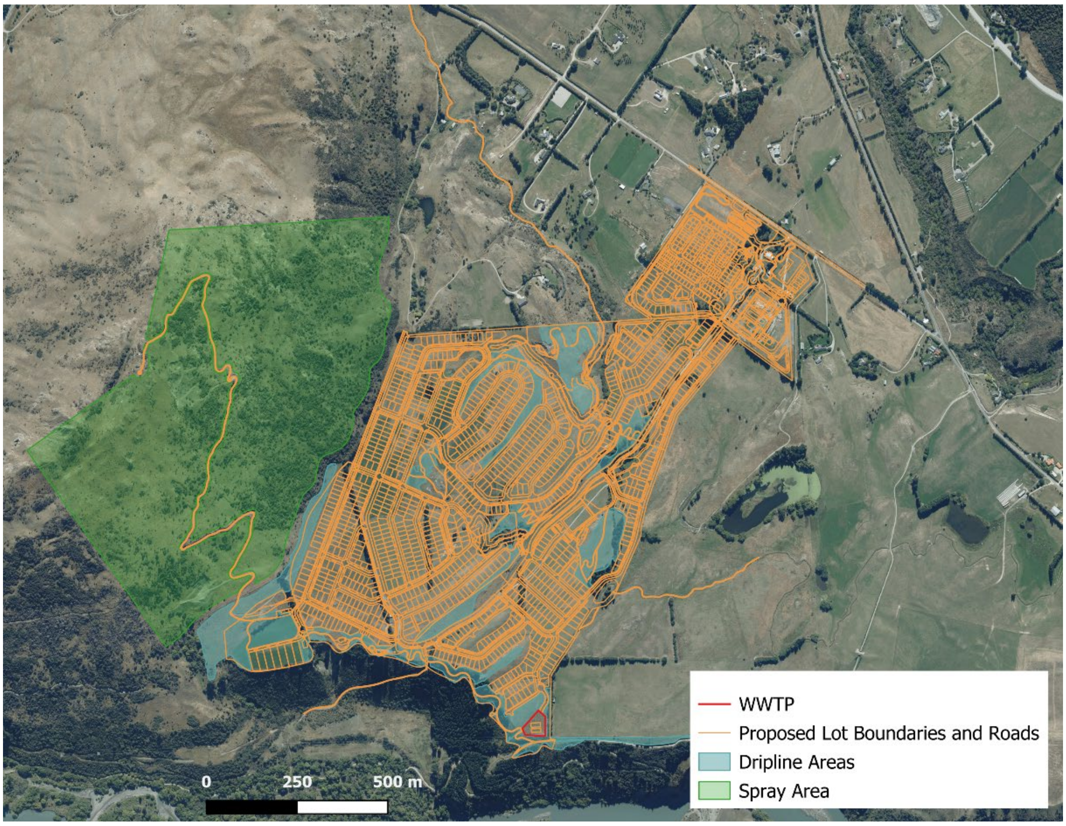

Figure 2: Site Plan of the Proposed Ridgeburn Development

2.2 Ridgeburn WWTP and Land Discharge System

The proposed WWTP will only treat wastewater from the Ridgeburn development, which will be primarily residential with a small percentage of commercial discharges. Treated wastewater will be irrigated to land in the areas outlined in Figure 2. The WWTP preliminary design has estimated wastewater flows of up to approximately 1,200 m^3/day[2]. A backup generator will be maintained onsite to provide power to the WWTP during network outages.

The WWTP will treat wastewater to a high standard, comprising primary, secondary and tertiary treatment as outlined below:

- Primary treatment: A screen and grit sedimentation channel remove solids larger than 2 mm from the wastewater. Screenings and grit are stored in covered bins before disposal to landfill. Screened wastewater is stored in an equalisation tank (1,500 m^3 capacity) to buffer fluctuations in influent wastewater flows.

[2] Best Practical Option for Environmental Success (BPO), *Ridgeburn Wastewater Treatment Plant Design Report DRAFT*, 2025

- Secondary treatment: Covered Sequencing Batch Reactors (SBRs) are used for biological treatment of the wastewater. The SBRs degrade organic matter by cycling through anoxic and aerobic stages[3]. Waste Activated Sludge (WAS) is removed from the SBRs and dewatered using a centrifuge before offsite disposal at a landfill. An SBR design has been chosen for its small footprint, cost-effectiveness, robust treatment process and flexibility.
- Tertiary treatment: Membrane filtration is used to remove bacteria, viruses and remaining suspended solids.
- Polishing: UV treatment is used to deactivate any remaining pathogens in the wastewater.
- Disposal of treated wastewater: Irrigation of treated wastewater to land via a mixture of spray irrigation (on Morven Hill) and subsurface drip irrigation (to sections of land within the development area).

Air from the headwork screening, equalisation tank, SBRs, WAS tank and dewatering system is extracted and discharged via a biofilter. Figure 3 presents a visual summary of the key stages within the WWTP treatment process[2].

[3] Aerobic wastewater contains dissolved oxygen (O_2). Anoxic wastewater has no ‘free oxygen’ (there is no unreacted dissolved oxygen) but other oxygen sources capable of accepting electrons such as nitrates are present.

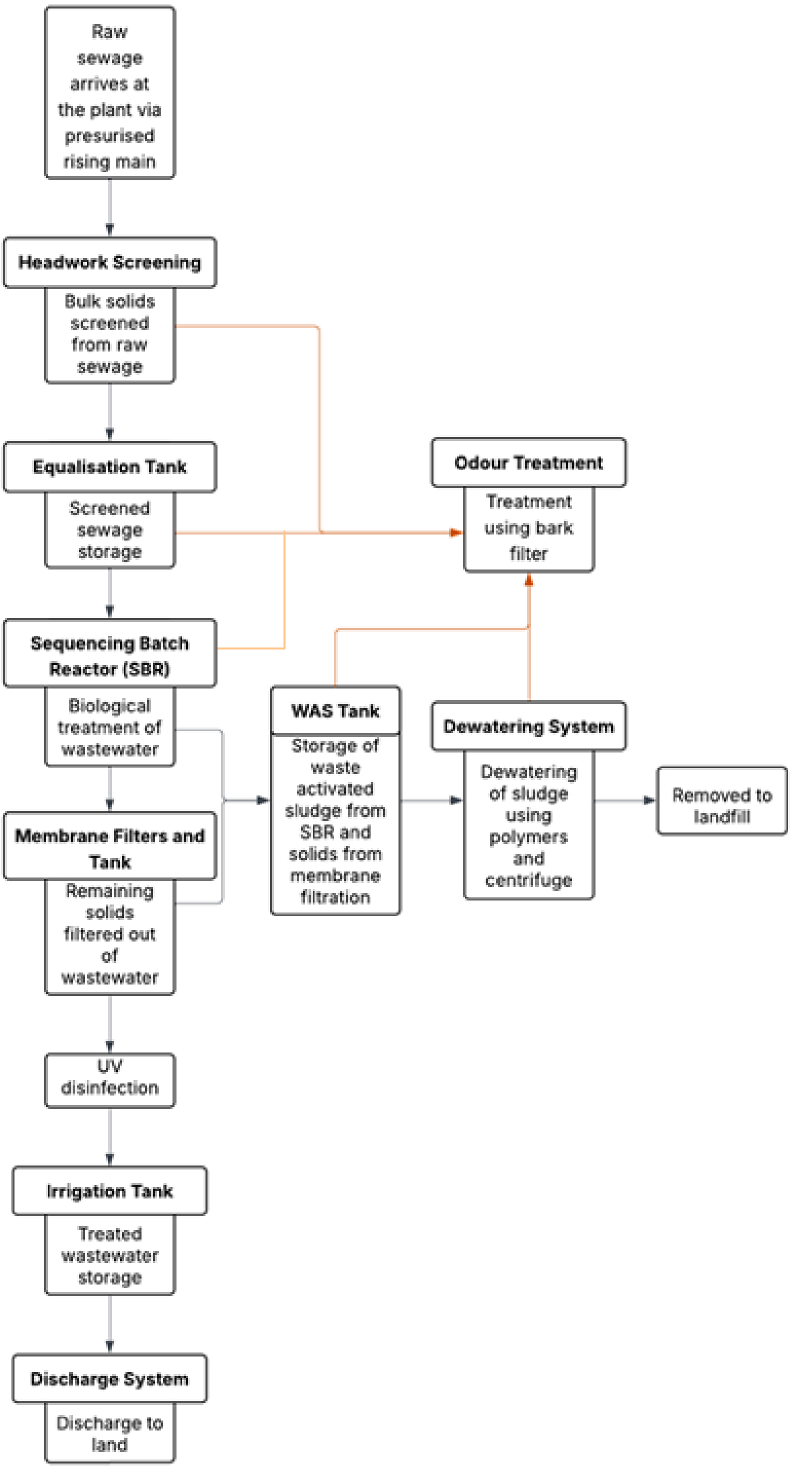

Figure 3: Flowchart of the WWTP Treatment Process

An area of approximately 3,000 m^2 has been set aside for the WWTP. An initial draft of the proposed WWTP layout is shown in Figure 4.

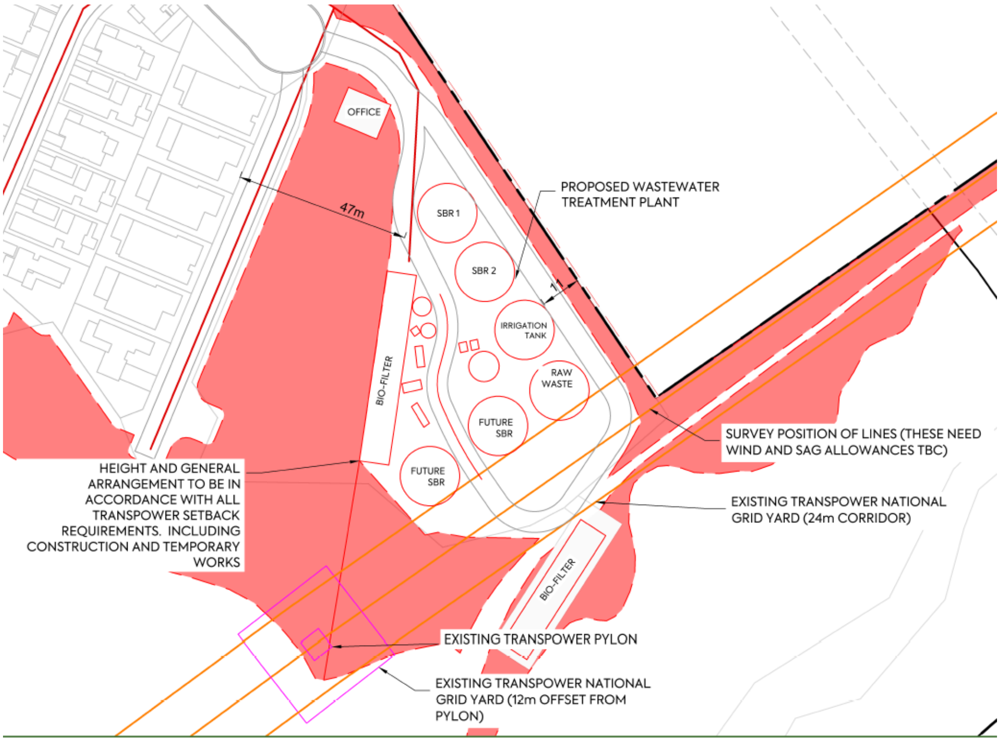

Figure 4: **Preliminary Layout of the Ridgeburn WWTP (Pending Detailed Design)**

All tanks onsite including the SBRs will be enclosed, with air from most tanks (including the SBRs) being extracted and treated via the biofilter. Note that allowance has been made on the site plan for two ‘Future SBRs’. PDP has not assessed odour from any future expansions to the WWTP in this report, including the use of the two ‘Future SBRs’.

2.3 Context - Regional Plan: Air for Otago

The Regional Plan: Air for Otago regulates discharges to air in the Otago region. It is understood that the treatment and disposal of wastewater is considered waste management under this plan. According to the permitted activity conditions of Rule 16.3.7.1, this activity for air discharges is likely to be a discretionary activity under Rule 16.3.7.3.

The primary potential air discharge associated with the proposed WWTP and disposal fields is anticipated to be odour and aerolised pathogens from spray irrigation, however other air discharges are also assessed in accordance with Rule 16.3.7.3 and are identified in Section 2.5.

Discharge of combustion products from a backup power generator are expected to be a permitted activity under Rule 16.3.4.2.

2.4 Potential Odour Sources

There are multiple potential odour sources throughout the wastewater treatment process, which are described in Table 1. The description in this section relates to the proposed process under normal operating conditions, and comments on where odour could potentially occur in upset conditions. Apart from the odour treatment system this description doesn't include additional recommended mitigation measures (these are discussed in Section 5.0).

Table 1: Potential for Odour Generation by Source

Source	Odour Generation Potential	Odour Producing Process	Vented to Biofilter?
Screening and Grit Removal	High	Raw sewage and screenings. Due to high organic content, sulphur compounds, ammonia and nitrogenous compounds, volatile fatty acids and organic acids.	✓
Equalisation Tank	High	Raw screened sewage. Due to high organic content, sulphur compounds, ammonia and nitrogenous compounds, volatile fatty acids and organic acids.	✓
SBRs	Minimal	Wastewater in an aerobic or anoxic state is likely to produce a musty or soapy odour of low intensity. Wastewater is a potential source of odour if anaerobic conditions develop.	✓
WAS Tank	High	WAS from the SBRs and membrane filtration system has a high potential for odour if the sludge becomes anaerobic.	✓
Membrane Feed Tank	Minimal	If wastewater is properly treated. Insufficiently treated wastewater contains higher levels of organic matter and sulphur compounds than treated wastewater, which may produce odour under anaerobic conditions. There is no proposed additional aeration within the membrane feed tank.	

Table 1: Potential for Odour Generation by Source

Source	Odour Generation Potential	Odour Producing Process	Vented to Biofilter?
Membrane filters	Minimal	The filters are completely sealed (enclosed and operate under pressure). Membranes themselves are not anticipated to generate odour; however, fouling layers (biofilm, organic matter) can become anaerobic if not properly managed.	
UV Treatment	Minimal	Properly treated wastewater entering the UV treatment system has a low potential for odour generation. In addition, the UV treatment system is likely to be fully enclosed.	
Dewatering Building and Centrifuge	High	Thickened sludge. WAS contains organic matter and sulphur compounds. Residual moisture and bioavailable proteins can degrade and release odorous compounds. Higher torque and bowl speed changes may increase odour production. Processes that aim for higher cake solids may result in greater odour intensity[4].	✓
Irrigation tank	Minimal	Properly treated wastewater is likely to have a low organic content and therefore a low potential for odour generation even if anaerobic conditions occur. Insufficient treatment results in a higher potential for odour generation during anaerobic degradation. Extended storage of wastewater (particularly in warm conditions) increases the potential for odour generation.	✓

[4] Higgins, M. J. et al, *WERF Odor Study Phase III: Impacts of Dewatering Processes and Operational Parameters on Production of Odor Causing Compounds*, 2007. Water Environment Federation.

Table 1: Potential for Odour Generation by Source

Source	Odour Generation Potential	Odour Producing Process	Vented to Biofilter?
Odour Treatment System (Biofilter)	Moderate	Biofilters can produce an odour, typically not observable beyond 50 m when the biofilter has been properly sized and designed. The chance of additional odour is low during normal operation but there is potential for high levels of odour if bypassing occurs.	
Discharge to Land – Subsurface Drip Irrigation	Minimal	Subsurface drip lines have low potential for odour due to highly treated wastewater and discharge below ground (not open to air). Leakage from damaged lines may result in increased odour emissions.	
Discharge to Land – Spray Irrigation	Moderate	Spray irrigation has a moderate potential for odour due to the production of aerosols and potential for wind transport. Irrigation of anaerobic wastewater increases the potential for odour.	

The odour treatment system captures and treats process air from sources within the WWTP with a high potential for odour generation. Process air from the screening and grit removal works, equalisation tank, WAS tank, SBRs, irrigation storage and dewatering building including WAS biosolids storage is contained and vented to the odour treatment system using centrifugal fans. A biofiltration scrubber (biofilter) treats the process air by passing it through a biologically active bed of bark and/or woodchips. Microorganisms in this bed naturally degrade odorous compounds including hydrogen sulphide, mercaptans and ammonia. Biofilters are a commonly used and an effective method of treating process air from WWTPs.

2.5 Other Potential Air Discharges

The WWTP preliminary design includes an approximate 320 kWe backup generator for use during power outages. This will occasionally result in the discharge of combustion products, however operation of a generator is a permitted activity. Additionally, operation of the generator is likely to be infrequent and for short durations.

Discharge of wastewater via spray irrigation may result in a fine mist which has the potential to include pathogens. These can have adverse effects on human health if inhaled. There is also potential for the spray to be odorous if the effluent becomes anaerobic. PDP has completed a spray drift assessment (see Section 6.0) and discussed appropriate mitigation measures in Section 5.0.

Potential for dust associated with construction phase of the WWTP and disposal system is possible, should construction occur during dry or windy (> 5 m/s) periods. This is able to be mitigated with appropriate management of dust sources (see Section 5.3).

Provided appropriate dust management is implemented during construction, it is considered that there are no other potential air discharges associated with the proposed WWTP and disposal fields which require assessment.

3.0 Existing Environment

3.1 Site Description

3.1.1 Location

The centre of the proposed WWTP site is at NZTM coordinates 5008551.44 m N, 1272082.28 m E, within land parcel Lot 4 DP 300661. The surrounding area is classified as a Rural General Zone, which is categorized by a diverse range of farming activities. It is anticipated that the Ridgeburn development will primarily be zoned Residential.

The nearest rural residential area (Lake Hayes Estate) is located approximately 2 km to the north-west of the WWTP on the opposite side of Morven Hill. There is a further residential zone approximately 2 km to the north which is in early stages of development (as part of Arrowtown).

3.1.2 Topography

The Ridgeburn development lies towards the southeast corner of the Whakatipu Basin, to the east of Morven Hill. The Whakatipu Basin is sheltered to the south by The Remarkables, to the east by the Crown Range and to the north by the Coronet Range.

The Ridgeburn development has approximately 40 m of elevation change across its extent (approximately 200 ha) as shown in Figure 5. The WWTP is located at the lower extent of the Ridgeburn estate with an 80 m slope to the Kawarau River to the south.

Figure 5: Topography of Site

3.1.3 Existing Odour Sources

The site and surrounding area is currently a rural area which will have associated rural odours. PDP is not aware of there being any specific odour sources in the area.

3.2 Meteorology

3.2.1 Wind

The nearest available weather station to the site is located at the Queenstown Aerodrome (Labelled 'Met Station' in Figure 1). A windrose from this site is presented in Figure 6.

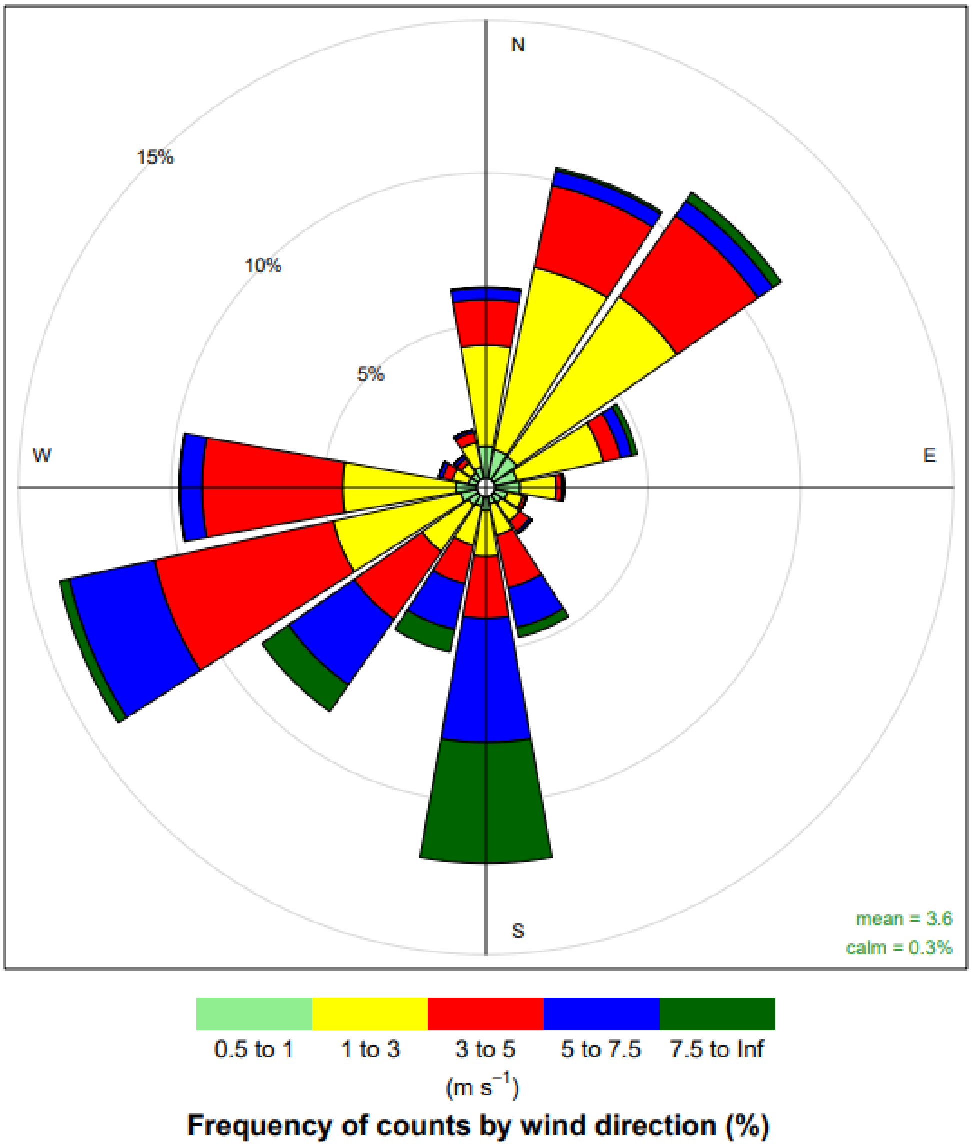

Figure 6: Windrose for Queenstown Aerodrome (2020 - 2024)

The windrose shows that the predominant winds are from the northeast, southwest and south. This aligns well to the flatter topography near the weather station site. At the 'met station', winds from the south travel unimpeded up Lake Whakatipu, whereas the Ridgeburn development is more sheltered from the southerly winds by the Remarkables (Kawarau Maunga) mountain range. Due to the differing topography at the WWTP site it is expected that wind may vary from that shown in the windrose, with a likely lower percentage of high wind speeds from the south and a higher percentage of high winds from the southwest quarter.

3.2.2 Rainfall

The average daily rainfall (2000 to 2023) at the Queenstown Aerodrome for each month of the year is presented in Figure 3.3. The percentage of days with rainfall is presented in Figure 7. Based on this data rainfall at the site appears reasonably consistent year-round in both quantity and frequency of rainy days. On average there are approximately 250 days per year with less than 0.2 mm of rain.

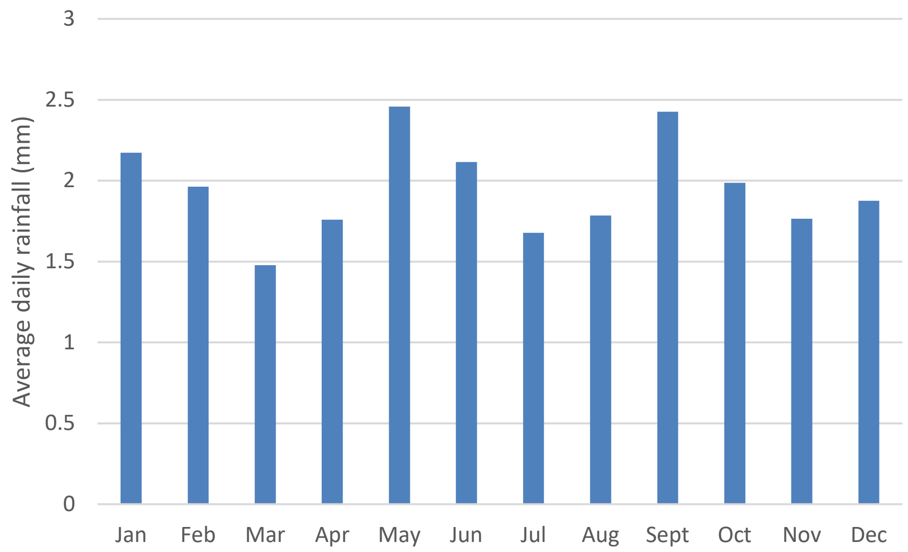

Figure 7: Queenstown Aerodrome Average Daily Rainfall by Month (2000 - 2023)

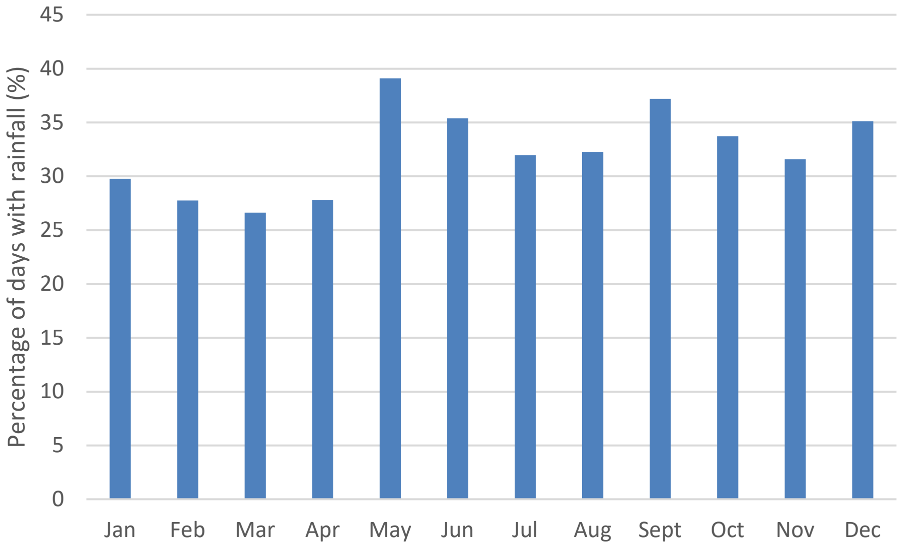

Figure 8: Queenstown Aerodrome Frequency of Rainfall Days (2000-2023)

Intense rainfall may saturate the disposal fields and may prevent irrigation of treated wastewater. This has potential to result in increased storage over winter, which may increase the potential for odour from the irrigation storage tank.

3.2.3 Temperature

Temperatures recorded at the Queenstown Aerodrome are presented in Figure 9.

Low temperature does not directly produce odorous compounds; however, it creates conditions that favour anaerobic zones. At lower temperatures microbial activity decreases, leading to reduced nitrification and denitrification rates and the potential accumulation of ammonia and nitrates. This may increase the potential for odour from the SBRs. However, process air from the SBRs is treated via the biofilter and the SBRs will be operated with longer aeration cycles during low temperature conditions to provide sufficient aeration.

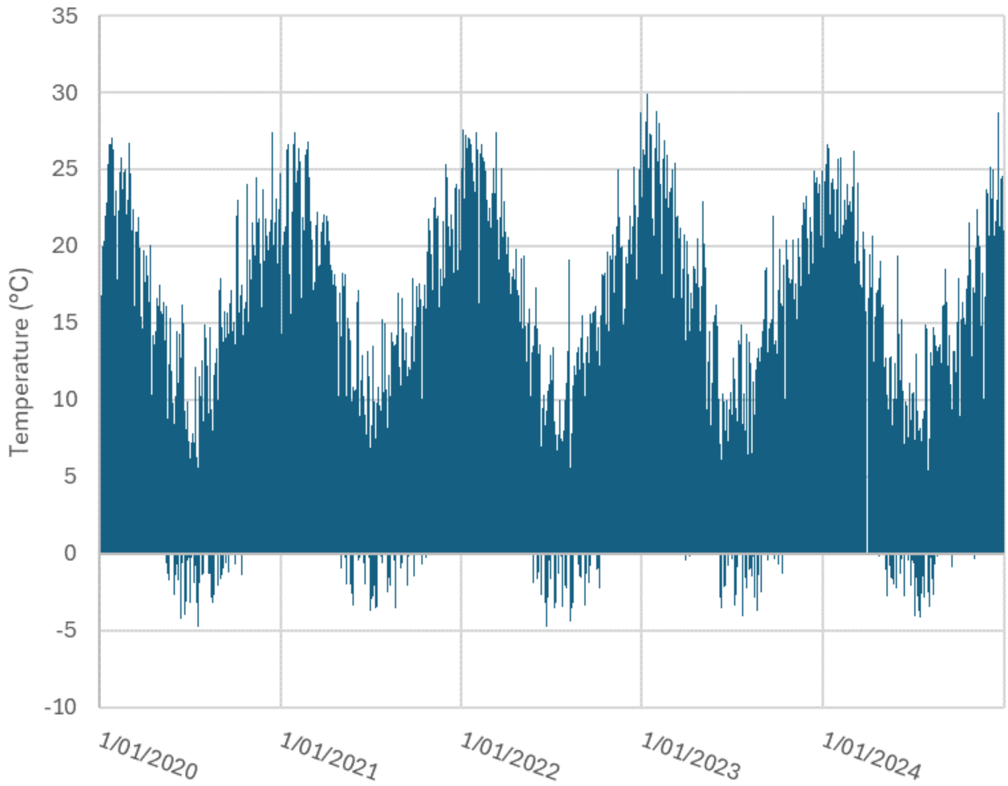

Figure 9. Queenstown Aerodrome Hourly Temperatures (2020 – 2024)

There is potential for odour emissions from wastewater pipes freezing and bursting. The temperature of influent wastewater, insulating properties of HDPE pipe and sub-surface burial of pipes decreases the risk of any pipes bursting.

3.3 Sensitive Receptors

A desktop study was undertaken to identify receptors deemed sensitive to odour emissions from the WWTP. In the context of this report, 'sensitive receptors' are locations where people or surroundings may be particularly sensitive to the effects of odour. Examples of sensitive receptors include:

- Any residential activity,
- Visitor accommodation,
- Educational facilities,
- Healthcare facilities, and
- Day care facilities.

The range within which sensitive receptors were identified has been limited to 1 km from the WWTP or disposal field boundaries where potential odour sources may be, which is considered highly conservative. The Victoria EPA recommends a separation distance of 160 m for a WTWP of this size, beyond which distance the potential for adverse amenity effects from odour is considered negligible[5].

Multiple sensitive receptors outside the proposed Ridgeburn development were identified within 1 km of potential odour sources. This assessment takes the approach that if there are no 'significant' offensive or objectionable odours likely at the nearest sensitive receptors as a result of the WWTP activities, then the effects at other sensitive receptors further away in the same direction will also be negligible. PDP has therefore selected the closest receptors to odour sources as representative in each direction from the potential sources, and the potential effects at other sensitive receptors have not been assessed.

Sensitive receptors assessed in this report are presented in Table 2 and shown spatially in Figure 10. All residential properties within the Ridgeburn development were considered sensitive receptors and were therefore assessed as a single area receptor.

Table 2: Sensitive Receptors from Source

Source of Odour	Receptor	Closest Distance to Odour Source (m)	Direction from Source	Sensitivity to Odour
WWTP	R1 - 505 Chard Road	830	Southeast	Moderate
	Ridgeburn Residential Properties	47[6]	West to northeast	High
	Twin Rivers Trail	85	East to west	Moderate
Spray Irrigation Field on Morven Hill	Ridgeburn Residential Properties	50	Northeast to southwest	High
	Northern Cycle Trail	1	All	Moderate
	Twin Rivers Trail	370	East to southwest	Moderate
	R2 – 68 Sicilian Lane	480	Southwest to northwest	High

[5] Victoria Environment Protection Authority, *Recommended Separation Distances for Industrial Residual Air Emissions*, Publication 1518 (Melbourne: EPA Victoria, 2024).
[6] McKenzie & Co, 2026. *Wastewater Treatment Plant Concept Plan Draft Print.*

Table 2: Sensitive Receptors from Source

Source of Odour	Receptor	Closest Distance to Odour Source (m)	Direction from Source	Sensitivity to Odour
	R3 – 89 Sicilian Lane	400	Southwest to northwest	High
	R4 – 49 Hayes View Lane	560	West to north	High
	R5 – 886 Lake Hayes-something something	780	West to north	High
	R6 – 52 Morven Ferry Road	350	Northeast to east	High
	R7 – 62 Morven Ferry Road	400	Northeast to east	High
	R8 – 24 Morven Ferry Road	350	Northeast to southeast	High
Drip Irrigation Fields	Ridgeburn Residential Properties	2.5[7]	All	High
	Ridgeburn Recreational Areas	0 (driplines will be installed beneath recreational areas)	All	Moderate

[7] Best Practical Option for Environmental Success (BPO), *Queenstown Development Wastewater Anticipated Consent Conditions DRAFT*, 2025.

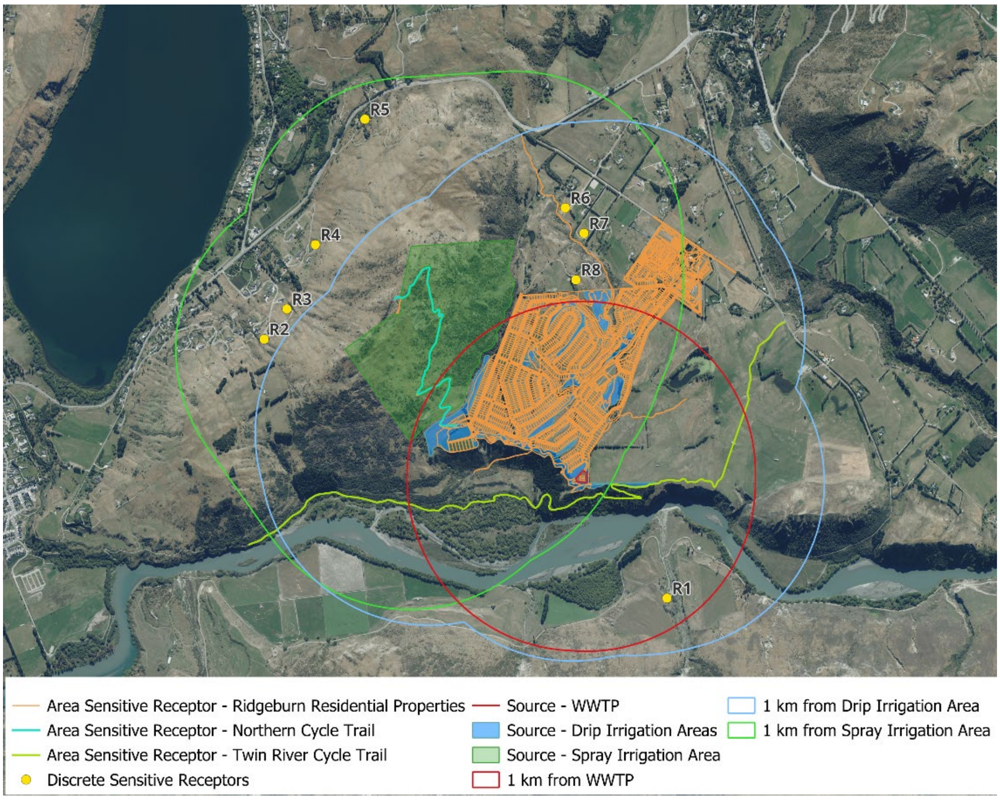

Figure 10: Sensitive Receptors Within 1 km of Odour Sources Associated with the Ridgeburn WWTP

The Ministry for the Environment (MfE) Good Practice Guide for Assessing and Managing Odour (GPG Odour)[8] provides examples of the sensitivity of different types of land use to odour.

Rural zones are considered to have a low sensitivity to rural activities, and a moderate to high sensitivity to other activities. Rural dwellings and surrounding rural land areas are therefore considered to have a moderate sensitivity to odour from the proposed WWTP. Residential properties within the new development are likely to be more sensitive to rural type odours than the existing surrounding properties.

4.0 Assessment Criteria

4.1 MfE Good Practice Guide for Assessing and Managing Odour

Under the MfE GPG Odour the following assessment tools for a resource consent application for new or modified facilities have been selected for use for assessing the effects of odour from the irrigation:

[8] Ministry for the Environment, *Good Practice Guide for Assessing and Managing Odour* (Wellington: Ministry for the Environment, 2016).

- Experience and knowledge from other sites of a similar nature, scale and location,
- Site management and contingency plans, and whether the best practicable option is being applied,
- Process controls and design, including details of emission controls and engineering risk assessment for system failures, and
- Analysis of site-specific meteorology and topographical features.

The MfE GPG Odour also recommended the three additional tools identified below which PDP has not selected for use at this stage due to the nature of the activity. These tools could be used to further quantify the effects and develop community-focused solutions if the risk of the activity to cause objectionable and offensive effects was found to be high as a result of the FIDOL assessment.

- Community consultation,
- Dynamic dilution olfactometry measurements and odour dispersion, and
- Air dispersion modelling.

Under the Resource Management Act, the primary concern with odour is its ability to cause an effect that could be considered 'offensive or objectionable'. Whether an odour has an offensive or objectionable effect requires an overall judgement that considers the frequency, intensity, duration, offensiveness/character, and location of the odour event. These are known collectively as the FIDOL factors and are presented in Table 3.

Table 3: FIDOL Factors

FIDOL Factor	Definition
Frequency	How often an individual is exposed to the odour.
Intensity	The strength of the odour.
Duration	The length of exposure.
Offensiveness/character	The character relates to the 'hedonic tone' of the odour, which may be pleasant, neutral or unpleasant.
Location	The type of land use and nature of human activities in the vicinity of an odour source.

Odours may occur frequently in short bursts, or for longer, less-frequent periods, and may be defined as having 'acute' or 'chronic' effects.

Depending on the severity of the odour event, one single occurrence may be sufficient to consider that a significant adverse effect has occurred. In other situations, however, the event may be short enough, and the impact on neighbours sufficiently minor, that the events would need to be happening more frequently for an adverse effect to be deemed to have occurred.

A FIDOL assessment in accordance with the MfE GPG Odour has been used as the basis of this assessment methodology.

4.1.1 Intensity

Intensity can be assessed on a seven-point intensity scale as shown in Table 4 from no odour (0) to extremely strong odour (6). While this is subjective (different people will perceive odours as different intensities), it provides a useful quantitative tool for estimating odour intensity.

Table 4: Odour Intensity Scale (MfE, 2016)

Odour Intensity	Intensity Level	Descriptor[9]
Extremely Strong	6	The odour causes the assessor to feel nauseous or compelled to leave the area
Very strong	5	The odour causes some discomfort; assessor can remain in the area but will consider leaving or altering breathing patterns
Strong	4	Odour is strong but not causing discomfort to assessor
Distinct	3	Odour readily recognisable
Weak	2	Odour detectable and barely recognisable
Very weak	1	Odour detectable but character not recognisable
No odour	0	No Odour

4.2 IAQM Guidance on the Assessment of Odour for Planning

The IAQM Guidance indicates that an assessment of the effects of an odour source on surrounding users of the land will usually contain the following major elements:

[9] These descriptors were developed for use within PDP for odour assessments and are considered to be in line with intensity assessment descriptors from other air quality professionals.

1) A description of existing baseline odour conditions (including complaints history) where relevant.
2) A description of the location of receptors and their relative sensitivities to odour effects.
3) Details of potential odour sources (whether existing or proposed), including the activities and materials involved (including a brief outline of quantities, durations, methods of handling and storage, etc) and the resulting potential for generating odours, covering fugitive sources, diffuse sources and point sources as applicable.
4) A description of control/mitigation measures incorporated into the scheme (including management controls and, where appropriate, engineering controls).
5) A prediction or observation (or combination of both), using appropriate assessment tools, of the likely odour impact and resulting effects at relevant sensitive receptors, and taking into account:
    a. the likely magnitude of odour emissions (after control by measures incorporated into the scheme, if applicable);
    b. the likely meteorological characteristics at the site;
    c. the dispersion and dilution afforded by the pathway to the receptors and the resulting magnitude of odour that could result;
    d. the sensitivity of the receptors; and
    e. the potential cumulative odour effects with any odours of a similar character.
6) Where odour modelling has been used the reports should contain full details of the input data and modelling options used to allow a third party to reproduce the results.
7) Where odour effects are assessed as significant, details of appropriate further mitigation and control measures that could allow the proposal to proceed without causing significant loss of amenity.
8) The residual odour impacts and their effects.
9) A conclusion on the significance of the residual effect.

The IAQM Guidance notes that to make the predictions or observations in Point 5 above, Air Quality Practitioners need to use at least one odour assessment tool that takes the FIDOL factors into account.

The methodology section of the IAQM Guidance recommends that the Air Quality Practitioner should justify the following:

- Why the chosen odour assessment tools have been used and why they are suitable for the assessment in question; and
- That the approach used is of a depth and rigour consistent with the likely risk of adverse effects.

4.3 Assessment Methodology

This assessment is prepared in accordance with good practice adopting approaches from both the MfE GPG Odour and IAQM guidelines. This report therefore includes the following information to align with the recommendations of the above assessment criteria:

- Description of the proposed activity including:
  - Details of potential odour sources (Section 2.4);
  - Site management and contingency plans (Section 5.0);
  - Process controls and design, including details of emission controls (Sections 2.2 and 5.0); and
  - A description of control/mitigation measures incorporated into the irrigation to land (Section 5.0).
- Description of the Existing Environment including:
  - Analysis of site-specific meteorology and topographical features (Section 3.1.2 and 3.2);
  - A description of existing baseline odour conditions (Section 3.1.3); and
  - A description of the location of receptors and their relative sensitivities to odour effects (Section 3.3).
- Assessment of Environmental Effects including:
  - A prediction, using appropriate assessment tools, of the likely odour impact and resulting effects at relevant sensitive receptors (Section 7.0).
- Conclusion including:
  - The residual odour impacts and their effects (Section 9.0); and
  - A conclusion on the significance of the residual effect (Section 9.0).

Given the nature of the proposal, a qualitative approach has been taken over a quantitative approach. Therefore, atmospheric dispersion modelling has not been undertaken and a FIDOL assessment in this circumstance is considered to be more appropriate than modelling.

5.0 Management and Mitigation

5.1 Proposed Odour Mitigation

A draft Odour Management Plan (OMP) is included in Appendix A, which will be updated following granting of consent. The OMP is for use in conjunction with the WWTP and disposal fields to implement and monitor the efficacy of the proposed management and mitigations. This could form part of the WWTP operation manuals.

5.1.1 Commissioning

Additional odour controls such as odour sprays or other temporary controls may be used during commissioning if abnormal odours are occurring (refer to the OMP for further information).

5.1.2 Normal Operation

Odour mitigation has been incorporated throughout the design of the WWTP. Table 5 outlines proposed odour mitigation measures, which are primarily from the Ridgeburn design report[10] and the draft consent conditions[11]. Additionally, based on the provided information, PDP has assumed that the odour sources within the WWTP are set back 47 m from the boundary of the closest residential property[6].

Table 5: Odour Mitigation by Source

Source	Odour Potential	Mitigation Measure
Screening and Grit Removal	Raw sewage and screenings which have high potential for odour generation	The screening system and grit channel are covered and connected to the odour removal system. This operates under negative pressure to prevent fugitive odour emissions. Bins receiving screenings and grit are fully enclosed and are removed once full for offsite disposal.

[10] Best Practical Option for Environmental Success (BPO), *Ridgeburn Wastewater Treatment Plant Design Report DRAFT*, 2025.

[11] Best Practical Option for Environmental Success (BPO), *Queenstown Development Wastewater Anticipated Consent Conditions DRAFT*, 2025.

Table 5: Odour Mitigation by Source

Source	Odour Potential	Mitigation Measure
Equalisation Tank	Raw screened sewage has a high potential for odour generation	The Equalisation Tank is covered and connected to the odour removal system. Mixers within the tank prevent solids settling to mitigate odour generation. The tank operates under negative pressure to prevent fugitive odour emissions.
SBRs	There is a potential for odour generation in anaerobic conditions.	Wastewater within the SBRs is highly oxygenated during the aerobic phases preventing offensive odour generation. Anoxic phases are cycled for short durations to prevent the formation of anaerobic conditions which could give rise to offensive odours. Process air from the SBRs is vented to the odour treatment system.
WAS Tank	There is a high potential for odour generation in anaerobic conditions.	The WAS Tank is covered and connected to the odour removal system. This operates under negative pressure preventing fugitive odour emissions. The sludge is aerated within the tank to prevent anaerobic conditions.
Membrane Feed Tank	Treated wastewater with low TSS and residual BOD has a low potential for odour generation.	This tank is enclosed limiting the escape of any potential odour.
Membrane filters	Minimal risk.	Membranes are fully enclosed and sealed.
Dewatering Building	Thickened sludges have high potential for odour generation.	Centrifuges and sludge storage bins are enclosed and directly connected to the odour removal and treatment system. This operates under negative pressure preventing odour from escaping. The building itself is also connected to the odour removal and treatment system.
Irrigation tank	Low Risk	The irrigation tank contains wastewater treated to a high standard with minimal solids and organic content meaning the risk of odour generation is very low. The irrigation tank is enclosed.

Table 5: Odour Mitigation by Source

Source	Odour Potential	Mitigation Measure
		The Irrigation tanks will have aerators installed and will be used to prevent anaerobic conditions if wastewater is stored for extended periods. The tank is connected to the odour treatment system and vented to the biofilter.
Odour Extraction System	There is a high potential for odour generation in case of a system failure.	Air inlets into the vented process units have adequate path lengths to eliminate fugitive emissions from wind gusts. Each odour point-source has its own flow control valve to enable efficient balancing of the odour extraction system. Odour fans have been designed with 100% redundancy, and pressure monitoring in the odour ducting system will alarm during abnormal conditions. An onsite backup generator mitigates the risk of odour extraction system failure during a power outage.
Biofilter	Low risk of odour at sensitive receptors during normal operation. There is a moderate potential for odour generation during biofilter remediation or if the biofilter is not adequately maintained.	Air humidification upstream of the biofilter and additional water application as required will enable optimum uniform moisture conditions throughout the biofilter bed. Construction and maintenance of biofilter bed will enable air passing through this is sufficiently treated. The biofilter bark medium will be periodically replaced to enable effective treatment of process air.
Discharge to Land – Subsurface Drip Irrigation	Minimal	The land application areas will be designed and operated so that wastewater does not seep through the surface – wastewater will be discharged 150 to 200 mm below the soil surface. Additionally, all wastewater will be highly treated and polished by the time it is

Table 5: Odour Mitigation by Source		
Source	**Odour Potential**	**Mitigation Measure**
		applied into land, resulting in a lower potential for odour generation.
Discharge to Land – Spray Irrigation	Moderate	Spray irrigation areas will be set back 50 m from all residential lot receptors. Irrigation lines will be designed to drain empty when not actively irrigating or be flushed with clean water at the end of a cycle. This is to prevent anaerobic conditions developing with stagnant wastewater sitting in pipes between periods which increase the potential for odour. Additional control as proposed in Section 5.2 to minimise spray drift.

Regular site walkovers of the WWTP and irrigations field will be undertaken. This is to check for any signs of abnormal operations that may cause odour, leaks or ponding which may indicate leaks, and pipes which have surfaced. Should any issues be identified, this will be remedied as soon as practicable (refer to the OMP in Appendix A).

PDP considers that the proposed mitigation measures will effectively treat most odour from the WWTP during typical operations.

5.1.3 Maintenance

During remediation of the biofilter, process air from the odour treatment system may not be able to be treated. Releasing process air without treatment presents a very high risk of odour at sensitive receptors. Mitigation options include designing a biofilter with two independent cells which can be isolated for remediation, or temporary use of activated carbon filters during remediation operations. A two-cell biofilter design will require sufficient capacity for each bed to treat all process air at a high standard, and when one cell is taken offline during maintenance, process air is still able to continue to be treated at an acceptable standard.

The following measures will be considered during detailed design and operation/maintenance of the biofilter:

- A robust and effective leachate removal system is designed to prevent flooding and anaerobic conditions in the beds,

- Inclusion of compost and lime or crushed seashells in the media to seed microbial populations and maintain an appropriate pH,
- Regular monitoring of compaction, cracking, increased organic growth, odour, pressure drop across the beds, temperature and moisture within the biofilters,
- Biofilter remediation works should be carried out when sensitive receptors are not downwind where practicable,
- Old biofilter media should be disposed of offsite, and
- Access to the biofilter should be unimpeded to decrease the period of biofilter remediation operations.

5.1.4 Redundancy

A backup generator will be installed with sufficient capacity to prevent the WWTP from generating odours during network power outages.

Transportable power sources will be kept on site to take to spots (such as pump stations) to empty these out should wastewater be backing up or stagnating resulting in odour during periods of extended power outages.

5.2 Mitigation of Human Health Risks

Spray irrigation of wastewater poses a potential health risk to receptors if they come into contact with aerosolised pathogens. Based on the spray drift assessment (see Section 6.0), the following mitigation measures will be implemented:

- Irrigation will not occur during winds greater than 7.5 m/s.
- A meteorological monitoring station should be installed within the land application area or at a representative established meteorological monitoring site will be used to track wind speeds and trigger irrigation cut-offs if required.
- Irrigation system design and nozzle selection shall consider particle size distribution to increase droplet sizes and direct spray flat or downward where practicable and reduce spray drift. Non-misting heads should be selected.
- Maximum droplet release height from the spray irrigation will be 0.5 m above ground level.
- The spray irrigation area should be fenced off, with clear signage in English and Māori to prevent access.
- A minimum setback distance of 50 m from residential boundaries and any other recreational area including the bike path up Morven Hill will be

applied. If a 50 m setback cannot be applied from the bike path to spray irrigation fields, then this area should only be irrigated at off peak time (i.e. night time when less people are out);

- Not undertaking spray irrigation of areas upgradient of receptors in the mornings (i.e. not before 8 am in summer months and 9 am in winter months).

These controls will minimise potential for significant spray drift to occur while also keeping public away from areas where coming into contact with spray drift may be increased. PDP considers that these controls, in addition to the high treatment quality expected for the treated wastewater, are appropriate to minimise risk to human health from the spray irrigation system.

5.3 WWTP Construction Dust Management

During construction of the WWTP and irrigation site, it is recommended that dust control measures such as watering exposed areas and stockpiles on dry and windy days above 5 m/s, and prompt stabilisation of disturbed surfaces is implemented in to reduce the potential for nuisance dust to leave the site.

This may be done in accordance with a dust management plan or broader environmental construction management plan for the wider development.

6.0 Potential Change to Biofilter Location

The area required by the biofilter may increase during detailed design, in which case the biofilter location indicated on the draft layout plan (Figure 4) may be unsuitable. On the basis that the site is spatially constrained, PDP understands that the biofilter may have to be located elsewhere. PDP could potentially support locating the biofilter to the west of the draft WWTP footprint, closer to the residential property boundaries provided the following conditions are met:

- The separation distance between the residential receptors and the biofilter must be maximised, with an absolute minimum separation distance of 20 m,
- The design and maintenance requirements of the biofilter will have to be rigorous to minimise the potential for elevated odour production,
- The biofilter must still be located within the WWTP boundary with adequate access for remediation purposes,
- Public access to the biofilter must be adequately restricted, and
- No other sources of odour from the WWTP may be located closer than 47 m to the residential property boundaries.

7.0 Assessment of Spray Drift

The distance that droplets from spray irrigation can travel depends on three factors, firstly how strong the wind is, secondly how large the droplets are, and finally the maximum height at which the droplets are released. In addition to these dispersal factors, the slope of the hill and any obstacles, including plants, will impact the dispersal of the droplets and likely spray drift distances.

7.1 Windspeed

Based on meteorological data obtained from the Queenstown aerodrome, as referenced in section 3.2.1, the average windspeed is expected to be 3.5m/s. Along with this average windspeed a maximum operating wind speed of 7.5m/s has been considered to demonstrate the potential effects of spray drift. Winds above 7.5m/s occur annually at a frequency of 7% based on data from the Queenstown aerodrome.

7.2 Katabatic Flows

Katabatic wind flows (downslope winds) occur in the mornings, specifically during the early morning hours, as they are a nocturnal phenomenon driven by the radiative cooling of the ground. Katabatic flows result in very low speed in winds blowing down Morven Hill and across the disposal fields towards receptors. This increases the potential for odour and spray drift risk to be observed as these winds to not result in significant mixing or dispersion. Section 5.2 provides controls for the irrigation system which avoids irrigating in the early mornings.

7.3 Droplet Size Distribution

The irrigation system is not fully designed yet and will be contingent on the areas required for land application, however it is likely to consist of microsprayers across the Morven Hills disposal area. Droplet size and throw distance can be adjusted during the detailed design process.

Common sprinkler water droplet distributions can typically be between 250 and 4,000 µm. Research on droplet size distribution from sprinklers has found irrigation systems produce between 0.1 and 1 percent of droplets as small as 50 µm in size[12]. Therefore, to add to the conservatism of this assessment PDP has used a minimum droplet size of 50 µm, as well as a more common droplet size of 250 µm.

[12] Noonan, M. J., Ross, C. M., Donniston, A. M., Bell, S. T., Fisher, G., & Ironmonger, A. (2002). Can the microbial quality of effluents be used to determine the risks of aerosols during spraying of treated wastes? *New Zealand Water and Wastes Association.* Christchurch

7.4 Maximum Droplet Release Height

The proposed microsprinkler system can be designed to a wide range of nozzle heights. For the purpose of this assessment a maximum nozzle height of 0.5 m has been assumed. Nozzle heights greater than this would increase spray drift distances.

7.5 Spray Drift Potential

Based on the three factors that influence spray drift, Figure 11 depicts the distance potentially travelled by the irrigation water droplets in flat terrain for a range of wind speeds based on particle diameters of 50 and 250 µm (noting droplet size assuming a non-misting head is expected to be primarily greater than 250 µm).

Figure 11 shows that most of the spray will fall to the ground within 5 metres of the nozzle, even at 7.5 m/s windspeeds. However, the far smaller component (50 µm) could travel as far as 25 metres in average windspeeds (3.5 m/s) and 50 metres horizontally at 7.5 m/s winds.

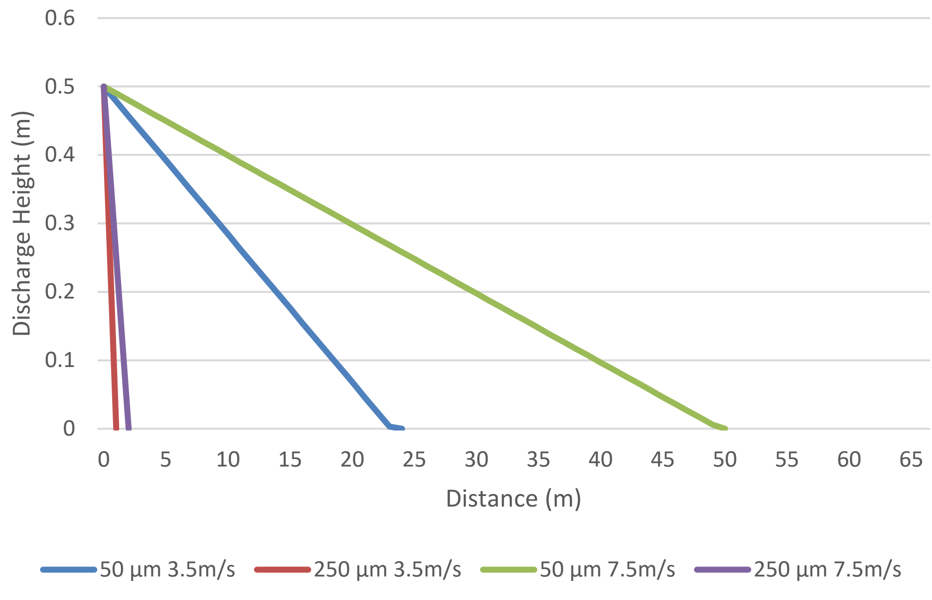

Figure 11: Potential Distance of Spray Drift

7.6 Terrain

The above assessment of horizontal spray drift travel distances assumes flat terrain with no obstacles. Morven Hill has an average slope of around 30 degrees which may result in dispersal to a much greater distance than modelled above. Limiting durations and strategic timing of when the spray irrigation operates will reduce potential for exposure should some droplets travel further due to being released uphill from receptors, in addition the controls proposed in Section 6.2 mitigate risk of spraydrift being carried downhill.

7.7 Planting

Plants located in the path of the micro-spray system will also act as obstructions impeding the dispersal away from the sprinkler nozzles. Larger plants are expected to be a better control for dispersal of droplets than smaller planting below the height of the sprinkler nozzle. This will assist in reducing spray drift potential.

7.8 Health Effects

While a small amount of treated wastewater spray can be transported off-site it does not necessarily mean there is a microbial or viral risk associated with this spray. There are several factors that affect the likelihood of these spray particles transporting microbes or viruses off-site, these include the microbial / viral concentration of the treated wastewater, the size of the particle, ambient temperature and humidity.

As outlined in the BPO Design Report[13] the proposed discharge quality is of a high standard, with membrane filtration and UV treatment, treated wastewater is expected to have very low microbial and viral concentrations. *Escherichia coli* has a target concentration of <10 cfu/100mL.

Research shows that the smaller the droplet size the less likely it is to contain microbes**Error! Bookmark not defined.**. A study by NIWA also showed a very low presence of pathogens in aerosols from irrigation spray[14]. The study concluded that on average there was very little risk (<0.1%) of becoming ill from repeated exposure to irrigation spray at a distance greater than 10 m from the source.

With the proposed setback from parcel boundaries being 50 m, the majority of the droplets will have fallen to the ground even in windy conditions with just a small percentage of droplets remaining in suspension, and a smaller component of these droplets likely to contain microbial or viral risk.

7.9 Performance and Design Criteria

Based on the above assessment, the performance and design standards in Section 5.2 are proposed to be adopted to minimise exposure of sensitive receptors to spray drift.

These performance criteria will be applied in conjunction with the proposed setback distances, noting that a 50 m separation distance is required from the

[13] Best Practical Option for Environmental Success (BPO), *Ridgeburn Wastewater Treatment Plant Design Report DRAFT*, 2025

[14] Roberts, G. S. (2020). *Microbial Risk Assessment.* Fonterra.

property boundary at minimum and 50 m from bike paths. Should a setback of 50 m from bike paths be unachievable the alternative minimum requirement proposed is a minimum of 10 m setback from bike paths with 50 m of spray irrigation on either side only being used during nighttime when less people are likely to be in the area.

8.0 Odour Assessment of Effects

8.1 Frequency

The frequency of winds towards a potentially sensitive receptor in combination with how often odour is emitted from a source affects how often there is potential for odour at that receptor.

High wind speeds improve odour dispersion, so odours are typically observed in wind speeds less than 3 m/s. Table 6 shows the frequency of winds less than 3 m/s towards each sensitive receptor.

Table 6: Downwind Frequencies of Sensitive Receptors from Sources

Source of Odour	Receptor	Closest Distance to Source Boundary (m)	Downwind Frequency[15] (0.5-3 m/s)
WWTP	R1 - 505 Chard Road	830	1.1%
	Ridgeburn Residential Properties	47[6]	2.0%
	Twin Rivers Trail	85	8.3%
Spray Irrigation Field on Morven Hill	Ridgeburn Residential Properties	50	8.3%
	Northern Cycle Trail	1[16]	8.3%
	Twin Rivers Trail	370	8.3%

[15] Where receptors are grouped and cover a wide area (such as the Ridgeburn Residential Properties or cycle trails), the range of angles where the receptors are downwind of the source are divided into 20° segments with the maximum frequency of the segments presented.

[16] This distance will be updated in accordance with mitigation measures outlined in Section 5.0 to a minimum of 10 metres

Table 6: Downwind Frequencies of Sensitive Receptors from Sources			
Source of Odour	**Receptor**	**Closest Distance to Source Boundary (m)**	**Downwind Frequency[15] (0.5-3 m/s)**
	R2 – 68 Sicilian Lane	480	3.9%
	R3 – 89 Sicilian Lane	400	2.3%
	R4 – 49 Hayes View Lane	560	1.5%
	R5 – 886 Lake Hayes-something something	780	1.5%
	R6 – 52 Morven Ferry Road	350	5.3%
	R7 – 62 Morven Ferry Road	400	5.0%
	R8 – 24 Morven Ferry Road	350	5.0%
Drip Irrigation Fields	Ridgeburn Residential Properties	2.5[17]	8.3%
	Ridgeburn Recreational Areas	0 (driplines will be installed beneath recreational areas)	8.3%

Receptors 1 to 5 are infrequently downwind (<5% of the time)[18] of potential odour sources within 1 km. Receptors 6, 7 and 8 to the north of the Ridgeburn development are moderately frequently downwind (5-12% of the time) of the spray irrigation fields.

Ridgeburn residential receptors are infrequently downwind of the WWTP but moderately frequently downwind of the two potential irrigation field odour

[17] Best Practical Option for Environmental Success (BPO), *Queenstown Development Wastewater Anticipated Consent Conditions DRAFT*, 2025.
Note: PDP has assessed odour on the basis of a 2.5 m separation distance between residential properties and dripline irrigation areas. Ridgeburn Ltd have indicated that this separation distance may be less than 2.5 m however this is unlikely to materially affect the assessment of odour from subsurface dripline irrigation.
[18] Institute of Air Quality Management, *Guidance on the Assessment of Mineral Dust Impacts for Planning*, May 2016.

sources. Any given location along the bike trails is either infrequently or moderately frequently downwind of potential odour sources, however receptors are only likely to be at these spaces for short periods of time which reduces the frequency of odour observed at these locations.

When considering the frequency of low wind speeds towards sensitive receptors and the frequency of increased odour emissions, the expected frequency of detectable odour from the WWTP and disposal fields at sensitive receptors is predicted to be low.

8.2 Intensity

Intensity is the perceived strength of an odour by individual receptors. Subjective measurements are made on a scale of 0 to 6 as per the MfE GPG Odour. Intensity depends on the concentration of odour emitted from the source and the dilution that occurs between the source and the receptor. The dilution is a product of the distance between receptors and the windspeed.

The intensity of odour varies between sources identified across the WWTP process.

- Biofilter odour during normal operation is typically Weak (2) to Distinct (3) at very close range (<5 m). In PDP's experience, odour from a biofilter is not typically observable beyond 50 m from the source. Odour is likely to be occasionally observable at Weak (2) intensities within 20 m of a biofilter during normal operations.
- Processes connected to the odour treatment system are not expected to emit odour due to being maintained under negative pressure. Any fugitive emissions are expected to have a Weak (2) intensity close to the source, which will be quickly dispersed and are not expected to be observable beyond the WWTP boundary.
- The membrane feed tank and irrigation tank (which are not connected to the odour treatment system) are enclosed, limiting the potential for odour emissions. Provided anaerobic conditions are avoided, the odour potential of the treated wastewater is low. Any fugitive emissions are therefore expected to have a maximum of Weak (2) intensity at close range and be dispersed quickly. Extended storage of wastewater or anaerobic conditions increase the potential for odour generation from these tanks, which could be mitigated by connection to the odour treatment system.
- Land application of treated wastewater via subsurface drippers is likely to have a maximum intensity of Very Weak (1) provided anaerobic conditions are avoided. The low solids and organic content of the treated wastewater from the Ridgeburn WWTP in conjunction with the

sub-surface delivery is likely to result in a very low odour potential. Odour is unlikely to be detectable at any sensitive receptors during normal operation. If leakage of wastewater resulting in ponding occurs, the intensity of odour may increase.

- Spray irrigation of treated wastewater produces aerosols which result in a higher odour intensity than subsurface irrigation. The maximum intensity of odour from spray irrigation of treated wastewater is likely to be Very Weak (1) to Weak (2) close to the source, under normal operating conditions. If the wastewater becomes anaerobic, the potential for odour of a Weak (2) to Distinct (3) intensity increases.
- Bins storing screenings and grit from the inlet works are fitted with lids to reduce odour emissions. The resulting odour is likely to have a Distinct (3) intensity at very close range. Given the small size of the wheelie bins, odour is likely to disperse quickly and is unlikely to be detectable beyond the WWTP boundary.

Given the low intensities of odour expected to be emitted from all processes during typical operations, sensitive receptors may occasionally observe weak odour from the WWTP. Sensitive receptors are unlikely to observe odour from the Disposal Fields during typical operations.

The intensity of odour emissions during commissioning (for example before equipment is tuned to optimal settings) may potentially be higher than during typical operations. The intensity of odour from biofilter remediation depends on the condition of the biofilter media. If the biofilter is appropriately maintained, then low intensity odour may be detected within 50 m from the source. If the biofilter is not appropriately designed or maintained, then strong odours will be detectable out to more than 100 m.

The intensity of odour has potential to increase should a power outage occur and treatment processes be affected; the backup generator and continued operation of the odour treatment system is anticipated to reduce any potential for increased intensity.

8.3 Duration

The duration that any receptor will experience odour will depend on the period of time that the receptor is downwind of the source, in combination with the period when the source is emitting odour.

The WWTP will be operating continuously, resulting in a constant emission of low-intensity odour. However, some activities on-site may temporarily result in potentially increased odour emissions:

- Commissioning of the WWTP - This may occur over multiple weeks but is likely to occur only once and may take place before the closest residential properties are occupied.
- Emptying of the screenings and grit bins for offsite disposal is expected to have a very short duration approximately two to four times per month.
- Biofilter remediation typically takes a few days every 3-5 years.

Irrigation of treated wastewater to land will be occurring on a rotation to allow areas of the disposal fields to rest. The duration of the rotations will be determined during the detailed design phase. PDP has therefore assumed that irrigation will be occurring constantly in all disposal field areas. The frequency of exposure for bike trail and recreational area receptors is expected to be relatively short due to the way people typically use these spaces, however exposure for residential properties must be assumed to be constant.

8.4 Offensiveness/Character

The character of fresh untreated wastewater can be described as earthy, pungent, organic and often soapy. It generally does not smell like untreated faecal matter. However, it can be considered offensive by the public, especially at high intensities.

Wastewater in an aerobic state during treatment may also produce odour with a 'musty' character. This may be considered offensive by members of the public at high intensities. Anoxic wastewater is likely to have a character similar to fresh wastewater or aerobic wastewater, especially when anoxic cycles are of short duration as with SBR operations.

If the wastewater becomes anaerobic, then compounds like reduced sulphur compounds such as dimethyl sulphides, mercaptans and especially hydrogen sulphide can be generated. These compounds are all highly odorous and have characters ranging from 'brassica' and 'rotten cabbage' to 'rotten egg'[19]. Because of these characteristics, it is considered unpleasant by members of the public. Anaerobic conditions are not expected throughout the treatment process, partly due to the small catchment and constant wastewater inflows. Mitigation measures to decrease anaerobic conditions include aeration of the SBRs and WAS Tank.

Once the wastewater has been treated, the solids and organic content of the wastewater is very low, therefore little residual odour is expected, and it is unlikely to be considered unpleasant.

The character of odour from bins containing screenings, grit and WAS sludge is considered very unpleasant by members of the public, especially at high

[19] Holyoake, K. M.; Kotze, K. V., *Odour Control for Pump Stations*, n.d. ARMATEC Environmental Ltd.

intensities. Reduced sulphur compounds may be generated during transport to the WWTP, resulting in a sulphur-like characters as described above. The relatively short travel distances provide limited opportunity for anaerobic degradation of the screenings. The sealed lids on these bins are expected to contain most of the odour, and these will be frequently taken for disposal offsite when full instead of being stored at the WWTP.

The character of odour from the WWTP during power failure (assuming no back up power source is available) is likely to become more characteristic of anaerobic wastewater as remaining oxygen within the wastewater is consumed through biological degradation and aeration is not available. This odour would be considered extremely unpleasant by members of the public.

During typical operations, the biofilter is expected to produce odour with an earthy character, similar to wet bark or compost. This is generally not considered offensive. During biofilter remediation, old media is likely to have an earthy character similar to that of well-aged compost. This could be considered unpleasant especially at high intensities. Media which has decomposed anaerobically is likely to have an unpleasant odour – mitigation measures to decrease anaerobic conditions are described in Section 5.0.

8.5 Location

The closest sensitive receptors to the WWTP operations are likely to be zoned Residential, with a high sensitivity to odour. The bike trails (which are in very close proximity to the WWTP and Disposal Fields) have a moderate sensitivity.

Highly sensitive receptors will be located directly on top of or adjacent to subsurface irrigation of treated wastewater to land. As established in Section 7.2, odour emissions from the irrigated land subsurface disposal areas are expected to be negligible. Odour from irrigation of treated wastewater is not likely to be perceptible at any sensitive receptor locations.

Highly sensitive receptors will also be located 50 m from to spray irrigation of treated wastewater to land, with a bike track either 10 m (with areas within 50 m only irrigated at night) or 50 m from the spray irrigation areas. Odour emissions from the irrigated land subsurface disposal areas are expected to be low or negligible. Odour from irrigation of treated wastewater has low likelihood to be perceptible at any sensitive receptor locations.

Some highly sensitive receptors will be located 47 m from the odour sources within the WWTP. Odour from typical operations may often be present at low intensities at the WWTP boundary, however it is likely to disperse before reaching the closest residential receptors. Odour may be detectable at residential sensitive receptors if receptors are downwind during low wind speed conditions. If the biofilter must be located closer than 47 m to the residential receptors (to be identified during detailed design), odour from typical biofilter operation may not disperse completely and odour may be observable at these receptors.

A separation distance of 47 m may be insufficient to disperse odour emissions from biofilter remediation operations or during power failure, especially during low wind speeds. The backup power supply mitigates the impact of power failure.

8.6 FIDOL Assessment Conclusion

Despite the WWTP and disposal fields being located close to highly sensitive receptors, odour from normal WWTP operations is unlikely to be observable at the WWTP and disposal field boundaries most of the time. Odour at Weak (2) intensities may be detectable at the closest sensitive receptors however, this is likely to be infrequent and short in duration. PDP therefore considers that it is unlikely that normal operation of the WWTP will result in offensive or objectionable odour effects beyond the boundary. Odour from the subsurface drip irrigation fields is unlikely to be perceptible under typical operations and is highly unlikely to cause offensive or objectionable effects. Odour from the spray irrigation fields is unlikely to cause offensive or objectionable effects provided the mitigation measures recommended in Section 5.0 are implemented. If the biofilter must be located closer than 47 m to the residential receptors, occasional, low-intensity odour is likely to be perceptible during typical operations. The odour character for a biofilter which has been well-maintained is not typically considered unpleasant which reduces the likelihood of offensive or objectionable effects.

During commissioning of the WWTP, odour emissions may be higher in intensity and have an unpleasant character for a temporary but unknown duration. Commissioning is an unavoidable procedure which only occurs once. It is possible that during the commissioning period, the closest residential properties will not be occupied which greatly decreases the potential for offensive or objectionable offsite odour effects.

Biofilter remediation activities may result in observable odour at sensitive receptors. Although remediation activities happen infrequently (every 3-5 years), there is potential for the closest sensitive receptors to experience offensive or objectionable effects. Mitigation measures as outlined in Section 5.0 are likely to be effective at preventing offensive or objectionable effects.

9.0 WWTP Construction Phase Dust Effects

There is potential for nuisance dust during construction of the WWTP and disposal field components. The close residential properties are not expected to be occupied during the construction phase. Therefore, the nearest sensitive receptors are likely to be the current dwellings identified in Section 3.3 which are greater 850 m in distance from the WWTP and disposal sites and downwind infrequently.

Potential effects from nuisance dust during construction to establish the WWTP and disposal fields are anticipated to be negligible, however dust management practices in accordance with Section 5.3 are recommended as further mitigation.

10.0 Conclusion

The proposed Ridgeburn WWTP will service a small population of primarily residential properties. While located close to sensitive receptors, odour control and mitigation within the WWTP is comprehensive and is expected to effectively control odour during typical operations.

Odour from the WWTP may occasionally be observable at the closest sensitive receptors during for short durations during typical operations, however the intensity is likely to be Weak. Therefore, offsite odour effects are unlikely to be offensive or objectionable. Odour from the disposal fields is likely to be minimal due to the subsurface nature of the driplines and the highly treated wastewater being irrigated. Odour from the drip irrigation of wastewater is likely to be minimal due to the subsurface nature of the driplines and the highly treated wastewater being irrigated. Adverse health effects and odour from the spray irrigation of wastewater are likely to be effectively mitigated using the measures outlined in this report. These include highly treated wastewater with lowered potential for pathogens to be present applied using micro-spray irrigation close to the ground with many controls in place including nozzle design and setbacks.

Biofilter remediation may result in odour at sensitive receptors every 3-5 years during media changes, at generally weak intensities. Provided the biofilter is appropriately designed and operated, the proposed mitigation measures are expected to be effective at preventing offensive or objectionable odour effects outside of the WWTP boundaries.

Appendix A: Draft Odour Management Plan

Odour Management Plan - Ridgeburn Wastewater Treatment Plant and Irrigation System

Prepared for

Ridgeburn Limited

2026

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Quality Control Sheet

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Limitations:

This report has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Ridgeburn Limited and [others (not directly contracted by PDP for the work)], including BPO Limited and WGA Limited. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the report. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

This report has been prepared by PDP on the specific instructions of Ridgeburn Limited for the limited purposes described in the report. PDP accepts no liability if the report is used for a different purpose or if it is used or relied on by any other person. Any such use or reliance will be solely at their own risk.

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Appendices

1.0 Introduction

1.1 Purpose

This Odour Management Plan (OMP) has been prepared to outline an odour management strategy for Ridgeburn Limited to implement the future Ridgeburn wastewater treatment plant (WWTP) and irrigation fields when they are operated under normal conditions as well as outlining response measures when unexpected circumstances result in abnormal odours.

1.2 Background

The Ridgeburn WWTP will be located at the south-east corner of the development. The proposed WWTP will only treat wastewater from the Ridgeburn development, which will be primarily residential with a small percentage of commercial discharges. Treated wastewater from the WWTP will be irrigated to land in the areas outlined in Figure 1.

The WWTP will treat wastewater to a high standard, comprising primary, secondary and tertiary treatment, Figure 2 outlines the WWTP undertaken at this site.

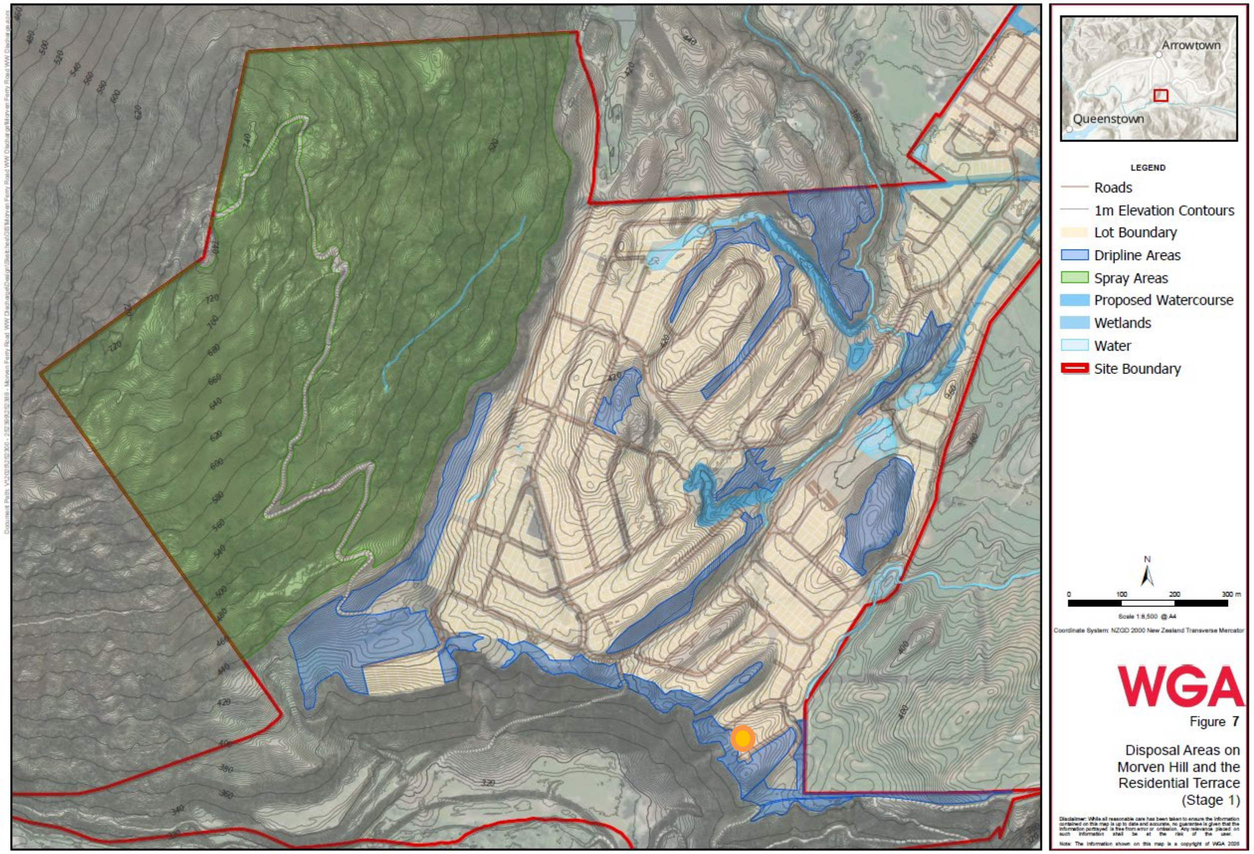

Figure 1: Locations of Treated Wastewater Irrigation Fields (WGA, 2026) (Orange dot added to indicate location of WWTP

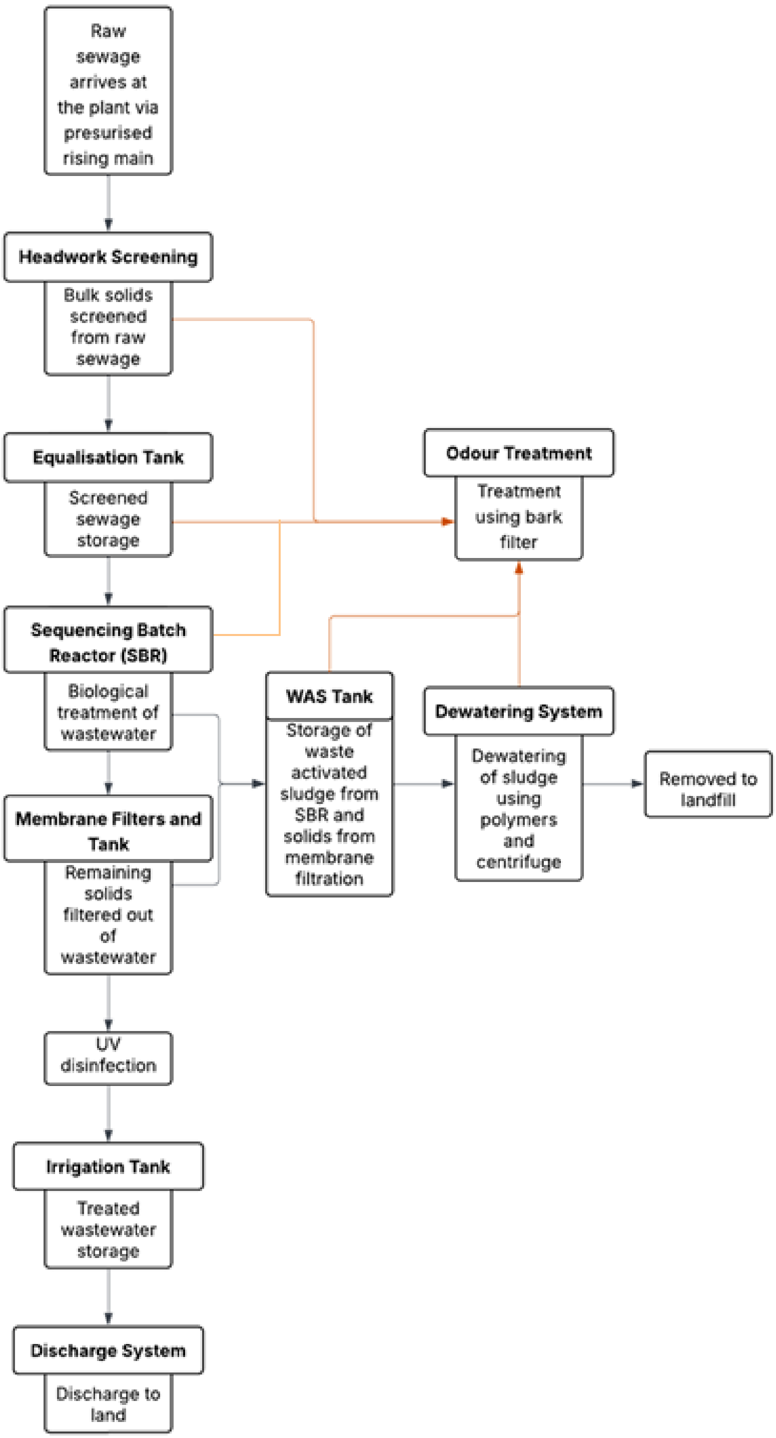

Figure 2. Flowchart of the WWTP Treatment Process

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2.0 Odour Management Measures

2.1 Commissioning Phase

As part of Ridgeburn’s communication strategy, any sensitive receptors and public occupying properties nearby at the time will be informed prior to commencing commissioning of the WWTP, with a contact number for the WWTP operation team should the public wish to report any abnormal odours beyond the boundary of the WWTP.

During commissioning all of the controls in Section 2.2 for regular operation will be implemented. The critical new treatment components will be monitored at all times during commissioning.

During commissioning of the WWTP there is slightly greater potential for abnormal odour generation while components are being tuned and filled. The following controls shall be implemented as contingency only in the circumstances that abnormal odours are generated during commissioning:

- Odour sprays
- Chemical dosing
- Freshwater flushing

Any unforeseen leaks or spills of wastewater shall be cleaned up immediately and disposed of in an appropriate facility.

2.2 Regular Operation

There are multiple potential odour sources throughout the wastewater treatment process, which are described in Sections 2.2.1 to 2.2.14

2.2.1 Screening and Grit Removal

The grit removal and screening facilities will be in a covered area which is connected to the odour extraction system and screenings are kept in sealed bins. Grit and screenings bins will always be covered and should be taken to landfill at regular intervals as filled to avoid odour from aging material. The inlet area is regularly cleaned (once daily), and conveyers washed with fresh water to reduce presence of organic matter that could generate odour as it decays.

2.2.2 Equalisation Tank

The 1,500 m^3 equalisation tank serves as a critical buffer between the incoming screened wastewater and the downstream Sequencing Batch Reactors (SBRs). Its primary function is to smooth out fluctuations in flow and load, providing for a consistent feed to the biological treatment process. During peak inflow periods, excess wastewater is temporarily stored in the tank and gradually released during low-flow periods. The tank is equipped with mixers to prevent solids settling and odour generation. The tank is connected to the odour extraction system.

2.2.3 Sequenced Batch Reactors (SBRs)

The two SBRs are aerated activated sludge reactors which provide for a cycle within the same tank to undertake the following:

- Mixed Fill/Anoxic Phase: Wastewater is introduced and mixed without aeration, promoting denitrification by encouraging facultative bacteria to reduce nitrates to nitrogen gas.
- Aerated Phase: Air is supplied via blowers to maintain aerobic conditions, supporting the breakdown of organic matter and nitrification (conversion of ammonia to nitrate). Some alkalinity addition may be required as this step consumes alkalinity.
- Anoxic Phase: Aeration stops and mixing continues, allowing denitrification to occur. Carbon dosing is typically required to drive this process.
- Settle Phase: Mixing stops, allowing solids to settle and form a sludge blanket.
- Decant Phase: The clarified supernatant is decanted and transferred to the membrane tank for further treatment.

The SBRs require pauses in mixing and aeration in different phases to promote anoxic zones for treatment, however this may generate unpleasant odours. Potential for odour is controlled and minimised by maintaining anoxic phases to short durations only and monitoring dissolved oxygen within the SBR.

2.2.4 Membrane Feed Tank

The membrane feed tank holds partially treated wastewater prior to membrane filtration. This tank is fully enclosed limiting the escape of any potential odour.

2.2.5 Membrane filters

Membrane filters are fully enclosed and sealed to reduce potential for odour.

2.2.6 UV Treatment

The UV treatment is fully enclosed and sealed to reduce potential for odour.

2.2.7 Irrigation tank(s)

The irrigation tank(s) will contain highly treated wastewater with minimal solids and organic content meaning the risk of odour generation is very low. However, should highly treated wastewater be stored for long periods of time due to the irrigation system being unable to operate, there is still potential for treated wastewater to become anaerobic. The irrigation storage tanks will therefore be equipped with aerators which may be turned on by operators if treated wastewater is being stored for multiple days without irrigation occurring. The treated wastewater storage tanks will also be connected to the odour extraction system.

2.2.8 Waste Activated Sludge (WAS) Tank

In the WAS tank there is a high potential for odour generation if it becomes anaerobic. The WAS Tank is covered and connected to the odour extraction system, which maintains the tank under negative pressure prevent odour from escaping. The sludge is aerated within the tank to prevent it turning anaerobic.

2.2.9 Dewatering Building and Centrifuge

Waste sludge from the SBRs and membrane system is pumped to the purpose-built dewatering shed to contain odour and includes ventilation to the odour extraction system, where it is processed using a high-speed centrifuge. Polymer is dosed to enhance solids separation, resulting in a dewatered sludge cake with approximately 18% solids content.

The dewatered material (cake) transferred directly to covered trucks which will be taken to the landfill facility as soon as the bin is full to minimise aging biosolids and odour on site. Solids cake bins shall be emptied once daily at minimum (Monday – Friday).

2.2.10 Odour Extraction System

The odour treatment system captures and treats process air from sources within the WWTP with a high potential for odour generation. Process air from the screening and grit removal works, equalisation tank, WAS tank, dewatering building including WAS biosolids storage, and treated wastewater storage is contained and vented to the odour treatment system (see Biofilter controls in Section 2.2.11) using centrifugal fans.

An overview of the above sources and whether they are to be connected to the odour extraction system is given in Table 1.

Table 1: Potential WWTP Odour Sources Required to be Connected to Odour Extraction System

Source	Odour Generation Potential	Vented to Biofilter
Screening and Grit Removal	High	✓
Equalisation Tank	High	✓
SBRs	Minimal	✓

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Table 1: Potential WWTP Odour Sources Required to be Connected to Odour Extraction System

Source	Odour Generation Potential	Vented to Biofilter
WAS Tank	High	✓
Membrane Feed Tank	Minimal	
Membrane filters	Minimal	
UV Treatment	Minimal	
Dewatering Building and Centrifuge	High	✓
Irrigation tank	Minimal	✓

Air inlets into the vented process units have been designed with adequate path lengths to eliminate fugitive emissions from wind gusts. Each odour point-source has its own flow control valve to enable efficient balancing of the odour extraction system. The odour fans have been designed with 100% redundancy and connected to the back-up generator to provide for uninterrupted operation.

Online pressure monitoring in the odour ducting system will alarm during out of normal conditions. Air humidification upstream of the biofilter will enable optimum uniform moisture conditions throughout the biofilter bed.

2.2.11 Odour Treatment System (Biofilter)

A biofiltration scrubber (biofilter) treats the process air by passing it through a biologically active bed of bark and/or woodchips. Microorganisms in this bed naturally degrade odorous compounds including hydrogen sulphide, mercaptans and ammonia.

The bark media is periodically replaced to maintain efficiency, and the system is designed to handle variable airflows without compromising treatment.

During remediation of the biofilter, process air from the odour treatment system cannot be treated within that section being remediated. Releasing process air without treatment presents a very high risk of odour at sensitive receptors. Mitigation options include designing a biofilter with two independent beds which can be isolated for remediation, or temporary use of activated carbon filters during remediation operations.

The biofilter will consist of:

- A bed depth of at least 1.4 m (including gravel layer);
- A filter medium that is visibly damp below the surface with a moisture content of generally between 50% and 70% on a dry weight basis; water

application will be set manually, however a pre-humidifier will be installed upstream of the biofilter inlet to enable air to reach the bottom of the bed in a humidified state;

- An inlet temperature of generally less than 35°C;
- A pressure drop of generally less than 200 mm water gauge and monitored by a pressure gauge;
- An even distribution of air flow through the filter bed;
- A robust and effective leachate removal system is designed to prevent flooding and anaerobic conditions in the beds:
- There is no bypass of untreated air around the sides of or through fissures in the filter bed; and
- An operating pH in the range of between 5 and 8 (following an initial weathering period).

The following measures are to be incorporated or considered in operation and maintenance of the biofilter:

- Inclusion of compost and lime or crushed seashells in the media may be considered to seed microbial populations and maintain an appropriate pH;
- Regular monitoring of compaction, cracking, increased organic growth, odour, pressure drop across the beds, temperature and moisture within the biofilters;
- Biofilter remediation works should be carried out when sensitive receptors are not downwind where practicable;
- Old biofilter media should be disposed of offsite; and
- Access to the biofilter should be unimpeded to decrease the period of biofilter remediation operations.

2.2.12 Pump stations

Pump stations shall be sealed and have ventilation as appropriate. There is little risk of odour from pump stations except in circumstances systems have been shut down or left sitting for periods of time long enough to generate unpleasant odour, this is addressed in Section 2.3.1.

2.2.13 Spray Irrigation Field

Spray irrigation of treated wastewater shall have a 50 m setback from residential houses and from the bike path up Morven Hill. If a 50 m setback cannot be applied from the bike path to spray irrigation fields, then a 10 m setback should be applied and this area should only be irrigated at off peak times (i.e. night time when less people are out). The following controls will be installed:

- Fencing off the disposal field, with clear signage in English and Māori to prevent access.
- Installing spray nozzles at a maximum height of 0.5 m, with the largest droplet size possible to minimise spray drift.
- Avoiding irrigation of areas upgradient of in the mornings. Katabatic flows resulting in wind blowing down Morven Hill and across the disposal fields towards receptors increases the potential for odour to be observed.
- Irrigation lines are designed to sit empty when not actively irrigating or are flushed with freshwater at the end of irrigation periods, to prevent anaerobic conditions developing in pipelines which increase the potential for odour.
- Irrigation will not occur during winds greater than 7.5 m/s.
- A meteorological station should be installed within the land application area or at a representative established meteorological monitoring site will be used to track wind speeds and trigger irrigation cut-offs if required.
- Irrigation design and nozzle selection shall consider particle size distribution to increase droplet sizes and direct spray flat or downward where practicable and reduce spray drift. Non-misting heads should be selected.

2.2.14 Subsurface Drip Irrigation Field

Subsurface drip irrigation of treated wastewater should remain buried to decrease risk of odour to surrounding residences. Any exposed pipelines (unburied drippers) or leaks should be fixed as soon as practicable.

2.3 Contingency Controls

2.3.1 System Redundancy

Ridgeburn will maintain back up generation ability on site to enable the WWTP to remain operable in power outages, and aim to avoid wastewater stagnating in the system creating potentially anoxic environments with potential to develop unpleasant odour.

A minimum of 320 ekW of backup generation capacity for redundancy will be available to ensure the WWTP can continue to operate at duty loads during a power outage. The odour extraction system will continue to operate using the generator in the event of a power outage enabling odour mitigation while operators.

Transportable generators to power and empty pump stations will be kept on site and used in the circumstances long term outages cause pump stations to fill up and stagnate for extended periods.

All pumps and blowers will be in duty/standby mode or duty/duty/standby mode, meaning there is always one installed spare unit in the event of breakdown. All pumps and blowers would have essential spares on site.

The dewatering centrifuge does not have a standby unit but would have essential spares on site to enable the centrifuge to be repaired quickly.

2.3.2 Abnormal odours

In the event of abnormal WWTP operation resulting in unforeseen odours, Ridgeburn operators will follow the procedure as per Section 3.4.2.

3.0 Operations and Maintenance

Ridgeburn WWTP Operators are in charge of daily monitoring of the plant and findings are recorded in the operations logbook.

3.1 Daily WWTP Site Walkovers

An operator shall undertake a site walkover around the site boundary and process equipment once daily to check for any spills, abnormal operations or other issues which may result in offensive or objectionable odour. Any issues identified shall be remedied as soon as practicable following the inspection and reasonable actions shall be taken to avoid any re-occurrence.

3.2 Monthly Irrigation Site Walkovers

An operator shall undertake a site walkover around the irrigation areas while they are not operating once per month to check for any leaks, sign of ponding, exposed subsurface drippers or other abnormal operations which may result in offensive or objectionable odour. Any issues identified shall be remedied as soon as practicable following the inspection and reasonable actions shall be taken to avoid any re-occurrence.

3.3 Odour Observations

At least quarterly a Ridgeburn representative shall undertake odour observations along the boundary of the WWTP. The monitoring locations along the boundary are shown in Figure 1 (Appendix 2). These monitoring locations also include boundaries of the treated wastewater irrigation fields. Observations should be taken downwind of the WWTP and irrigation fields as priority, and an anemometer shall be used to record the wind speed at the time of the observation. Any offensive or objectionable odour identified shall be investigated and remedied as soon as practicable following the inspection and reasonable actions shall be taken to avoid any re-occurrence.

The Ridgeburn representative should be a person who is not normally based at the WWTP. If a representative who is not based at the WWTP is unavailable, an operator may undertake the observations at the start of their shift prior to becoming desensitised by any on site odour.

3.4 Maintenance

3.4.1 Routine and Planned Maintenance

The plant uses a computer software maintenance management system which creates work orders and tracks progress for various maintenance activities. The system is used to schedule and plan all maintenance and operational activities across the site. This system provides a schedule of planned work and identifies all the tasks and the frequency each task is completed.

Planned maintenance and specialist work that does not require additional input from external specialists is provided by the in-house maintenance technicians and contractors.

3.4.2 Non-Routine Maintenance

If there is an issue in the plant that needs to be taken care of via non-routine maintenance as highlighted during regular inspection, the operator will immediately notify the Wastewater Treatment Supervisor and generate a work order for it. All works shall be recorded in the operations incident log. The Wastewater Treatment Supervisor needs to sign off all maintenance (routine and non-routine) work orders before they can be marked as completed.

For any emergency works required, the Ridgeburn Wastewater Treatment Supervisor shall be alerted immediately (see contact details in Section 3.6).

3.4.3 Critical Spares

To deal with plant malfunctions in a timely manner and maintain the normal operation of the plant, critical spares are to be kept on-site.

All pumps and blowers will be in duty/standby mode or duty/duty/standby mode, meaning there is always one installed spare unit in the event of breakdown. All pumps and blowers have essential spares on site.

The dewatering centrifuge will have essential spares on site to enable the centrifuge to be repaired quickly.

3.4.4 Redundancy

Section 2.3.1 outlines the system redundancy for the WWTP.

3.5 Training

Staff training is also an integral part for the plants contingency planning. The operators of the plant are trained by existing experienced WWTP operators to competently perform duties. This enables the operators to have the ability to respond to any incidents in the plant as expected. Ridgeburn's learning framework includes the following:

- Induction
- On-line learning modules
- Competency-based learning
- Compliance training
- On-the-job training
- Role-specific training (external and internal)

All technicians are trained at minimum to NZQA Level 4 wastewater site technician. The Wastewater Treatment Supervisor is trained to level 5 Diploma.

The plant keeps a site risk register which records the risks identified in the plant and the corresponding control measures for staff to refer to. Identified odour related risks per treatment stage and their corresponding mitigation measures are listed in Section 2.0.

In addition to the in-house on-the-job training, staff are provided with continuous health and safety training as well as any other skills required or refreshers.

3.6 Complaints Procedure

Complaints to the Ridgeburn wastewater treatment plant can be sent to the Wastewater Treatment Supervisor: XXXX

Phone: (+64) XX XXX XXXX

Email: xxxx@xxxx.xxx

The Wastewater Treatment Supervisor contact number operates 24/7. Complaints can be directly forwarded to them, in particular if the complaint is urgent or happened after office hours.

When a complaint is received, the following information will be recorded:

- Name
- Contact details of the customer
- Nature of the complaint
- Date and time
- Location

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Complaints shall be actioned within 24 hours upon receipt, and the records shall be written into the plant's operational incident log.

For odour complaints, the WWTP operations team will do an odour survey on the site as soon as possible. A copy of the odour survey form can be found in Appendix 1.

Odour complaints will be forwarded to the Otago Regional Council.

3.7 Record Keeping

The operators as a part of their daily duties keep a daily operational record of notable events happening in the treatment plant. This allows operators to correlate any odour complaints receipted with abnormal operation or incidents around the WWTP and provides discussion and learning opportunities to mitigate re-occurrence in the future.

An operations incident log for the plant's operation records the following:

- Date and time of the incident
- Contact details of any customer or stakeholder involved
- Incident Description
- Possible consequence of the incident whether it affects the assets, environment and/or health and safety
- Priority of the incident
- Description of operators response to the incident
- Date and time of response
- Description of the resolution
- Parties being notified
- Form of notification
- Details of the notification

If an event caused a breach of resource consent or was a health and safety incident, the operator provides an incident notification. The notification contains the details of the incident. Regional council shall be notified as soon as practicable but within 24 hours of any non-routine issues or plant malfunction that has a potential risk of odour complaints, any unauthorised discharge, or any discharges of partially treated wastewater.

Any incident which is considered as a health and safety risk shall be communicated the to the members of the public as soon as possible.

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A follow up report detailing the investigation of the incident and any corrective actions that will be or have been undertaken. Incident reports related to resource consent breaches are submitted to Otago Regional Council.

4.0 Review Requirements

Any amendment to this odour management plan will be triggered by the following:

1. Consent requirement.
2. Amendment recommended by Ridgeburn operations teams following incident learnings.
3. Amendment recommended by Otago Regional Council.
4. Any changes in the operation of the plant

Any updates must be in accordance with the conditions of the WWTP odour discharge consent XXXXX.

Otago Regional Council will review and approve any amendments regarding this document.

Appendix A: Odour Survey Form

Name:	Location of observations
Month:	

Date	Time	Odour event duration (hours/mins)	Continuity of the odour for this event (tick one)				**Character of odour** (Codes 1–40, see over and use all that apply)	Likely source of odour	Intensity (0–6, see over)	Description of effect odour has on you	Wind direction (see over)	Wind strength (Codes 0–7, see over)	Additional comments?
			Contin-uous	Most of the time	<50% of the time	Intermittent							

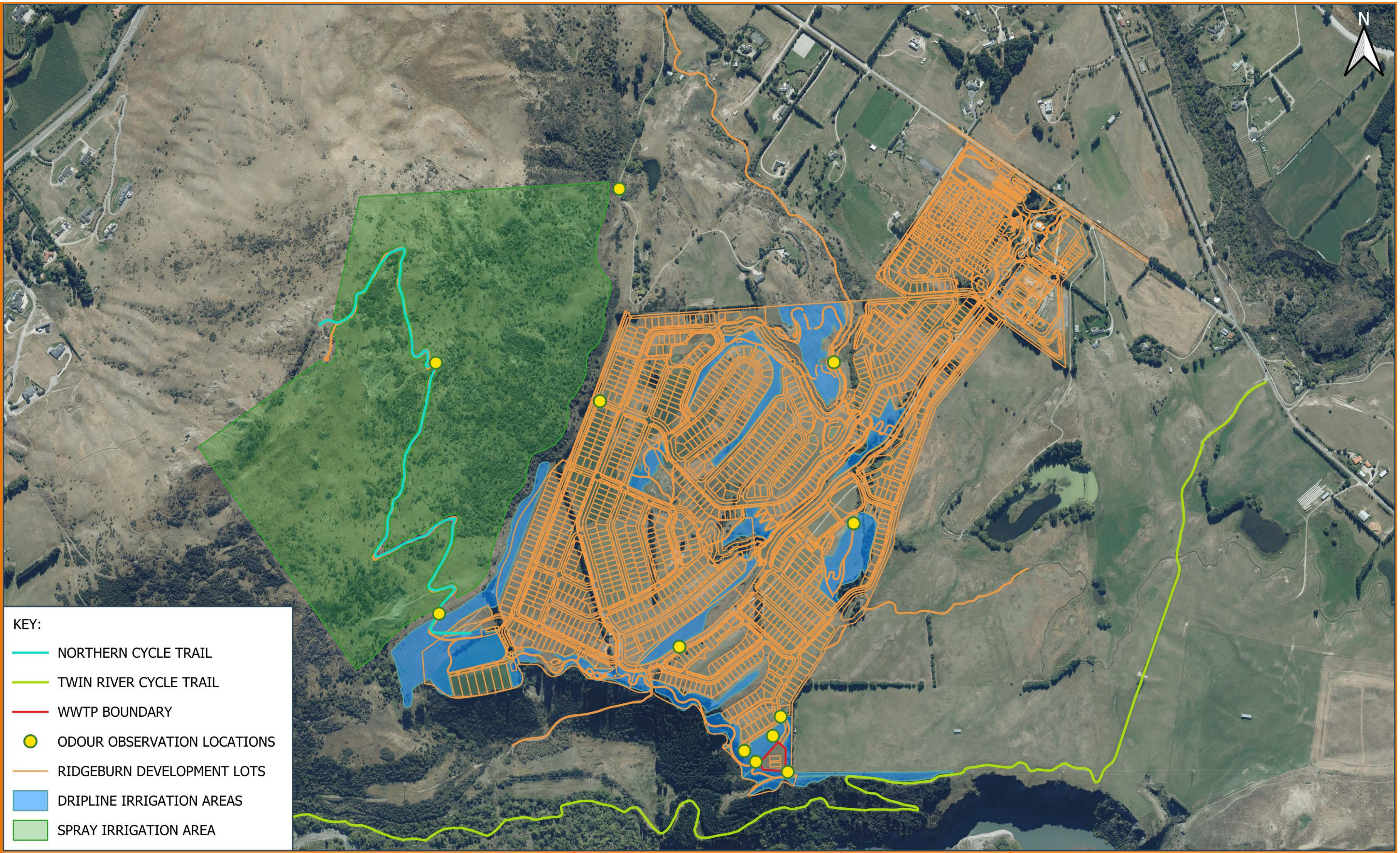
ODOUR DIARY REFERENCE SHEET

Odour character descriptors	
Code	Descriptor
1	Fragrant
2	Perfumy
3	Sweet
4	Fruity
5	Bakery (fresh bread)
6	Coffee-like
7	Spicy
8	Meaty (cooked)
9	Sea/marine
10	Herbal, green, cut grass
11	Bark-like
12	Woody, resinous
13	Medicinal
14	Burnt, smoky
15	Soapy
16	Garlic, onion
17	Cooked vegetables
18	Chemical
19	Etherish, anaesthetic
20	Sour, acrid, vinegar
21	Like blood, raw meat
22	Rubbish
23	Compost
24	Silage
25	Sickening
26	Musty, earthy, mouldy
27	Sharp, pungent, acid
28	Metallic
29	Tar-like
30	Oily, fatty
31	Like gasoline, solvent
32	Fishy
33	Putrid, foul, decayed
34	Paint-like
35	Rancid
36	Sulphur smelling
37	Dead animal
38	Faecal (like manure)
39	Sewer odour
40	Other – please describe

Scale of odour intensity	
No.	Intensity
6	Extremely strong
5	Very strong
4	Strong
3	Distinct
2	Weak
1	Very weak
0	No odour

Land Beaufort wind scale		
B. No.	Description	How to recognise
0	Calm	Smoke rises straight up
1	Light air	Smoke drifts
2	Light breeze	Wind felt on face; leaves rustle
3	Gentle breeze	Flags flap; twigs move all the time
4	Moderate breeze	Papers blow; small branches move
5	Fresh breeze	Small trees sway
6	Strong breeze	Large branches move, wind whistles
7	Near gale	Whole trees sway

Appendix B: Odour Observation Locations



V:\T02000-T02100\T02024_Morven_Ferry_Development\T020240001_Odour_Assess\007_Work\Base _Data\GIS\QGIS Project\Morven Ferry WWTP.qgz

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FIGURE 1: ODOUR SURVEY LOCATIONS

C056990001 RIDGEBURN WASTEWATER TREATMENT PLANT AIR DISCHARGE ASSESSMENT

NOTES:
1. AERIAL IMAGERY SOURCED FROM THE LINZ DATA SERVICE [https://data.linz.govt.nz] AND LICENCED BY LINZ FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 INTERNATIONAL LICENCE.

0 250 500 m
METRES (A4)
SCALE : 1:12,000

REVISION: 01 | DATE: JAN 26 | BY: LG
CLIENT: RIDGEBURN LIMITED