# Apex Water Limited

Unit B1
570 Mount Wellington Highway
Mount Wellington

Technical assessment of discharges to air from proposed wastewater treatment plant – Milldale, Ōrewa

**Report** 24464
**Report date** 26/03/2025

+64 9 912 1387
enquiries@airmatters.co.nz
587b Mount Eden Rd, Mount Eden
PO Box 96 256, Balmoral 1342, Auckland, NZ
**airmatters.co.nz**

Report prepared for Apex Water Limited by Air Matters Limited.

**Report written by:**

**Nigel Goodhue**
Senior Air Quality Consultant

**Report peer reviewed by:**

**Robert Murray**
Principal Air Quality Consultant



## Document History

| No | Version | Amendments made | Issue Date |
|---|---|---|---|
| 1 | Draft | Internal Review | 14/01/2025 |
| 2 | Draft | Client Review | 17/01/2025 |
| 3 | Final Draft | Updated drawing / consent requirements added | 7/02/2025 |
| 4 | FINAL | Incorporating client's review | 13/02/2025 |
| 5 | FINAL | Updated to include RO and statement of qualifications and experience. | 24/02/2025 |
| 6 | FINAL | Appended draft OMP | 26/03/2025 |

# Table of Contents

# Terms and Abbreviations

| Terms & Abbreviations | Explanation |
|---|---|
| **WWTP** | Wastewater Treatment Plant |
| **AB-WWTP** | Army Bay Wastewater Treatment Plant |
| **IPS** | Inlet Pump Station |
| **MBR** | Membrane Bioreactors |
| **UV** | Ultraviolet |
| **WAS** | Waste Activated Sludge |
| **$H_2S$** | Hydrogen Sulphide |
| **MfE** | Ministry for the Environment |

# Statement of Qualifications and Experience

I am a Senior Air Quality Consultant at Air Matters Limited (AML). AML is a consultancy specialising in assessing the effects of activities on air quality for the protection of human health and the environment. I have been employed at AML since June 2022.

My highest qualification is a Master of Science Degree with First Class Honours from the University of Waikato which I gained in 2007. I am a member of the Clean Air Society of Australia and New Zealand (CASANZ).

I have over 9 years direct experience in assessing, managing & consenting air quality. During my employment at AML my experience has included reporting of air quality assessments for a wide range of industrial processes including the effects of odour from municipal wastewater treatment plants.

I confirm that, in my capacity as author of this report, I have read and abide by the Environment Court of New Zealand's Code of Conduct for Expert Witnesses Practice Note 2023.

# 1. Introduction

## 1.1 Overview

Apex Water Ltd have engaged Air Matters Ltd to undertake a technical assessment of discharges to air from a proposed wastewater treatment plant (WWTP) in Milldale, near Ōrewa for a new residential subdivision. Apex is currently engaged by the developer to commence the design of a WWTP.

An Assessment of Environmental Effects for the overall development of the WWTP will be completed by the developer; this report is intended to cover only the technical assessment for discharges to air. A resource consent application for the residential subdivision, which the WWTP will support, has been accepted on the newly legislated fast-track consent process and therefore a set of proposed consent conditions is also required.

Wastewater from the surrounding Milldale area is currently directed to the Army Bay Waste Water Treatment Plant (AB-WWTP) which receives municipal waste from the greater Hibiscus Coast area. Watercare, the owner and operator of the AB-WWTP, have advised developers that the AB-WWTP is nearing capacity and that new connections into the system after November 2024 may not be accepted[1] until planned upgrades are completed by 2031.

Based on this, the developer of Milldale subdivision is proposing to install and operate a WWTP to take and treat wastewater from up to 1,200 residential houses. The treatment plant will extract wastewater from a main sewer line, treat it to a high tertiary standard, and then discharge the treated effluent into the adjoining Waterloo Creek via a Land Contact Infiltration Basin. The proposed WWTP is intended to have an operational life span of up to 10 years to allow the upgrades to the AB-WWTP to be completed.

## 1.2 Site Location

The proposed WWTP is to be located on Lysnar Road in Milldale, within an existing and proposed residential development and to the west of Silverdale. Planning for the development began in 2017. Once complete, the development will incorporate 4,500 houses, a primary school, as well as commercial facilities. The proposed site of the WWTP is currently used as a laydown area with rural pasture to the north, east and west (zoned for future Urban Growth) and the current Milldale development stage to the South in shown in Figure 1. Further information of the surrounding land use in relation to air quality effects is provided in Section 4.4.

[1] https://www.watercare.co.nz/home/about-us/latest-news-and-media/plans-to-invest-500m-for-growing-hibiscus-coast-community


**Figure 1. Proposed location of the WWTP and the surrounding residential development.**

# 2. Process Description

## 2.1 Proposed WWTP design

The final design of the WWTP would be expected to incorporate similar treatment processes to those included in the indicative design. These processes can be generally grouped as the following:

- Raw sewage screening – removal of large solid and grit from the raw wastewater, and storage and handling of the solid waste.
- Secondary treatment – biological nutrient removal and membrane filtration using a 4-stage Bardenpho process and membrane aerated biofilm reactor;
- Tertiary treatment - Ultraviolet (UV) disinfection of the treated wastewater and Reverse Osmosis;
- Sludge Handling Facilities – including the thickening, dewatering and storage of the biomass (sludge) generated from secondary treatment process.

In the indicative design, as demonstrated in Figures 2 and 3, the raw wastewater enters the WWTP via a wet well flow receival sump before being transferred to sewage screening. Screen water is then treated through membrane biofilter modules including aeration and anoxic stages to remove nutrients. The treated water is then pumped to membrane filtrations which separate the suspended biomass (sludge) (produced from the biological processes) from the permeate (the clear, treated wastewater).

Return activated sludge (RAS) is to be directed back into the treatment process for further refining. Waste sludge (WAS) is then pumped to centrifuges for dewatering to further reduce their volume. The dewatered sludge is then stored in enclosed storage bins before being transported offsite for disposal.

Permeate is disinfected by ultraviolet (UV) light and further clarification is provided through a Reverse Osmosis treatment plant before being discharged. The proposed method of discharge is by trickle feed into Waterloo Creek via a Land Contact Infiltration Basin.

The WWTP is design as an ‘offtake’ from the main sewer line and therefore does not require the buffering of flows or emergency storage as the WWTP is fed a consistent flow via a pump station. Any unanticipated fault with the WWTP would result in the raw wastewater continuing past the WWTP to the AB-WWTP facility.

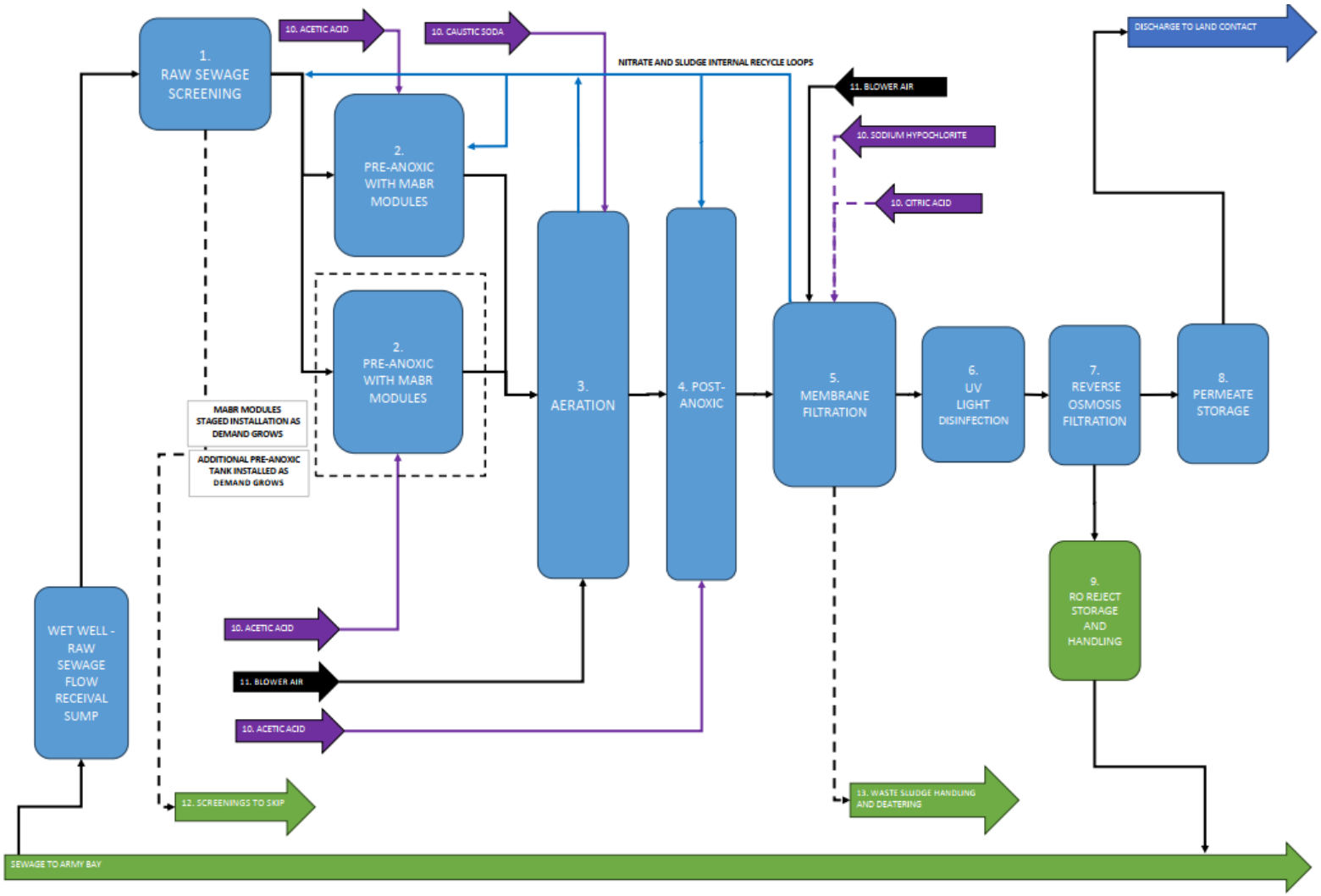


**Figure 2. Indicative design of the proposed WWTP.**

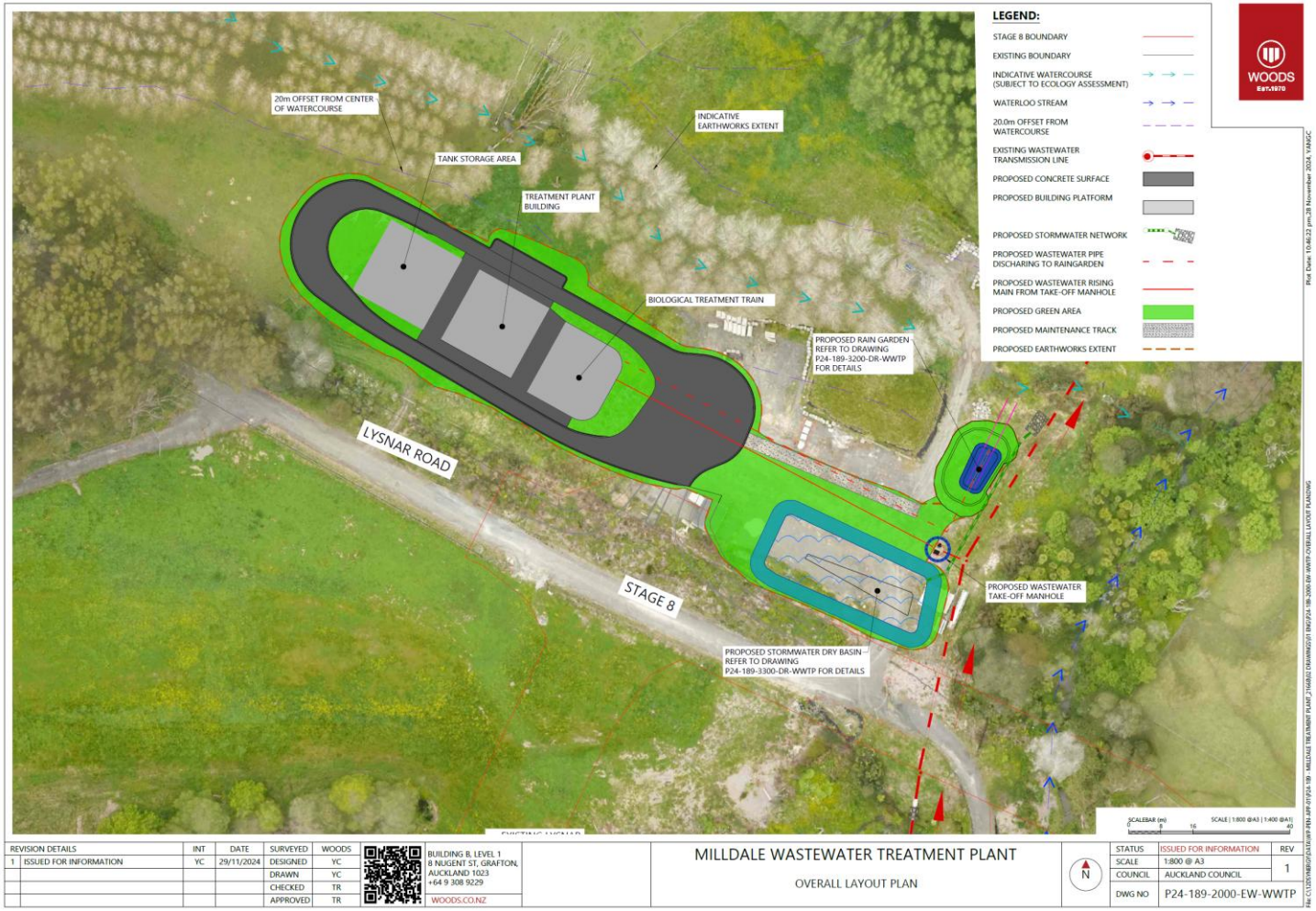


**Figure 3. Indicative ground layout of the proposed WWTP.**

## 2.2 Discharges to Air

The primary discharge to air from the wastewater treatment process will be odour. WWTP odours have the potential to be generated from the decomposition of organic material (e.g. carbohydrates, fats and proteins) present in the wastewater. High levels of odour may be generated when wastewater (or sludge) becomes oxygen depleted and anaerobic (septic) conditions become present. During anaerobic conditions, highly odorous compounds such as hydrogen sulphide ($H_2S$) are generated.

Odour generated by processing of wastewater will be made up of a complex range of organic compounds that are able to be detected by human olfaction (sense of smell). Health effects from individual compounds can occur if in elevated concentrations (for example $H_2S$), however based on Air Matters experience with WWTPs, concentrations of any compounds will be low and not result in any direct potential health effects. Consequently, this assessment is limited to the effects of odour from the proposed WWTP which are described in more detail in Section 5.

Dust may also be generated during the construction of the WWTP resulting in nuisance (soiling) or health related effects (finer dust). The level of dust generated is unlikely to be significantly different from that generated during the surrounding residential development. Furthermore, standard dust mitigations in place during the construction should limit the potential effects. As such, dust generation from the construction or on-going operation the WWTP have not been considered in this assessment.

## 2.3 Odour generation and mitigation

There will be a number of potential odour-generating sources from the WWTP which is summarised in Table 1 below along with a description of the proposed mitigation methods.

Table 1. Odour generating potential and mitigations for the proposed WWTP

| Process | Odour potential | Controls |
|---|---|---|
| Raw sewage wet well and screening | The intake screening process is a potential minor source of odour due to the fresh state of the influent. | • Odorous air from the intake screen and solids storage is to be extracted to an odour control unit (refer Section 2.4.1 & 2.4.2). Uncontrolled odour emission should be negligible during normal operations.<br>• Overloading of the screens and unplanned outages, which increase the release of odour, will be managed by having a second set of screens on standby.<br>• As the WWTP has the ability to stop accepting raw wastewater the risk of over loading can be rapidly avoided. |
| Secondary treatment<br>(Anoxic tanks) | Anoxic process is not inherently odorous. The anoxic tanks are not proposed to be enclosed and odour management is based on maintenance of anoxic conditions and avoiding anaerobic conditions. | • Ensure the tank remains in anoxic conditions and avoid anaerobic conditions. This will be achieved by effective mixing of the tank and aerobic control of influent based on real-time Oxidation Reduction Potential monitoring. |
| Secondary treatment<br>(Aerated/aerobic tanks) | The aerobic process is not inherently odorous provided that aerobic conditions are maintained. If anaerobic conditions develop the odour potential may increase. The aerobic tanks are not proposed to be enclosed or have air extracted and mitigation will rely on maintaining aerobic conditions. | • Mixing and aeriation will be automatically controlled based on dissolved oxygen concentrations;<br>• Blowers (supply air) will have a backup emergency power supply;<br>• Replacement blowers available onsite;<br>• Preventative maintenance; |
| Secondary treatment<br>(Secondary Anoxic tanks) | These tanks receive water from the aerated tanks and provide further nitrite removal. Influent not likely to be odorous. | • Same control as the anoxic balance tanks; |

| Process | Odour potential | Controls |
|---|---|---|
| Secondary treatment<br>(Membrane Filtration tanks) | Low potential to generate odour as receiving water is from the Secondary Anoxic tanks | • Wastewater within the membranes is cleaned using air ensuring the process remains aerobic at all times |
| Sludge (WAS) dewatering and storage | The odour associated with the dewatering plant has the potential to be moderate to high intensity with a character that is considered to be unpleasant. | • Dewatering process and storage area will be enclosed with the air extracted and treated (refer Section 2.4.1 & 2.4.2). |
| UV disinfection | Process is enclosed<br>The wastewater will have low odour potential (i.e. positive dissolved oxygen concentrations and low organic content). | • N/A |
| Reverse Osmosis | The wastewater will have low odour potential (i.e. positive dissolved oxygen concentrations and low organic content). | • N/A |
| Land Contact Infiltration Basin | The wastewater will have low odour potential (i.e. positive dissolved oxygen concentrations and low organic content) and be distributed into the ground quickly | • Management of effluent prior to discharge. |
| Emergency storage tanks | Not required for site | • N/A |

## 2.4 Mitigations

Mitigations employed to minimise the release of odour at the proposed WWTP are described in Table 1 and in summary include: ensuring aerobic/anoxic conditions are maintained through the process; process monitoring of key chemical/biological variables including oxygen levels; redundancy of key equipment on site; robust equipment maintenance and, extraction and treatment of potentially odorous air through the odour treatment system. A key mitigation to avoid the accumulation of potentially odorous raw wastewater on site is the ability to bypass raw wastewater to the AB-WWTP. Consequently, the WWTP design does not require any onsite flow buffering or emergency wastewater storage.

### 2.4.1 *Odour extraction*

The active air extraction system is a critical component of the odour management. It will draw odour-laden air from the processes with the highest potential to generate odour including raw influent screening, solids storage and the sludge dewatering and solids storage. Once installed and operational this should be checked to demonstrate negative pressure is maintained (under normal wind conditions) to ensure effective air extraction for each process.

The onsite back up electricity generators will supply power in the event of a power failure. Backup generation will be designed to enable operation of key WWTP odour mitigations including blowers, dosing systems and the odour extraction system.

### 2.4.2 *Carbon absorption beds*

Treatment/removal of odour is to be provided through extraction of air from the potential odour-generating areas as described in 2.4.1 above and directing the odour-laden air through activated carbon beds. To aid in odour removal the carbon bed will be impregnated with caustic soda. The volume of carbon will be designed to ensure that the airflow velocity through the bed is minimised to maximise odour absorption. Given the sensitivity of the receiving environment, it should be designed to ensure as high removal rates as practical. As moisture can interfere with absorption preheating of the extracted air flow will occur to reduce humidity levels.

The carbon media will become saturated overtime. Consequently, the media bed will require periodic changes prior to reaching saturation. The WWTP operator will undertake regular testing of the bed saturation.

### 2.4.3 *Acetic Acid tank*

The findings from the Meremere site odour survey (Section 5.2.2) highlighted that the Acetic Acid tank was a consistent source of low intensity odour at a distance of up to 45 m. For the Milldale WWTP Apex Water is proposing to direct the tank overflow through a lute pot (a water seal) and place a carbon filter on the vent to remove any odours.

# 3. Consent Requirements

## 3.1 Auckland Unitary Plan (AUP)

Table E14.4.1 (Rule A163) of the AUP states that Treatment of municipal wastewater (municipal wastewater treatment plants) is a Discretionary Activity in all air quality areas.

The proposed WWTP is designed to accept and treat municipal waste water from a new subdivision. As such the emissions to air, including odour, is a **Discretionary** activity.

Table E14.4.1 (Rule A48) of the AUP states that Emergency generators used for the purpose of generating electricity for premises during mains power unavailability (includes operation for the purpose of generator testing and maintenance) is a Permitted Activity.

The site will include an emergency generator which will meet the intent of Rule 48 and as such is a **Permitted** activity.

No other Rules in the AUP Chapter 14 Air Quality relate to the emissions to air from the operation of the WWTP.

## 3.2 National Environmental Standards

### 3.2.1 *National Environmental Standards for Air Quality Regulations 2004*

In 2004, five standards for ambient (outdoor) air quality were introduced in New Zealand under the Resource Management (National Environmental Standards Relating to Certain Air Pollutants, Dioxins and Other Toxics) Regulations 2004 (NESAQ).

The NESAQ includes specific provisions relating to a consent authorities' ability to grant resource consents for discharges to air of $PM_{10}$ (Regulation 17) and other contaminants (Regulations 20 and 21).

Regulation 17 ($PM_{10}$) is not relevant to the applicant's site as it is not located in a polluted Airshed and the operation of the WWTP is not likely to generate $PM_{10}$ emissions. Regulation 20 of the NESAQ applies to the discharge of carbon monoxide, oxides of nitrogen, and volatile organic compounds (VOCs). Regulation 20 sets out that an application must be declined if it is likely to cause the concentration of carbon monoxide, oxides of nitrogen or volatile organic compounds in the Airshed to breach its ambient air quality standard and is likely to be a principal source of that gas in the Airshed. Regulation 21 applies to the discharge of sulphur dioxide and states that an application must be declined if it is likely to cause the concentration of sulphide dioxide in the Airshed to breach its ambient air quality standards.

The operation of the onsite emergency generator will generate carbon monoxide and oxides of nitrogen emissions. However, the ambient air quality standards will not be exceeded as a result of its operation. The discharges to air from the WWTP are expected to contain negligible concentrations of $SO_2$ and VOC's.

Therefore, the NESAQ does not restrict the granting of this consent for discharges to air.

### 3.2.2 *National Environmental Standards for Greenhouse Gas Emissions from Industrial Process Heat Regulations 2023*

On 27 July 2023 National Environmental Standard for Greenhouse Gas Emissions from Industrial Process Heat ('Greenhouse NES') and the associated National Environmental Policy ('Greenhouse NEP') were introduced for fossil fuel burning equipment that produces industrial process heat. The objective is to reduce emissions of Greenhouse Gases (GHG) in order to mitigate climate change and its current and future adverse effects on the environment and the wellbeing of people and communities. The Greenhouse NES outlines the activity status of a GHG emission dependent on the type of fossil fuel used and annual volume of GHG's emitted.

With regards to the proposed WWTP the only potential GHG emissions from the combustion of fossil fuel will be from a diesel-fired back-up electricity generation device. Backup heat devices are specifically excluded from the regulations (Section 10(1)b) and therefore the Greenhouse NES does not need to be considered as part of this assessment.

# 4. Existing Environment

## 4.1 Topography

The wider Milldale development is located approximately 5 km from the Ōrewa coast on undulating hill terrain. The site of the WWTP has an elevation of 15 m above-sea-level and is adjacent to the Waterloo Creek which runs from south to north. Terrian rises to the east (towards SH1) and west (towards Wainui Rd) with a peak elevation increase of ~20 m in both directions. To the south, the site of the current Milldale development, the terrain rises gradually.

## 4.2 Meteorology

Air quality effects, particularly odour, can be exacerbated during certain meteorological conditions. In order to assess the potential air quality effects, it is important to understand local meteorology.

The nearest calibrated Automated Weather Station (AWS) relative to the WWTP site is located in Shakespear Regional Park, Whangaparāoa, approximately 16 km to the east of the proposed WWTP (referred to as SRP-AWS). Air Matters reviewed the data collected at this site during the two-year period 01 Jan 2020 to 31 Dec 2021.

Figure 4 shows a wind rose from SRP-AWS (97m above sea level) over the 2-year period and demonstrates the following characteristics:

- The most predominant and strongest winds are from the west (21 % of the time); the next most predominant winds are from the south-west (17%) followed by the north-east (15.3 %); these predominant wind directions are consistent with previous wind patterns reported for Northern regions of Auckland (NIWA, 2010).
- Calm conditions (<0.5 m/s) occurred for <0.1% which is reflective of the exposed coastal location of the meteorological station positioned on the Whangaparāoa Peninsula. The higher average wind speed of 5.5 m/s again is likely representative of the exposed coastal location.

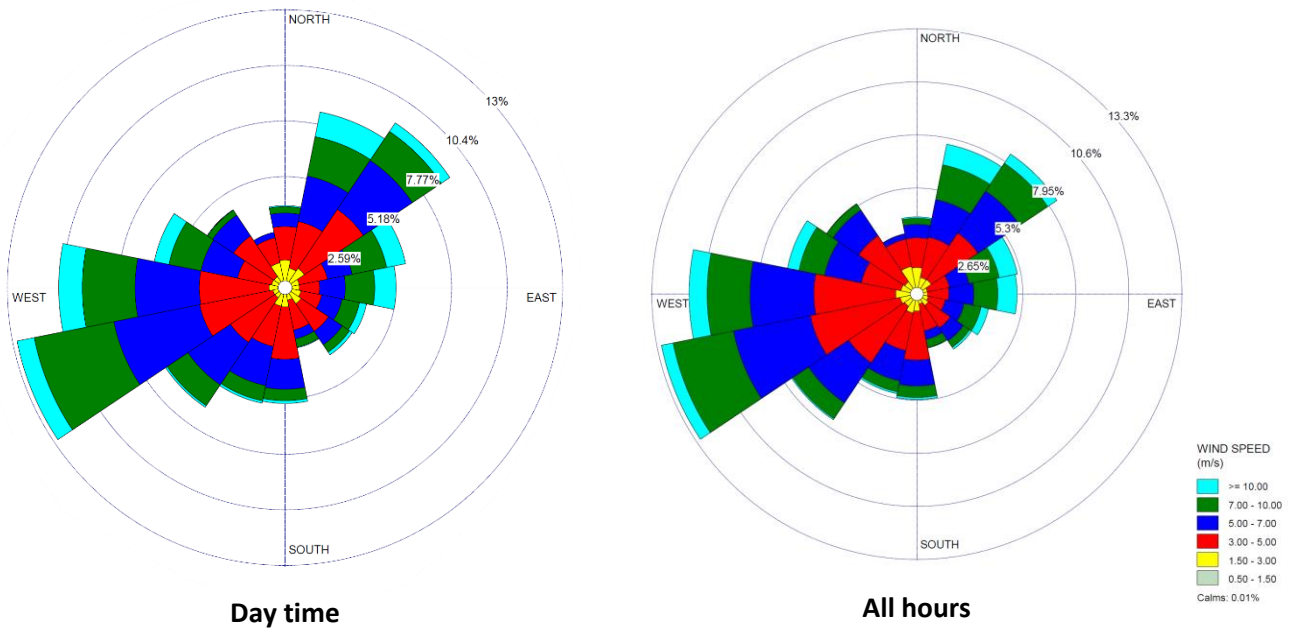


**Figure 4. Wind Rose 2020-2021 from Shakespear Regional Park, Whangaparāoa. LEFT daytime (6:00-10:00 pm) and RIGHT all hours.**

Wind conditions measured at the SRP-AWS are expected to be a good representation of the direction within the wider Ōrewa and Milldale area. Wind strength is likely to be overestimated in the SRP-AWS met record when compared to the proposed site of the WWTP which is 4.5 km inland and located within a slight depression.

Low wind speeds can result in reduced dispersion and exacerbate the effects of odour. A conservative allowance has been made in Section 5 based on the likely over representation of wind speeds at the SRP-AWS. The WWTP is also located in the base of a valley adjacent to Waterloo Creek. The surrounding rolling hills have the potential to create air drainage ('down valley flows') during evening periods on calm nights. Due to the limited scale of the valley (height and fetch) these drainage winds are expected to be very limited and the overarching regional winds are likely to be the dominant influence. Based on the review of this wind data the SRP-AWS is expected to be appropriate for undertaking an assessment of effects.

## 4.3 Background Air Quality

To understand the existing air quality in the area surrounding Milldale WWTP, Air Matters has completed a desktop study using available information and supplemented this with a site visit to review surrounding land use activities.

There are no other known consented air discharges within a one km radius of the proposed WWTP site. Service stations and fast-food restaurants are located within 1 km of the proposed WWTP within the Silverdale area. Given the separation distances, emissions from these sites are unlikely to impact on the same areas as the proposed WWTP.

Milldale is a residential development that will in time encircle the site of the proposed WWTP. Construction of the initial development to the south of the WWTP is currently underway and includes large scale civil works

and construction of residential houses. These activities are likely to generate elevated levels of dust emissions, but limited potential for odour.

Immediate surrounding land use to the north, east and west of the development is rural. Typical rural odours are likely common but intermittent including stock, silage, burn-offs and fertiliser spreading. There is not expected to be any significant additive effect of odour from the WWTP. Rural odours such as silage are the exception to this, however they are likely to be very intermittent or not occurring. These rural areas are zoned for future development, however the proposed WWTP is intended to be removed prior this development occurring.

In summary the area surrounding the site is expected to have good air quality, characterised by rural odours and possibly occasional dust from construction of the residual development at time. Given the proposed life of the WWTP (10 years) and the expansion of Milldale, it is likely that odour associated with rural activities will decrease as more residential development occurs.

### 4.4 Sensitive Activities (Receptors)

When assessing air discharges, the sensitivity of the environment must be taken into account, and should be considered as part of any odour assessment. When assessing air discharges, sensitivity is based on characteristics of the land use, including the time of day and the reason people are at the particular location. Other factors that may determine whether an offensive or objectionable effect from an odour emission is likely to occur are the presence of background odours (Section 3.3), aspects influencing perception, and the mental and physical state of the affected person.

Ministry for the Environment (MfE) (2016) guideline recommends the use of district planning maps as these zones are based on controlling adverse effects on amenity, which aligns with odour effects.

Typical activities that have a high sensitivity to odours include (MfE, 2016):

- Residential properties (including rural residential);
- Hospitals, schools, childcare facilities, rest homes and marae;
- Public outdoor locations (e.g. parks, reserves, sports fields, beaches).
- Tourist, cultural, conservation
- Some commercial and retail businesses

Figure 5 and Table 2 illustrate the identified sensitive receptors surrounding the WWTP. This is based on zoning from the Auckland Unitary Plan along with specific high-sensitivity activities within low sensitive zones (dwellings in rural zoned areas) within close proximity of the WWTP.

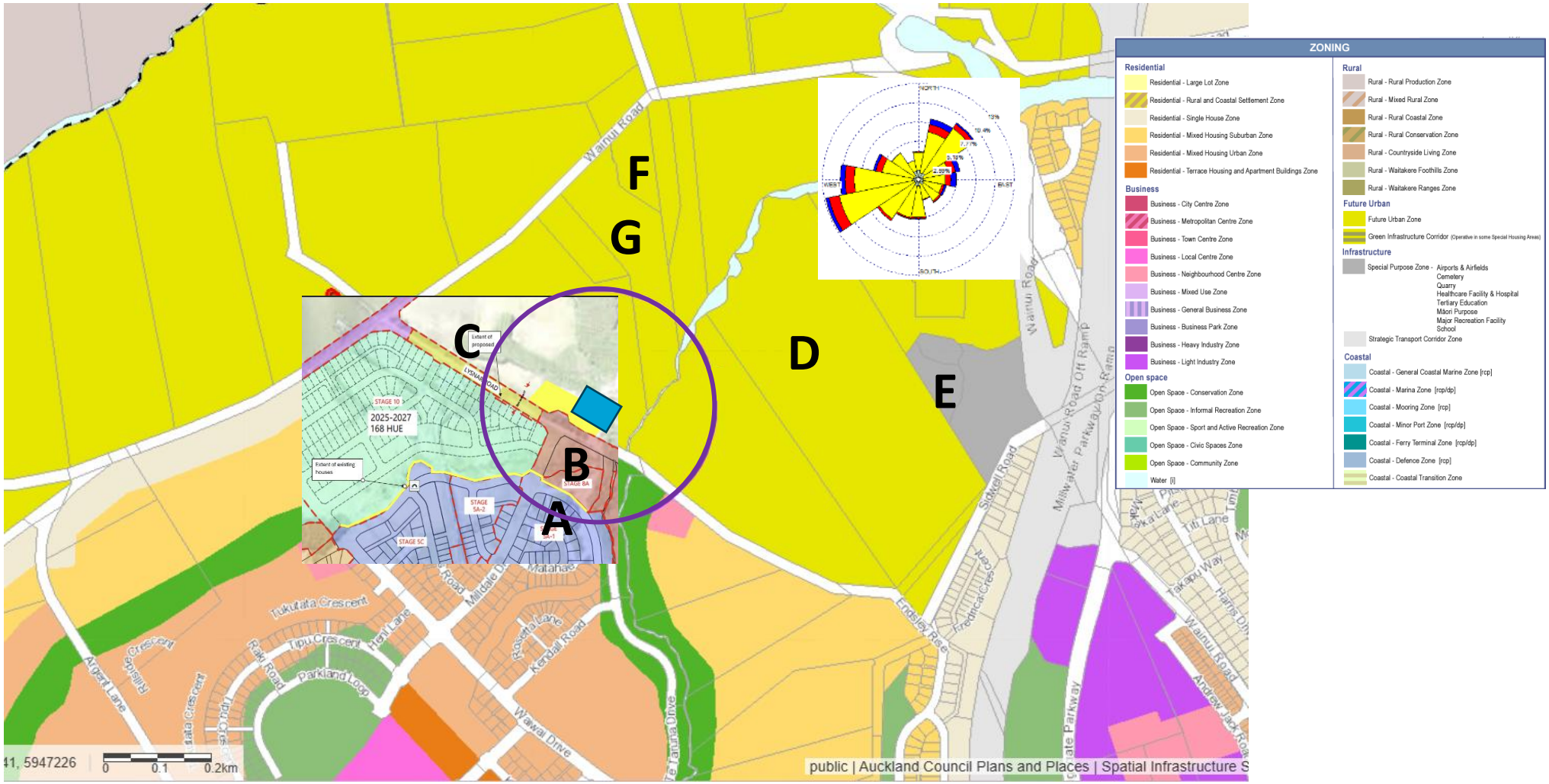


**Figure 5. Auckland Council's District Plan zones surrounding the WWTP (blue box). Locations sensitive to potential odour effects are identified (A-G) and detailed in Table 2. Purple circle represents a 200m radius from the centre of the proposed WWTP (The relevance of this 200 m distances is discussed in more detail under Section 4). A windrose illustrating the wind patterns for the area is also included.**

Table 2. Receptors sensitive to potential odour effects surrounding the WWTP (refer Figure 5 for locations). Bold locations identify those properties at higher risk to odour effects (discussed further in Section 4).

| ID | Area / address | Zoning+ | Direction from WWTP | Distance (m) |
|---|---|---|---|---|
| **A** | **285-295 Te Taruna Drive** | **Residential – Mix housing Urban** | **South – south-east** | **180+** |
| **B** | **Stage 8a / Stage 10 (S-E of Lynsar Road)** | **Open Space Conservation*** | **South – south-east** | **45+** |
| C | 16 Lynsar Road | Future Urban Zone | North-west | 240 |
| D | 36 Sidwell Road | Future Urban Zone | North-east | 360 |
| E | Meraki Montessori Primary School | Special Purpose | North-east | 660 |
| F | Fantails Childcare - Country | Future Urban Zone | North | 460 |
| G | 427 Wainui Road | Future Urban Zone | North | 310 |

* Presumed to be rezoned residential for proposed development;
+ https://unitaryplanmaps.aucklandcouncil.govt.nz/upviewer/ accessed on 18 January 2025.

Receptor A and B have been identified as Sensitive Receptors located within 200 m of the proposed WWTP site. Beyond these receptors in a general southerly direction is the Milldale development. This subdivision is of residential nature and is also considered sensitive to the effects of odour in accordance with the MfE-Industry GPG (2016).

Future subdivisions to the North of Lysnar Road in the area zoned as 'Future Urban Zone' (refer Figure 5) have not been considered, in this assessment, to form part of the existing environment. This is based on no current consent application for a subdivision within these areas. Notwithstanding this, given the temporary nature of the WWTP (up to 10 years) it is expected that the WWTP will be removed prior to the completion of any subdivision in this area.

# 5. Assessment of Effects

## 5.1 Potential effects of odour

Odour is perceived by our brains in response to chemicals present in the air we breathe. Humans have a sensitive sense of smell and can detect odour even when chemicals are present in very, very low concentrations. Given that odour is a human perception, it is extremely difficult to measure an odour using a chemical, mechanical or electronic apparatus as is possible for other nuisance effects such as noise and light. At present, assessment by human nose is the most reliable method for determining an odour (MfE, 2016). In the context of undertaking an assessment, odour can be described in two ways:

- Acute - high-intensity and/or highly unpleasant odours occurring infrequently or for short periods (a few minutes to an hour);
- Chronic - low-intensity and/or moderately unpleasant odours occurring frequently or continuously over a long period.

The concept of acute and chronic odour is discussed throughout this assessment.

People have reported effects of odour that include nausea, headaches, retching, difficulty breathing, frustration, annoyance, depression, stress, tearfulness, reduced appetite, being woken in the night, and embarrassment. All of these can contribute to a reduced quality of life for the individuals who are exposed to the odour. People can develop physiological effects from odour even when their exposure is much lower than that typically required to cause direct health effects. This effect is sometimes termed 'odour worry' and is due to effects brought on by stress or the perception that if there is a smell it must be doing physical harm (MfE, 2016).

## 5.2 Screening level Assessment

### 5.2.1 *Separation distance*

The initial screening assessment is based on the separation distance between sensitive receptors and the proposed WWTP. By having a suitable separation distance, odour emissions can be dispersed and diluted to such an extent that their effects at sensitive locations are minimised to an acceptable level.

Separation distance guidelines are not intended to be used as a pass/fail test, rather as a trigger for more detailed assessment for a particular site. MfE (2016) notes that relevant separation distances should be considered when assessing odorous discharges to air to address unintended or accidental releases, and/or effects that cannot be internalised even with adoption of the best practicable option. Site specific factors which may influence discharge rates and how they are dispersed, for example terrain, are not taken into account in separation distances.

Environment Protection Authority Victoria publishes a 'recommended separation distances for industrial residual air emissions' (EPA Victoria, 2024). In New Zealand these guidelines have been extensively used and are accepted as appropriate separation distances.

In accordance with the EPA Victoria (2013) guidelines, a separation distance of 160 m from the WWTP to sensitive receptors would be applicable in this instance based on a mechanical/biological wastewater plant serving a population of 3,600 residents[2]. To provide a buffer for the proposed WWTP, a screening level separation distance of 200m has been adopted.

Separation distances have been calculated based on the distance to a neighbouring dwelling (as opposed to the property boundary). This is referred to as Method 2 'the rural method' in EPA Victoria (2013) and is appropriate for this assessment where some properties are on rural / lifestyle blocks. A central position within the proposed WWTP has been used to define the onsite location. The extent of the 200 m buffer is detailed on Figure 5 (purple circle).

Taking into account the location of sensitive receptors as described in Table 2, two of the Sensitive Receptor dwellings (A&B) are within 200 m of the proposed WWTP. These locations are shown in bold in Table 2.

- **Location A** represents an existing housing development on the northern extent of the existing Milldale subdivision. There are ~9 residential dwellings that are located within the 200 m separation distance between Matahae Cresent and Te Taranu Drive (refer Figure 5).
- **Location B** represents a number of potential dwellings as part of future Milldale developments (Stage 8a / Stage 10) between the WWTP and the existing houses (Location A). These future developments are located between 45-180 m from the site of the proposed WWTP. The total number of dwellings represented by Receptor B is not currently defined. But based on the preliminary design there is estimated to be 30-40 house with the 200 m separation area.

### 5.2.2 *Comparable WWTPs*

APEX have designed and commissioned multiple WWTP of similar design and capacity as that proposed for Milldale. Air Matters visited one of these WWTP (commissioned in 2022) located in Meremere which receives and treats municipal wastewater from the township of Meremere. Air Matters undertook an odour survey at the Meremere WWTP on 16 January with the aim of the survey to ascertain the potential for odour to be generated. The Meremere WWTP does not include the capture and treatment of odour laden air from the inlet screening/storage or WAS dewatering/storage.

The survey findings (Appendix B) concluded that odour associated with the inlet screening/WAS and acidic acid storage was detectable at a distance of 45 m from the WWTP. The intensity of the odour at 45 m was described as 'weak' and the frequency was intermittent (in accordance with the MfE 2016 guidance).

Based on this survey results it is recommended for the proposed Milldale WWTP:

- The inlet screening/storage and WAS dewatering/solids storage should include active capture and treatment of air to minimise the release of odour (as is currently proposed - refer Section 2.4.1 – 2.4.2);
- Mitigations should be put in place to minimise the generation of odour from the acetic acid tank (as is currently proposed - refer Section 2.4.3);

[2] Based on 1,200 dwellings with an average occupancy of three persons.

## 5.3 FIDOL Assessment

In New Zealand a recognised qualitative approach to evaluate the likelihood of odour giving rise to 'offensive or objectionable odour effects' is based on an evaluation of the FIDOL factors. The FIDOL factors are described in the MfE GPG-Ododur (2016) and in summary are:

**Table 3 FIDOL assessment factors (MfE, 2016)**

| Factor | Description |
|---|---|
| Frequency | How often an individual is exposed to the odour |
| Intensity | The strength of the odour |
| Duration | The length of exposure |
| Offensiveness | 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 |

These factors have been applied to the potential odour emissions from the proposed WWTP and discussed in Section 5.3.1 below. As noted above, locations within 200 m buffer are the primary focus of the FIDOL assessment, however other locations outside of this zone are also discussed where relevant.

### 5.3.1 *Frequency*

Frequency relates to how often odours will be experienced at a receptor. The frequency at which odour could be detected at a receptor will be a combination of the occurrence of the odour emission and certain meteorological conditions, such as wind direction and speed.

Worst-case dispersion conditions for odour emitted from any WWTP typically occur during low wind speed (<1.5 m/s) and highly stable atmospheric conditions. A threshold of 1.5 meters per second (~5 km/h) is often employed, however given the underestimate of calmer periods from the SRP-AWS, Air Matters considers an increased threshold (3 m/s) is more appropriate for this assessment to define 'low wind speeds'.

The higher risk sensitive receptors (A&B) are located to the south/south-east of the proposed WWTP. Winds from the north/north-east therefore have the potential to result in odorous emissions from the proposed WWTP being dispersed onto these locations. Based on analysis of data from the SRP-AWS winds from these directions are defined in Table 4.2.

The maximum percentage of time wind could carry odour from the temporary WWTP towards an individual dwelling at Receptor A or B is **9.2% (all wind conditions)** and **1.3% (low wind speeds).** Receptors 'A' & 'B' represent a number of dwellings (refer Figure 5) and therefore these percentages are based on the maximum

frequency that any individual dwelling may experience an odour and not the cumulative[3] effects of all wind directions towards Receptors 'A' & 'B'.

Given the short separation distance to future dwellings at Receptor B, it is possible that odour generated from the proposed WWTP would be detectable, at this location, when wind speeds are above the 'low wind speed' threshold.

**Table 4. Wind direction frequency analysis.**

| Direction | % of time (all wind speeds) | % of time (low wind speeds) | Sensitive Receptors in downwind direction (within 200m) |
|---|---|---|---|
| N | 3.8 | **1.3** | A&B |
| NNE | 8.3 | 0.9 | |
| NE | **9.2** | 1.1 | |
| ENE | 5.7 | 0.7 | |
| E | 5.2 | 0.7 | |
| ESE | 3.9 | 0.8 | |
| SE | 3.8 | 0.9 | |
| SSE | 2.8 | 0.6 | |
| S | 5.4 | 0.9 | |
| SSW | 5.5 | 0.9 | |
| SW | 6.7 | 0.6 | |
| WSW | 12.7 | 0.6 | |
| W | 10.5 | 0.7 | |
| WNW | 6.2 | 0.6 | |
| NW | 4.3 | 0.6 | A&B |
| NNW | 2.6 | 1.2 | |

Based on the design of the replacement WWTP, odours that would be capable of being offensive at the boundary are not expected to be emitted under normal operations. Potentially higher odour emitting events will be limited to infrequent upset and abnormal operations (acute events) which are discussed in more detail in the following section 'Intensity' and 'Duration'. To support this, the odour survey carried out at the equivalent Meremere WWTP (Appendix B) only identified wastewater odours out to 45m from the WWTP relating to the inlet screening/WAS storage which is proposed to be fully mitigated via air extraction and treatment at the Milldale development and is currently undertaken at the Meremere WWTP.

The expected absence of chronic odour and rare occurrence of acute odour generating events at the WWTP will limit the potential for offsite odour at Sensitive Receptors. Frequency of any odour events, will be further

[3] When taking into account all wind directions that may blow towards any receptor at location A or B the cumulative percentage increases to 39.1% (all wind speeds) and 6.5% (low wind speeds).

limited by wind conditions towards high-risk sensitive locations (which occur for a maximum of 10% of the time).

### 5.3.2 *Intensity*

The intensity of odour at a receptor depends on emission strength at the source and the separation distance between the source and receptor.

Odour associated with the operation of a WWTP can have a strong intensity. For the proposed WWTP under normal operations it is expected that odour would have no discernible intensity at the boundary based on the small scale of the plant and the extensive mitigation methods deployed.

Abnormal acute discharges, if to occur, would be a cause of increased odour intensity, for example if wastewater were to turn anaerobic following WWTP failure. Abnormal discharges that result in unacceptable odours, are not expected to occur based on the mitigations in place as described in Section 2.3-2.4.

The odour survey carried out at the equivalent Meremere WWTP (Appendix B) only identified weak wastewater odours out to 45m from the WWTP relating to the inlet screening/WAS storage which is proposed to be fully mitigated via air extraction and treatment at the Milldale development.

**The proposed WWTP has the potential to create elevated intensity odours under abnormal conditions, however these are not expected to occur based on the employed mitigations.**

### 5.3.3 *Duration*

The duration that a receptor may be exposed to odour depends on the amount of time the wind blows in a specific direction, along with the duration that the odorous activity occurs. Duration of wind is covered above and, in summary, acute or chronic odour from the WWTP activities could affect high risk sensitive receptors for up to 9.2% of the time.

Wastewater treatment plants may have extended and more consistent elevated odour during plant failures and emergency situations. During these upset or unanticipated events, the increased odour may last for periods of hours to days. However, based on the mitigations employed including the ability to stop receiving wastewater (refer Section 2.4) the duration of any upset or abnormal conditions will be very low.

**The duration of rare odour generating events during upset or abnormal conditions has the potential to last for periods of minutes to hours. Duration of the effects on nearby sensitive receptors will be further limited by the wind direction.**

### 5.3.4 *Offensiveness*

As described in Section 2.2 odour associated with the processing of wastewater has an elevated potential to be offensive at sensitive locations.

### 5.3.5 *Location*

Location is possibly the most important of the factors, due to the fact that even if odours are generated there is little potential for effect if there are no sensitive receptors located downwind of the source. There are a number of existing and proposed sensitive receptors located within proximity of the WWTP that may be affected by odours if present. In particular these are Receptors to the south and south-east (refer Figure 3 and Table 3 for details) located between 50-200m of the proposed WWTP.

**The proposed WWTP has a short separation distance to sensitive residential locations to the south / south-east. The location in relation to sensitive receptors to all other directions is suitable.**

### 5.3.6 *FIDOL Conclusion*

Taking into account the Offensiveness and Location, Air Matters considers that odours from the WWTP have the potential to result in offensive or objectionable effects at sensitive locations A&B. This conclusion is based on the characteristics of WWTP odours and the small separation distance to residential dwellings to the south and south-west which are in one of the predominant downwind directions.

The frequency, intensity and duration of emitted odour is expected to be very low based on the design of the proposed WWTP and employed mitigation measures. Based on this, the odour experienced at any sensitive receptors is considered to be acceptable.

The WWTP design will incorporate best practical options (BPO) for minimising the generation of acute high intensity odour events. A focus on meeting BPO should continue throughout the detailed WWTP design phases.

# 6. Conclusion

The proposed WWTP is intended as a temporary solution (up to 10 years) to service 1,200 residential dwellings as part of the Milldale development. The WWTP is designed to extract raw effluent from an existing sewer line and treat it to a high standard before discharging it into Waterloo Creek via a Land Contact Infiltration Basin.

The proposed WWTP is based on a 4-stage Bardenpho membrane aerated biofilm reactor treatment principle and includes primary, secondary and tertiary treatment stages. Mitigations to minimise odour will include ensuring aerobic/anoxic conditions are maintained, process monitoring of key chemical/biological variables including oxygen levels, redundancy of key equipment on site, robust equipment maintenance and, extraction and treatment of potentially odorous air through the odour treatment system. Based on the employed mitigations the treatment plant is considered to meet the best practical option for eliminating and minimising odour.

A screening level assessment that considered the appropriate separation distances and the type of surrounding land use was undertaken. This assessment identified two sensitive receptors to the south of the WWTP that could be affected by odours if they cannot be effectively controlled at their source. The identified receptors are an existing residential area and proposed residential development representing up to 50 dwellings.

A detailed FIDOL assessment, in accordance with the MfE GPD-Odour was undertaken focusing on the sensitive receptors. In summary, it was identified that during times of odour generation these receptors could experience an elevated exposure to odour due to their position to the prevailing wind direction and small separation distance. However based on the modern plant design and odour mitigations employed, the generation of odour from the WWTP, beyond the site boundary, is not expected to occur. This is supported, subject to the proposed mitigations, by odour survey of the Meremere WWTP.

During abnormal or upset conditions WWTP's can generate elevated chronic odour. Based on the design of plant including the employed redundancies these chronic higher-intensity odours are not expected to occur.

Based on this assessment and the design of the WWTP, the potential effects on amenity values on the surrounding land use are considered to be acceptable and remain less than minor for the duration of the consent. A set of proposed consent conditions have been included to ensure any effects can continue to be controlled to an acceptable level.

# 7. References

**Ministry for the Environment. (2016)**: Good Practice Guide for Assessing Discharges to Air from Industry. Wellington: Ministry for the Environment.

**Ministry for the Environment. (2016)**: Good Practice Guide for Assessing Odour. Wellington: Ministry for the Environment.

**Victoria Environmental Protection Agency (2024):** 1518: Recommended Separation Distances for Industrial Residual Air Emissions – Guideline.

# Appendix A Proposed Consent Conditions

**General conditions**

1. [Activity to be undertaken in accordance with the plans, including the AEE]

2. Under section 125 of the RMA, this consent lapses five years after the date it is granted unless:

   a. The consent is given effect to; or
   b. The council extends the period after which the consent lapses.

3. Air discharge consent number [XX] expires 10 years after the consent is issued unless it has lapsed, been surrendered or been cancelled at an earlier date pursuant to the RMA.

4. The consent holder must pay the council an initial consent compliance monitoring charge of $[XX] inclusive of GST, plus any further monitoring charge or charges to recover the actual and reasonable costs incurred to ensure compliance with the conditions attached to this consent.

5. Access to the relevant parts of the property must be maintained and be available at all reasonable times to enable the servants or agents of the council to carry out inspections, surveys, investigations, tests, measurements or take samples whilst adhering to the consent holder's health and safety policy.

**Limit Conditions: Air Discharges**

6. All processes associated with the wastewater treatment plant (WWTP) must be operated, maintained, supervised, monitored and controlled in accordance with the Air Quality Management Plan certified in accordance with Condition [X] to ensure that all emissions authorised by this consent are maintained at the minimum practicable level..

7. Discharges of contaminants into air from the WWTP must not cause:

   a. Odour that are noxious, dangerous, offensive or objectionable effect beyond the boundary of the Site, in the opinion of an enforcement officer.
   b. Visible emissions (other than water vapour/steam or heat haze) that cause a dangerous, offensive or objectionable effect, in the opinion of an enforcement officer.

   *Advice Note: Air discharge limits*

   *Condition 7 is to be assessed by suitably trained council enforcement officers in accordance with the procedures outlined in the Good Practice Guides for Odour (Ministry for the Environment, 2016), including consideration of the FIDOL factors (frequency, intensity, duration, offensiveness and location) for amenity effects (dust, odour and visible emissions).*

**Process Conditions**

8. Within one month of WWTP commencing treatment, the Consent Holder must provide to the Council a report from an appropriately qualified person, which verifies that the design and installation of the waste water treatment plant and odour control system (including the odour extraction and treatment system) in accordance with Conditions 1 and 9.

9. Air discharges from the solids screening and storage and sludge dewatering and storage must be extracted to an emission control system (including an activated carbon scrubber) and discharged from a stack at least 3 m above ground level or the apex height of the nearest building within 20 meters, without obstruction of the vertical discharge of air.

**Monitoring and Reporting conditions**

10. Within 3 months of exercising this resource consent, The consent holder shall:

    a. Operate and maintain a weather station on the site to measure and record the air temperature, wind direction and wind velocity on a continuous basis (at no less than 10-minute intervals). The weather data shall be retained for at least the duration of the resource consent.
    b. Weather data of any period shall be provided to Auckland Council within 5 days of a request.
    c. The weather station shall be located on the site in a location which, as far as is practicable, is unaffected by surrounding structures or vegetation or other features for the purpose of ensuring the most accurate measurements as practicable on the site.
    d. The weather station shall be installed and operated in accordance with AS/NZS 3580.14:2014 (Methods for sampling and analysis of ambient air - Meteorological monitoring for ambient air quality monitoring applications).

11. The Council must be notified as soon as practicable in the event of any significant discharge to air, which results or has the potential to result in a breach of air quality conditions or adverse effects on the environment. The following information must be supplied:

    a. Details of the nature of the discharge including any wind conditions as recorded under conditions 10 during the incident timeframe
    b. An explanation of the cause of the incident.
    c. Details of remediation action taken.

    *Advice Note: Significant discharges*

    *Significant discharges to be notified to council in accordance with this condition include abnormal discharges arising from unexpected failures of the WWTP (including emission control systems). An email to monitoring@aucklandcouncil.govt.nz should be sent detailing the nature of the issue and what contingency measures are to be implemented to minimise potential air quality effects.*

12. All air quality complaints that are received must be recorded and notified to the council on request. The recorded complaint details must include:

a. The date, time, location and nature of the complaint.

b. The name, phone number and address of the complainant, unless the complainant elects not to supply these details.

c. Weather conditions, including wind speed and direction, at time of the complaint.

d. Any remedial actions undertaken.

**Air Quality Management Plan**

13. Prior to the commissioning of the WWTP, an Air Quality Management Plan (AQMP) must be submitted to the Council for certification, to confirm that the activities undertaken in accordance with the AQMP will achieve the objectives of the plan and compliance with the relevant consent conditions. Any subsequent review of the AQMP must also be submitted to the council for certification. The consent holder must meet the costs of the production, certification, monitoring and review of the AQMP.

    The purpose of the AQMP is to document the monitoring, management and operational procedures, methodologies and contingency plans required to comply with the conditions of this consent. The AQMP may be a sub-section of a wider Environmental Management Plan, and must incorporate a series of monitoring, management and operational procedures, methodologies and contingency plans, and together shall accurately record all information required to comply with the conditions of this consent. The AQMP must include the following:

    a. Identification of all point sources for discharges of contaminants into air, including a map and schematic diagram showing the location of each source;
    b. Procedures to minimise discharges of contaminants into air (including odour), including details of the inspection, maintenance, monitoring and contingency procedures in place for the waste water treatment plant.
    c. The operating parameters of odour control equipment and the frequency and scope of the regular checks to be performed on emissions control equipment; including testing of the carbon bed saturation;
    d. Procedures for the monitoring of odour, including details of inspection procedures, recording requirements and contingency measures;
    e. The identification of staff responsibilities;
    f. The procedures for the receipt, recording and handling of air quality complaints received.

14. The AQMP must be reviewed on an annual basis and any subsequent changes to the certified AQMP must be submitted to the council for certification prior to implementation. The council will advise the Consent Holder in writing if any aspects of the AQMP are considered to be inconsistent with achieving the provisions of this consent.

*Advice Note: Air Quality Management Plan*

*The council acknowledges that the Air Quality Management Plan is intended to provide flexibility both for the consent holder and the council for the management of the air discharges. Accordingly, the Air Quality Management Plan may need to be reviewed over time. Any reviews should be in accordance with the stated objectives of the management plan and limited to the scope of this consent.*

*Certification of the Air Quality Management Plan by the council relates only to those aspects of the management plan that are relevant under the RMA. The certification does not amount to an approval or acceptance of suitability by the council of any elements of the management plan that relate to other legislation, for example, but not limited to, the Building Act 2004 or the Health and Safety at Work Act 2015.*

# Appendix B Meremere WWTP odour survey

# Meremere

## Wastewater Treatment Plant

Odour survey – **16 January 2024**

**Report** 24464
**Survey Date** 16/1/2025
**Report date** 17/01/2025

+64 7 262 3070
enquiries@airmatters.co.nz
17 Banks Avenue, Mount Manganui 3116
PO Box 96 256, Balmoral 1342, Auckland, NZ
**airmatters.co.nz**

# 1. Introduction

Air Matters Ltd carried out an odour survey in the area surrounding Meremere Waste Water Treatment Plant (the Plant) on 16 January 2025. The focus of the survey was to characterise the odour, its sources and the intensity at various downwind locations from the Plant. Below is a summary of the surveyor who undertook the field assessment and the timing and environmental conditions at the time of the survey.

| **Surveyor Information** | |
|---|---|
| **Name:** | Nigel Goodhue |
| **Company:** | Air Matters Limited |

| **Summary of Conditions** | **16 January 2025** |
|---|---|
| **Survey Time Period** | 15:25 – 16:15 |
| **Temperature** | 24$^0$C (average) |
| **Wind conditions (average over survey)** | Light to moderate north/north-easterly (1–3.6 m/s) |
| **Weather conditions** | Clear day (full sun) |
| **Plant design** | The WWTP follows the same principals as that proposed for the Milldale development, being primary screening, secondary treatment based on the Bardenpho process including membrane filtration and tertiary treatment via UV disinfection. WAS is stored onsite in two tanks and removed from site via tanker. The surveyed WWTP does not employ any active odour extraction and treatment.<br>The proposed Milldale WWTP will be of similar design but in addition incorporates:<br>• WAS will be dewatered onsite through a mechanical process and solids taken offsite for disposal;<br>• Inlet screening and WAS dewatering process will be housed inside a building;<br>• No open top holding tank of waste water after the screening process.<br>• Active extraction of air from the inlet screening and WAS dewater process (including from within the building) will be directed through an odour control unit (carbon scrubbers). |
| **Site activities** | The Plant was operational with the secondary and tertiary treatment phase continuously running. The inlet screens were operating intermittently. |

| Summary of Conditions | 16 January 2025 |
|---|---|
| **Survey locations (refer Map)** | • **A**: Full (10-min) survey downwind in 1 location (~45 meter from Plant);<br>• **B**: 1 x downwind scouting check (10-140 m downwind);<br>• **C**: 4 x (5-min) survey downwind of acetic acid tank at various distances (6,12, 33, 45m);<br>• **D**: 1 x upwind check;<br>• **E-G**: 3 x 5-minute surveys immediately downwind of the different stages off the Plant (membrane filtration \| tertiary treatment \| inlet screens and solids storage and WAS tanks); |

The detail of the survey and outcome are presented in the subsequent sections.

# 2. Survey Results

**16 January 2025**


**Location Map**

Survey locations **A** Average wind direction Odour Generating area

## 2.1 Results

The table below outlines the results of the survey in terms of the odour character and intensity (DW = downwind).

| Location | Distance from nearest odour generating source (m) | Odour detected? (% of time) | Character of detected odour | Intensity |
|---|---|---|---|---|
| **A** (DW of Plant – south end) | 45 | Yes (18%) | Sewage | weak |
| **B** (DW odour scouting) | 45-140 | No | - | - |
| **C** (DW of Plant – north end) | 6-45m (at 4 locations) | Yes @6m = 100% @12m = 75% @33m = 40% @45m = 40% | Vinegar (acetic acid) | @6m = distinct @12m = weak/distinct @33m = weak @45m = weak |
| **D** (Upwind) | Upwind | No | - | - |
| **E** (DW of Membrane filtration) | 10 | No | - | - |
| **F** (DW of tertiary treatment) | 10 | Yes (33%) | Sewage | Weak |
| **G** (DW of inlet screens/WAS tanks) | 5 | Yes (90%) | Sewage | Weak/distinct |

## 2.2 Key results

- An odour consistent with sewage was detected at location A, ~45 meters downwind of the treatment plant. Based on wind direction and the survey undertaken in closer proximity to the Plant (Locations E-G) the observed odour is expected to be generated from the primary treatment stage (wastewater screening)/WAS storage.
- The scouting odour survey along the pond track (Location B) did not detect any odour. Due to the location of the pond and the wind direction, downwind surveys between 40- 140m were not possible on the day of the survey.
- Survey location on the north side detected a vinegar odour which was related to the acetic acid storage tanks. Intensity and frequency of odour was surveyed at various distances downwind and reduced with distance but was still detected ~45 meters downwind of the acetic acid tank.
- A survey of the Plant immediately downwind (5-10m) detected:
    - an intermittent weak earthy sewage odour downwind of the aeration/anoxic tanks (Location F); and
    - a consistent weak to distinct sewage odour was observed at the inlet screening (Location G) and consistent with the downwind survey at Location A.
- An upwind check was completed (Location D) following the downwind survey and no odour was present at this upwind location, establishing that all detected odour during the survey was from the subject site.

## 2.3 Recommendations relating to Milldale WWTP

During the survey the greatest intensity and frequency odour were detected from the inlet screening/WAS storage processing and the acetic acid tank. These were detected at a distances upto 45 m from the Plant which correlates with the nearest sensitive receptors to the proposed Milldale plant. Additional downwind surveys at distances of 45-140m from the Plant could not be undertaken due the presence of the pond. However, a scouting survey did not detect any odour at a distance of 140m. Based on this survey:

- The inlet screening/storage and WAS dewatering/solids storage should ensure active capture and treatment of air to minimise the release of odour;
- Mitigations should be put in place to minimise the generation of odour from the acetic acid tank.

# 3. Methodology

The odour survey is carried out as per the process described in Appendix 3 of the *Good Practise Guide for Assessing and Managing Odour, Ministry for the Environment, 2016,* which is based on the German Standard VDI 3882.

A summary of important descriptors used in this assessment are included in Figure 2 below.

The surveyor had their noses calibrated to the screening procedure for panellists detailed as per AS/NZS 4323.3:2001, Section 9.7.2. The surveyor fell outside of the standard detection range for individual threshold however meet the standard for standard deviation.

Figure 3-1: Summary of odour survey descriptor notes used in this assessment

Odour Description Notes

| Note 1: Observation Point Sensitivity |
|---|
| 1. Remote (no housing, commercial/industrial premises, or public area within 500m of obs point) |
| 2. Low sensitivity (no housing, commercial/industrial premises, or public area within 100m of obs point) |
| 3. Moderate sensitivity (housing, commercial/industrial premises, or public area within 100m of obs point |
| 4. High sensitivity (housing, commercial/industrial premises, or public area within area of obs point) |
| 5. Extra sensitive (complaints arising from residents, business, and users of public areas within the area of obs point) |

| Note 2: Wind Strength | |
|---|---|
| 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 |

| Note 3: Weather Conditions | |
|---|---|
| Precipitation | Temperature |
| 1. Dry | 1. Cold |
| 2. Rained recently | 2. Cool |
| 3. Drizzle | 3. Warm |
| 4. Raining | 4. Hot |
| 5. Foggy | |

| Note 4: Scale of intensity | Note 5: General Hedonic Tone |
|---|---|
| 6. Extremely strong | -4 Extremely unpleasant |
| 5. Very strong | -3 |
| 4. Strong | -2 |
| 3. Distinct | -1 |
| 2. Weak | 0 Neutral |
| 1. Very weak odour | 1 |
| 0. No odour | 2 |
| | 3 |
| | 4 Extremely pleasant |

**Note 6: Odour character descriptions**

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

| Note 7: Cloud cover | | | |
|---|---|---|---|
| 0 | Clear sky | 5 | |
| 1 | Sunny | 6 | Mostly cloudy |
| 2 | Mostly sunny | 7 | Considerable cloudiness |
| 3 | | 8 | Overcast |
| 4 | Half the sky covered in cloud | F | Fog/mist |

# 4. Limitations

These odour surveys were carried out on a single day of operations with weather conditions as found on the day. These odour surveys provide a snapshot of the environment on this day and results do not assume that this will be consistent through time.

# Appendix C Odour Management Plan

# Fulton Hogan

## Milldale subdivision - Waste Water Treatment Plant

Odour Management Plan

**Document** 25090

**Report date** 19/03/2025

17 Banks Avenue, Mount Maunganui 3116
PO Box 96 256, Balmoral 1342, Auckland, NZ

**airmatters.co.nz**

Odour Management Plan prepared by Air Matters Limited.

**Prepared by:**

**Nigel Goodhue**
Senior Air Quality Consultant
Air Matters Ltd

**Reviewed by:**

Fulton Hogan



## Document History

| No | Version | Amendments made | Issue Date |
|---|---|---|---|
| 1 | Pre-consent draft | | 19 March 2025 |
| | | | |
| | | | |
| | | | |

# Table of Contents

# 1. Introduction and purpose of the Plan

## 1.1 Scope

The purpose of the Odour Management Plan (OMP) is to document the monitoring, management and operational procedures, methodologies and contingency plans required to comply with the conditions of consent. Detailed procedures to support this outcome through avoiding and mitigating odour are already documented in other Management Plans and are cross-referenced in this document where applicable.

As per the requirements of Resource Consent [XX] the OMP sets out the following:

a. Identification of all point sources for discharges of contaminants into air, including a map and schematic diagram showing the location of each source;
b. Procedures to minimise discharges of contaminants into air (including odour), including details of the inspection, maintenance, monitoring and contingency procedures in place for the waste water treatment plant.
c. The operating parameters of odour control equipment and the frequency and scope of the regular checks to be performed on emissions control equipment; including testing of the carbon bed saturation;
d. Procedures for the monitoring of odour, including details of inspection procedures, recording requirements and contingency measures;
e. The identification of key staff and their responsibilities;
f. The procedures for the receipt, recording and handling of air quality complaints received.

## 1.2 Resource Consents

Resource consent from Auckland Council were issued on the XXX 2025. This Odour Management Plan has been drafted to satisfy the requirements of this consent specifically Condition X which requires the development of and implementation of an Odour Management Plan.

# 2. Key personnel and staff training

A minimum of two individuals will be trained to implement the OMP as outlined in the table below. These individuals will be responsible for ensuring the OMP is fully implemented and maintained. All plant operators' must take ownership of the OMP to ensure its success. Employees at the plant must receive training to understand the role of implementing and maintaining the OMP including conducting inspections and taking corrective actions.

| Name | Company | Position | Mobile | Email |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |

# 3. Complaints

Any complaints received by [operator of the WWTP] will be recorded on a complaints form. The recorded complaint details must include:

a. The date, time, location and nature of the complaint.

b. The name, phone number and address of the complainant, unless the complainant elects not to supply these details.

c. Weather conditions, including wind speed and direction, at time of the complaint.

d. Any remedial actions undertaken.

The complaint forms shall be kept in a register and submitted to Auckland Council on request.

# 4. Process description and method of operation

The design of the WWTP incorporates a range of treatment processes that can be generally grouped as the following:

- **Raw sewage screening** – removal of large solid and grit from the raw wastewater, and storage and handling of the solid waste.
- **Secondary treatment** – biological nutrient removal using a 4-stage Bardenpho membrane aerated biofilm reactor and clarification using a membrane filtration;
- **Tertiary treatment** - Ultraviolet (UV) disinfection of the treated wastewater and Reverse Osmosis;
- **Sludge Handling Facilities** – including the thickening, dewatering and storage of the biomass (sludge) generated from secondary treatment process.

In the proposed design, as demonstrated in Figure 1 and 2, the raw wastewater enters the WWTP via a wet well flow receival sump before being transferred to sewage screening. After screening waste water is directed into a balance tank which acts as a buffer protecting or decoupling the treatment processes from peak flows.

Screened waste water is pump from the Balance tank and treated through membrane biofilter modules including aeration and anoxic stages to remove nutrients. The treated water is then pumped to a membrane filtration unit which separates the suspended biomass (sludge) (produced from the biological processes) from the permeate (the clear, treated wastewater).

Return activated sludge (RAS) is to be directed back into the treatment process for further refining. Waste sludge is then pumped to centrifuges for dewatering to further reduce their volume. The dewatered sludge is then stored in enclosed storage bins before being transported offsite for disposal.

Permeate is disinfected by ultraviolet (UV) light and further clarification is provided through a Reverse Osmosis treatment plant before being discharged. The proposed method of discharge is by trickle feed into Waterloo Creek via a Land Contact Infiltration Basin.

The WWTP is design as an ‘offtake’ from the main sewer line and therefore does not require the buffering of flows or emergency storage as the WWTP is fed a consistent flow via a pump station. Any unanticipated fault with the WWTP would result in the raw wastewater continuing past the WWTP to the AB-WWTP facility

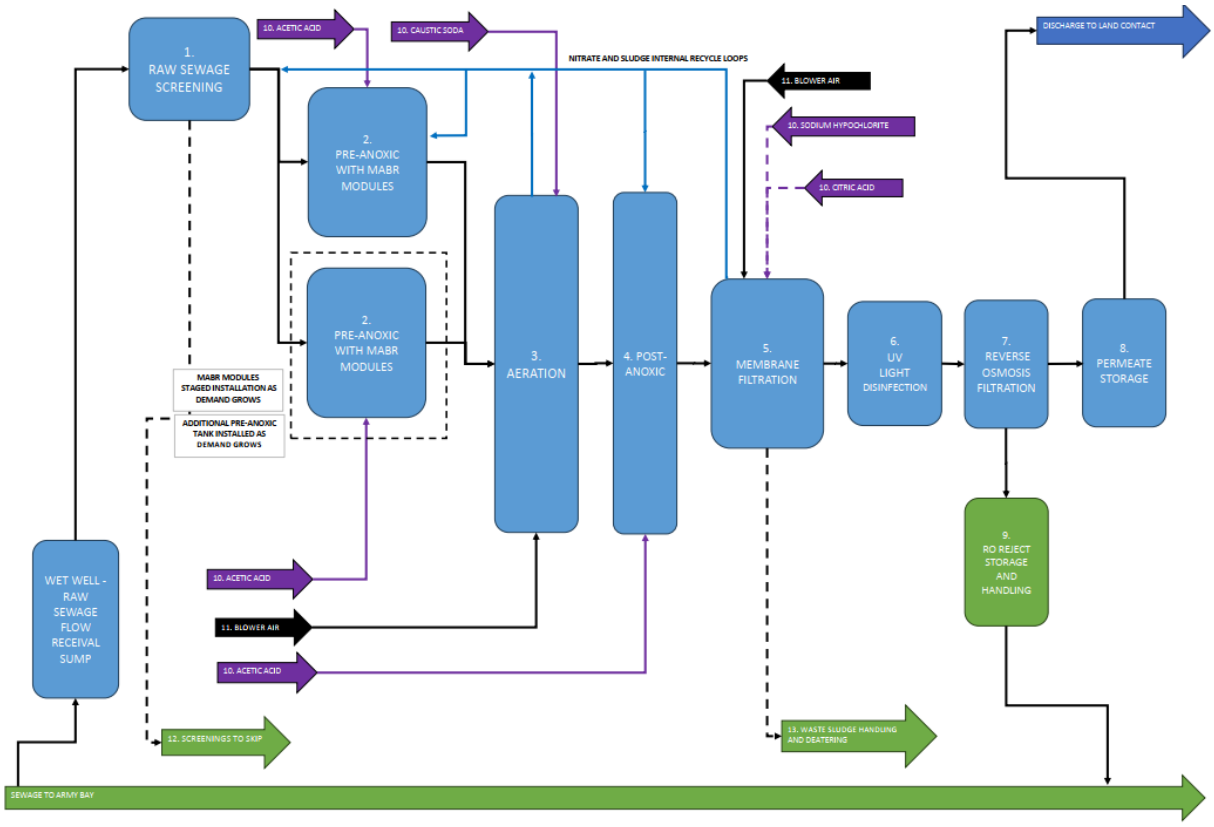


**Figure 1. Schematic of the WWTP design.**

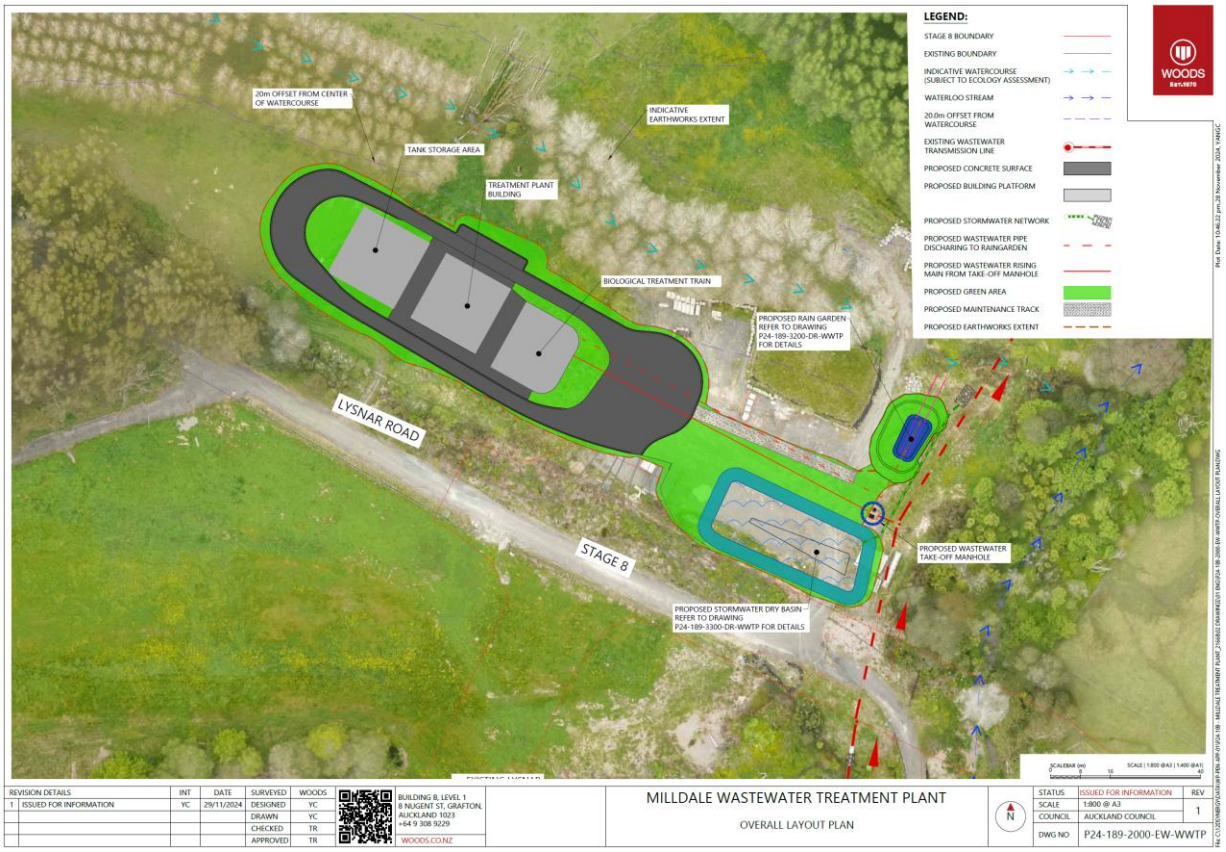


**Figure 3. Indicative ground layout of the proposed WWTP**

# 5. Sources and mitigation

There will be a number of potential odour-generating sources from the WWTP which are summarised in the Table below along with a description of the proposed mitigation methods

| Process | Odour potential | Controls |
|---|---|---|
| Screening | The intake screening process is a potential minor source of odour due to the fresh state of the influent. | • Odorous air from the intake screen and solids storage is to be extracted to an odour control unit. Uncontrolled odour emission should be negligible during normal operations.<br>• Overloading of the screens and unplanned outages, which increase the release of odour, will be managed by having a second set of screens on standby.<br>• As the WWTP has the ability to stop accepting raw wastewater the risk of over loading can be rapidly avoided. |
| Balance Tank | Potential minor source of odour due to the fresh state of the influent (solids removed) | • The tank is to be sealed and connected to the odour extraction network under negative pressure.<br>• In routine operation this tank will be operated at near 0% level and will be designed with an internal sump. |
| Secondary treatment<br>(Aerated/aerobic tanks) | The aerobic process is not inherently odorous provided that aerobic conditions are maintained. If anaerobic conditions develop the odour potential may increase. The aerobic tanks are not proposed to be enclosed or have air extracted and mitigation will rely on maintaining aerobic conditions. | • Mixing and aeriation will be automatically controlled based on dissolved oxygen concentrations;<br>• Blowers (supply air) will have a backup emergency power supply;<br>• Replacement blowers available onsite;<br>• Preventative maintenance; |
| Secondary treatment<br>(Anoxic balance tanks) | Anoxic process is not inherently odorous. The anoxic tanks are not proposed to be enclosed and odour management is based on maintenance of anoxic conditions and avoiding anaerobic conditions. | • Ensure the tank remains in anoxic conditions and avoid anaerobic conditions. This will be achieved by effective mixing of the tank and aerobic control of influent based on time Oxidation Reduction Potential monitoring. |

| Process | Odour potential | Controls |
|---|---|---|
| Secondary treatment (Secondary Anoxic tanks) | These tanks receive water from the aerated tanks and provide further nitrite removal. Influent not likely to be odorous (influent is from the Anoxic Balance tank). | • Same control as the anoxic balance tanks; |
| Secondary treatment (MBR tanks) | Low potential to generate odour as receiving water is from the Secondary Anoxic tanks | • Wastewater within the membranes is cleaned using air ensuring the process remains aerobic at all times |
| Sludge dewatering and storage | The odour associated with the dewatering plant has the potential to be moderate to high intensity with a character that is considered to be unpleasant. | • Dewatering process and storage area will be enclosed with the air extracted and treated (refer Section 2.4.1 & 2.4.2). |
| UV disinfection | Process is enclosed<br>The wastewater will have low odour potential (i.e. positive dissolved oxygen concentrations and low organic content). | • N/A |
| Reverse Osmosis | The wastewater will have low odour potential (i.e. positive dissolved oxygen concentrations and low organic content). | • N/A |
| Land Contact Infiltration Basin | The wastewater will have low odour potential (i.e. positive dissolved oxygen concentrations and low organic content) | • Management of effluent prior to discharge. |

## 5.1 Mitigation details

Mitigations employed to minimise the release of odour at the WWTP are described in the Table above. A more detailed description of the key mitigations is provided below.

### 5.1.1 *Odour extraction*

The active air extraction system is a critical component of the odour management. It will draw odour-laden air from the processes with the highest potential to generate odour including raw influent screening, solids storage, the sludge dewatering and solids storage and the Balance Tank.

### 5.1.2 *Carbon absorption beds*

Treatment/removal of odour is to be provided through extraction of air from the potential odour-generating areas as described above and directing the odour-laden air through activated carbon beds. To aid in odour removal the carbon bed will be impregnated with caustic soda. As moisture can interfere with absorption preheating of the extracted air flow will occur to reduce humidity levels.

The carbon media will become saturated overtime. Consequently, the media bed will require periodic changes prior to reaching saturation. The WWTP operator will undertake regular testing of the bed saturation as outlined in the [WWTP Operations and Management Plan].

### 5.1.3 *Back-up power supply*

The onsite back up electricity generators will supply power in the event of a power failure. Backup generation will be designed to enable operation of key WWTP odour mitigations including blowers, dosing systems and the odour extraction system.

### 5.1.4 *Spare critical components*

The consent holder will hold a number of replacement components on site or within a short distance of the WWTP (within Auckland Region). This will include critical blower (aeration) components, critical raw waste water screens and spare components of the air extraction system (including a fan and motor assembly).

# 6. Monitoring

Monitoring strategy for the WWTP is focused on avoiding the generation of odour from the WWTP. Ensuring that potential odour generation is limited as far as practical is central for the WWTP given the close proximity to the surrounding residential areas. A number of Best Available Techniques have been employed in the WWTP design (refer Section 5).

The [WWTP Operations and Management Plan] sets out the Operational and Maintenance procedures for the WWWTP including the system that are designed to minimise the generation of odour. A cross reference between the system for minimising Odour (Section 5) and the applicable sections in the [WWTP Operations and Management Plan] is provided in the Table below:

| System | Cross refence to the operational and maintenance procedures contained in the [WWTP Operations and Management Plan] |
|---|---|
| Building ventilation negative air system | |
| Odour treatment system | |
| Raw wastewater screens | |
| Balance Tank operating procedure | |
| Aerated/aerobic tanks (aeration control system) | |
| Anoxic balance tanks (Oxidation Reduction Potential monitoring) | |
| Screened and sludge dewatered waste storage and disposal | |

# 7. Reporting

## 7.1 Annual Report

[Outline any annual reporting requirements from Consent]

## 7.2 Significant discharge to air

The Council must be notified as soon as practicable in the event of any significant discharge to air, which results or has the potential to result in a breach of air quality conditions or adverse effects on the environment. The following information must be supplied:

a. Details of the nature of the discharge including any wind conditions as recorded under conditions XX during the incident timeframe
b. An explanation of the cause of the incident.
c. Details of remediation action taken.

Significant discharges to be notified to council in accordance with this condition include abnormal discharges arising from unexpected failures of the WWTP (including emission control systems). An email to monitoring@aucklandcouncil.govt.nz should be sent detailing the nature of the issue and what contingency measures are to be implemented to minimise potential air quality effects.

The [Site Operations Manager] has the responsibility of ensuring any significant discharge to air are notified to Council

# 8. Review

The OMP must be reviewed on an annual basis and any subsequent changes to the certified OMP must be submitted to the council for certification prior to implementation. The council will advise the Consent Holder in writing if any aspects of the OMP are considered to be inconsistent with achieving the provisions of this consent.

| Version Number | Amendments made | Issue Date |
|---|---|---|
| 1) Pre-consent draft | | 19 March 2025 |
| | | |
| | | |
| | | |
| | | |

# Appendices

# Appendix A Resource Consent [XXX]