CWTP Odour Mitigation Plan

Please note, this is a live document. It will be updated as required.

A. The ECan request in the Compliance Monitoring Report dated 19 February 2024:

3. *Please provide timeframes and the outcomes from the odour assessment done by Jacobs for the odour generating at the plant site by COB 27 February 2024. The information that must be included in the report, but not be limited to, is:*
   - *(a) A summary of where Jacobs conducted their odour assessment and what analysis was completed.*
   - *(b) A map identifying the areas on the plant site that is generating odour.*
   - *(c) Confirmation of why or what is causing this odour to arise now over this period.*
   - *(d) Indepth detail on what onsite specific actions will take place going forward to mitigate the odour arising from the plant site and ponds (Expanding on the action plan received on the 9 February 2024).*
   - *(e) What odour monitoring will further commence to measure compliance with item three above.*
   - *(f) Confirm the monitoring scheme that will take place to maintain the aerators on site and the process involved for maintenance of these devices that would impact its capability to provide manual aeration on the ponds or plant site as part of the treatment process.*

B. Introduction: the results of the fire

1. Resource consent from Ecan for discharge to air CRC164462 condition 3 states:
   3 *The discharges shall not cause any odour which is offensive or objectionable beyond the boundary of the property, which for the purposes of this consent is as shown on Plan CRC164462A, which forms part of this consent.*

2. A fire that occurred on the 1st November 2021 destroyed much of the infrastructure of the trickling filters. The tricking filters were a key component of the secondary treatment process at the Christchurch Wastewater Treatment Plant (CWTP), responsible for removing a substantial amount of the organic matter through the treatment process. The trickling filters were a fixed film biological treatment process with plastic media, distribution arms, air handling and drainage systems. Wastewater from the primary sedimentation tanks was pumped to the top of the structures and trickled through the media where biofilm on the media consumes nutrients. Air was pumped up from the bottom, to maintain aerobic conditions, and then withdrawn to be passed through biofilters to mitigate the odour.

3. The trickling filter structures have been isolated from the wastewater treatment plant process since the fire was extinguished. This has imposed significantly higher organic loads onto the downstream treatment processes.

4. As a result, the risk of offensive and objectionable odour is far higher; and the vulnerability of the plant to further mishap that causes spikes in odour is far greater.

5. The loss of treatment capacity for the plant will remain until the Council restores the trickling filters. As was reported by Council staff to the Council's Finance and Performance Committee meeting on 28 February 2024:

> *"…Council is proceeding with the concept design for the restoration of the trickling filters. In line with our insurance entitlement, the intention is to restore the trickling filters to a condition substantially the same as, but not better or more extensive than, their condition when new, and including any alterations that may be necessary to comply with any law.*
>
> *This design work is progressing well and is due to be complete within the next two months and will be reported and overseen by the Insurance Subcommittee. As part of the design process an estimated cost of restoration will be calculated, as well as a forecast of cost escalation over the life of the project.*
>
> *If potential improvements beyond the Council's insurance entitlement are considered, these will be allowed for in the Long-Term Plan".*

6. Until the trickling filters are restored, the Council is managing its consents by using temporary operational solutions.

7. A map showing potential odour sources from the plant is attached as **Appendix A.**

C. The odour mitigation efforts before the 23/24 summer

8. In the immediate 8 months following the fire, the Council completed an interim recovery plan. That interim plan comprised the installation of a temporary activated sludge plant by converting two of the four existing clarifier tanks to aeration basins. Following this, mechanical aeration on oxidation pond number one was installed by April 2023. This interim recovery plan did improve wastewater treatment effectiveness and allowed the plant to operate within its consent conditions, across both final effluent discharge quality to the ocean and odour discharges to atmosphere.

9. As the temporary activated sludge plant used all the available assets to maximise its size, the system has minimal redundancy and no resilience to mechanical or electrical breakdowns.

10. A number of other relatively minor activities were undertaken to increase the performance of the treatment plant. These were:
    - Poly dosing to the primary settlement tanks
    - Poly dosing to the clarifiers
    - Hydrogen Peroxide dosing to the Oxidation Ponds

11. To date, in excess of $23M has been spent across the significant range of activities in response to the fire and to attempt to restore the treatment capacity and maintain compliance with the site's resource consent.

12. Whilst attempts are made to operate the plant in a proactive manner, the past year has shown the need to respond quickly in a reactive manner to odour incidents.

D. The events of the 23/24 summer

13. It has been primarily identified that the dry hot weather this summer has resulted in low flows and less dilution from stormwater ingress into the sewers, coupled with high temperatures, resulting in wastewater arriving at the plant already in an anaerobic state. As a result, odour from the treatment plant has got worse.

14. During November 2023 it was noted that there were increasing levels of Hydrogen Sulphide being detected at the community monitoring sites close to the ponds and plant. At that time, monitoring of the dissolved oxygen levels in the ponds indicated there were some performance issues. A number of actions were taken to try and remedy the situation, such as ensuring all available aerators on Pond 1 were in use, and the flow path through the ponds was altered to try and balance the load between the ponds to prevent them becoming anaerobic and generating odours.

15. Since January 2024 the Council has engaged Jacobs to assist with intensive odour monitoring in response to the increased number of community complaints about odours. This intensive odour monitoring has shown increased levels of Hydrogen Sulphide at the plant site and boundaries. Jacobs were requested to try and identify the sources of the odour, and this information has been used to define a number of the action in this Odour Mitigation Plan.

16. A Jacobs memo describing that work is attached as **Appendix B**.

17. A table showing the odour mitigation works over the 23/24 summer is attached as **Appendix C.**

E. Ongoing and future mitigation: adaptive management

18. The Jacobs intensive odour monitoring has identified the odour as coming from a range of locations across the sites, including:
    - Inlet Screen Room
    - Primary Tanks
    - Primary by-pass chamber
    - Secondary Contact Tanks
    - Bio-bed No.1
    - Sludge Digesters

19. Actions to minimise the odours coming from these sources have been included in this Odour Mitigation Plan. A table showing the ongoing and future mitigation actions is attached as **Appendix D.**

20. This adaptive plan will continue to be updated in response to the performance of the treatment plant and the odour situation, and will be treated as a live document.

21. Whilst the odour monitoring is currently focused on the treatment plant, there is the potential for future odours from the Oxidation Ponds in April / May when the Oxidation Ponds transfer from summer to winter mode. To try and reduce the significance and severity of the odours, a Standard Operating Procedure is currently being developed.

F. Monitoring

22. The Jacobs memo attached as **Appendix B** describes the planned ongoing monitoring.

23. We note that the ECan Compliance Monitoring Report requested the Council to "*Confirm the monitoring scheme that will take place to maintain the aerators on site and the process involved for maintenance of these devices that would impact its capability to provide manual aeration on the ponds or plant site as part of the treatment process*". To monitor the operation of the 16 surface aerators on Oxidation Pond 1, an automated daily e-mail report is sent once a day to site operators. The maintenance of the 16 surface aerators on Oxidation Pond 1 is covered through a five year maintenance contract with the contractor who installed the units. This includes both planned and reactive maintenance for this five year time period.

Updates to this Odour Mitigation Plan

First draft: 6/3/24

Appendices

Appendix A: Map of the plant and odour sources
Appendix B: Jacobs memo
Appendix C: Mitigation actions over 23/24 summer
Appendix D: Ongoing and future mitigation actions

Appendix A

Activated Sludge Plant Pollution Roses 30 Jan - 26 Feb 2024

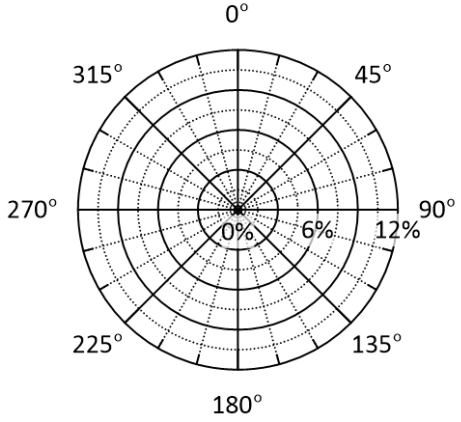
Map legend

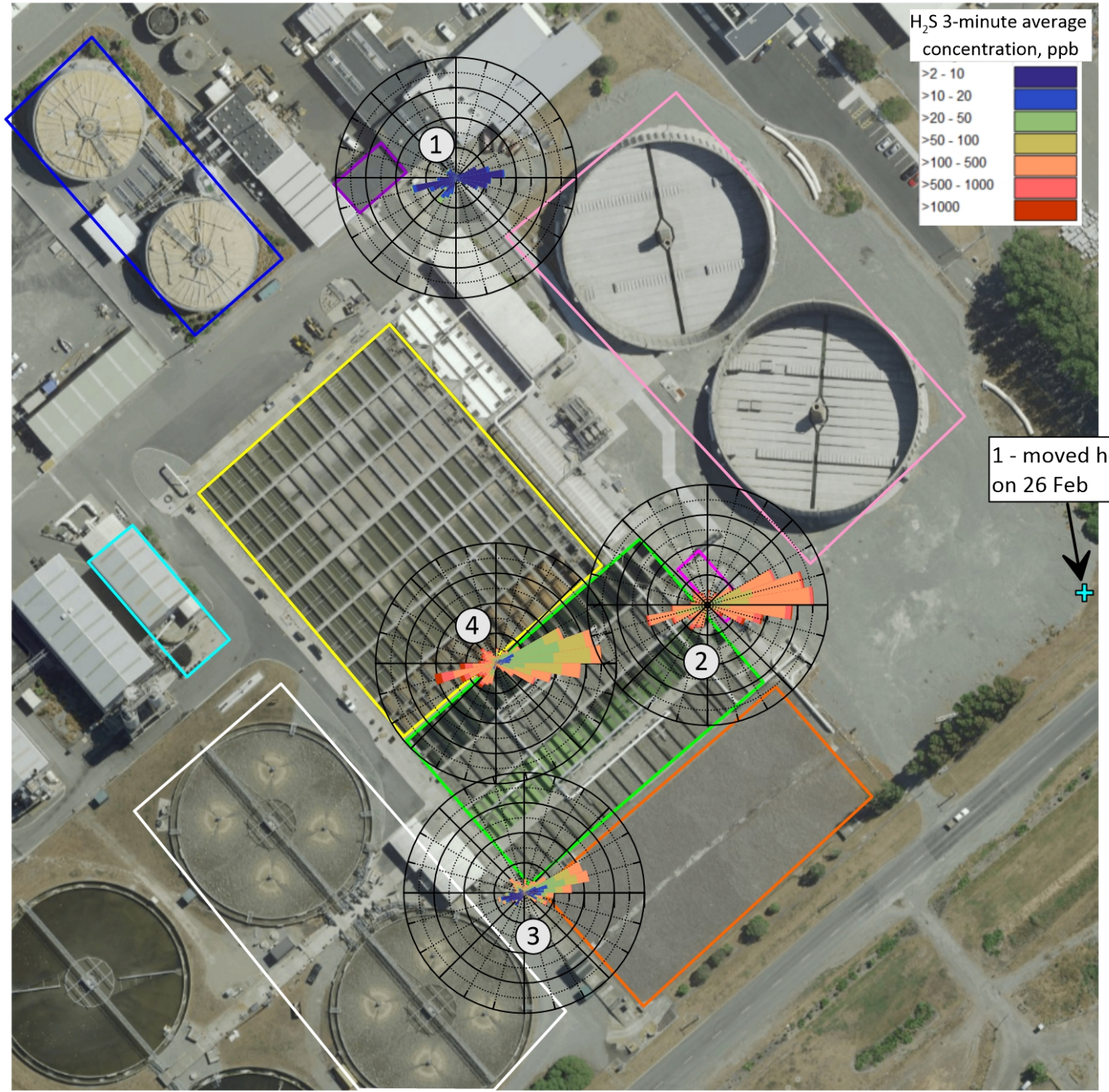
CWTP Processes

- Primary sedimentation tanks (PSTs)
- Solids contact tanks (SCTs)
- Biofilter 1
- Bypass channel grills
- Aerated tanks
- Screening room
- Dewatering building
- Digesters (2 of 6)
- Trickling filter structures

Acrulog sampling locations:

1 - Trickling filter bypass above ground pipework (moved to Cuthberts Rd boundary 26 Feb)
2 - Trickling filter end of SCTs
3 - Clarifier end of SCTs
4 - Between PSTs and SCTs





Jacobs

CWTP Odour Mitigation and Monitoring

Date:	6 March 2024
Project name:	CWTP Odour Mitigation and Monitoring
Project no:	IA306700
Attention:	Nigel Grant
Company:	Christchurch City Council (CCC)
Prepared by:	Tracy Freeman

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1. Introduction

On 1 November 2021, a large fire destroyed both of the trickling filters at the Christchurch wastewater treatment plant (CWTP) in Bromley. The trickling filters were a critical piece of the sewerage treatment process and the damage to them made the treatment process considerably less effective, with increased load on the oxidation ponds.

As a consequence, Christchurch residents, particularly those in the suburbs of Bromley, Aranui and South New Brighton, experienced a significant increase in unpleasant odours. These smells included:

- Smoke and then burnt plastic odours through November 2021,
- Raw sewage odours from the screening and grit tanks through November and December 2021, until staff reinstated the fire damaged air extraction and treatment systems,
- Odours from decaying organics material within the trickling filters through March and April 2022, following periods of rain and warm temperatures, and
- Odours from the oxidation ponds from late April 2022 as the ambient temperatures and sunshine hours dropped with the onset of winter.

The issues with increased odour emissions from the CWTP and ponds were largely mitigated by September 2022. For the following 12-14 months, the presence of odour from the CWTP and ponds in surrounding neighborhoods appeared to be minor, particularly after the commissioning of the pond aerators in autumn 2023. However, from approximately November 2023 increased odour emissions have been noticed from the CWTP, with the volume of "Smelt-It" responses and complaints increasing as the summer of 2023/24 progressed.

Jacobs has been assisting CCC to monitor ambient concentrations of hydrogen sulphide (H_2S) in the communities around the CWTP and ponds since May 2022. This monitoring was initially set up to monitor concentrations of H_2S as an indicator for potential human health concerns expressed by the community and as an early warning system for the condition of the ponds.

Whilst H_2S is a common component of odour emissions from sewage treatment, these odour emissions are a cocktail of a range of chemicals associated with decomposition of sewage and wastewater. The character and intensity of the odour emitted from various processes within a wastewater treatment plant depends on the specific process and stage of the treatment scheme, and the quality of the incoming wastewater. In addition to H_2S, the odour can include other chemical species such as methyl mercaptan, other reduced sulphides, or other highly odorous gases that are present in the ambient air at low concentrations.

The H_2S monitoring programme that Jacobs has been operating on behalf of CCC was not designed to monitor odour as such, but we consider that it provides useful information to support CCC's efforts to identify and remedy odour emissions from the CWTP.

This memorandum describes the methodology and purpose of the H_2S monitoring programme, supporting odour observations conducted by Jacobs and the identification of likely odour sources at the CWTP, and future monitoring that will be conducted by Jacobs and CCC.

2. H_2S Monitoring Equipment and Locations

All of the H_2S monitoring is conducted using Acrulog low-range (ppb) H_2S sensors. CCC owns nine of the sensors, eight of which are managed by Jacobs and one which is used by CWTP staff for spot monitoring.

The Acrulog sensors are permanently deployed in the field, and semi-continuously measure H_2S in ambient air by taking a 3-minute average sample every ten minutes. The sensors detect H_2S at very low concentrations down to 0.003ppm (3 ppb), and have a maximum range of 2ppm.

The sensors were trialled at a range of sites over the winter of 2022. After assessing the results from the initial trials and the prevailing wind directions (as shown in Figure 1), the following deployment was used throughout 2023:

1. Four community sites identified for long term monitoring to capture the range of prevailing wind directions and potential H_2S sources (Figure 2):

    a. A residence on Shortland Street, at the southeastern end of the street close to the CWTP boundary. This monitor was removed temporarily from October 2022 to June 2023.

    b. A residence on Rudds Road, near the intersection with Cypress Street

    c. South New Brighton (SNB) School, in the secure swimming pool area

    d. CCC Dog Shelter at Metro Place.

    CCC displays a graph of H_2S concentrations collected from these four meters on the Council's website, updated weekly. Data validation and processing is conducted by Jacobs.

    The monitor at the Dog Shelter site is not in a location close to residences, but was selected as a good site to detect H_2S from Ponds 1 and 4. The monitor at the Dog Shelter site is currently not in operation, as the meter was moved to the CWTP in January 2024 (as below).

2. Two monitors on the northeast and southwest side of Pond 1, to detect H_2S being emitted from Ponds 1 and 2 (Figure 2):

    a. Data from these monitors was regarded as having relevance only to plant operations due to being very close to the ponds and not in the vicinity of external receptors. Therefore, the data from these monitors is not published on the CCC website.

    b. One of the monitors, which was located on the bund between Ponds 1 and 2, was removed in January 2024 to be deployed at the CWTP (as below).

On 30th January 2024, four monitors were temporarily located within the CWTP and a fifth monitor on the northeast boundary of Pond 2, to help identify where H_2S emissions are coming from within the plant. This is still the current deployment on 6th March 2024. The current deployment is all nine Acrulog meters (including the one normally used by CWTP staff), in the following configuration which is also shown in Figure 3:

1. Three meters at community locations (Shortland Street, Rudds Rd, and SNB School)
2. Two meters on the oxidation pond boundaries (southwest of Pond 1, and northeast of Pond 2)
3. Four meters in the CWTP area around the primary sedimentation tanks (PSTs) and solids contact tanks (SCTs). One of the meters was initially located to the north of the PSTs, but was moved to a new location closer to Cuthberts Road on 26th February to help refine the emission sources.

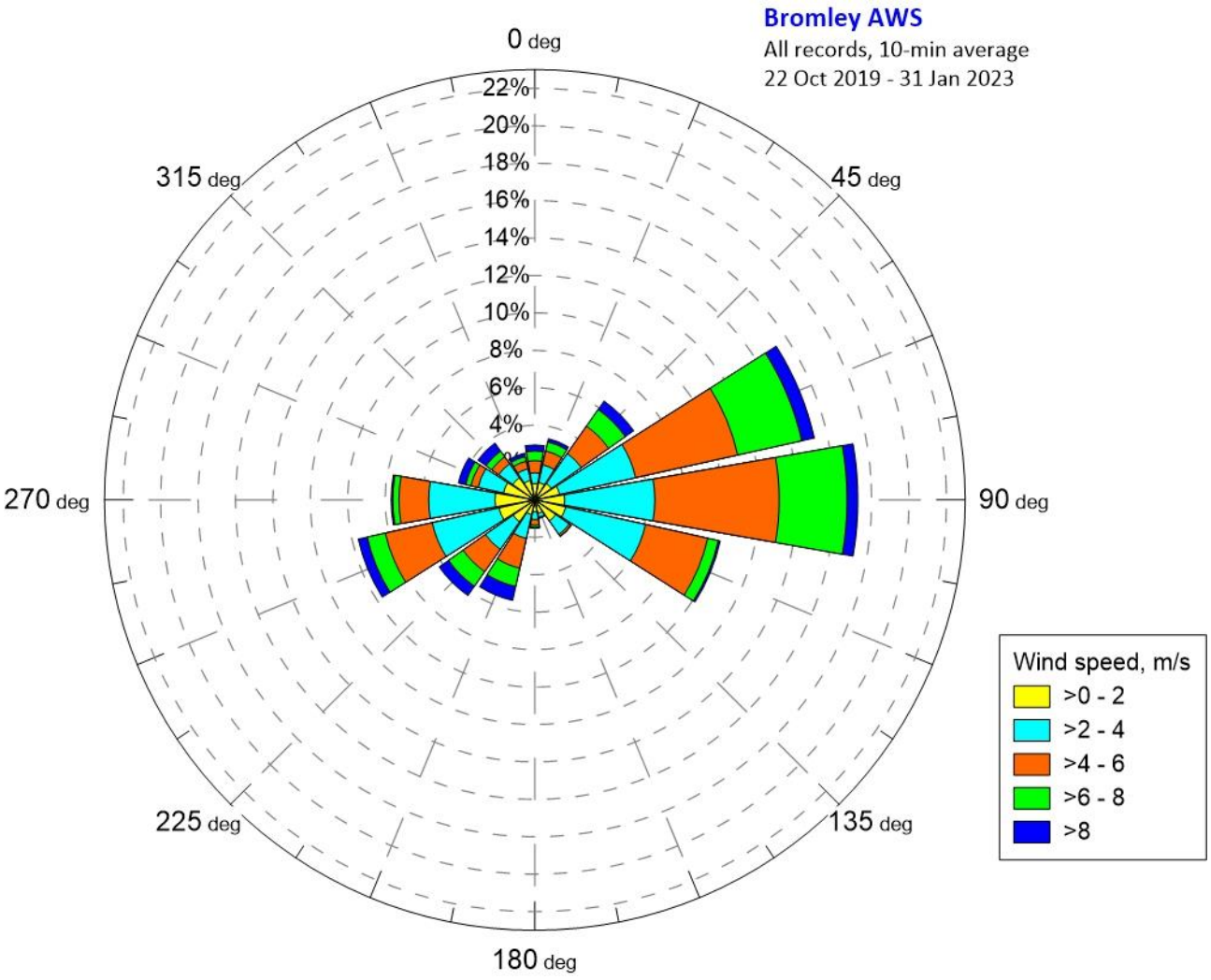


Figure 1: Windrose showing frequency and direction of winds, Bromley automatic weather station 10-minute averages, 22 October 2019 – 31 January 2023.

Figure 2: Long term community (red circle) and Pond 1-2 (yellow circle) H_2S monitoring locations

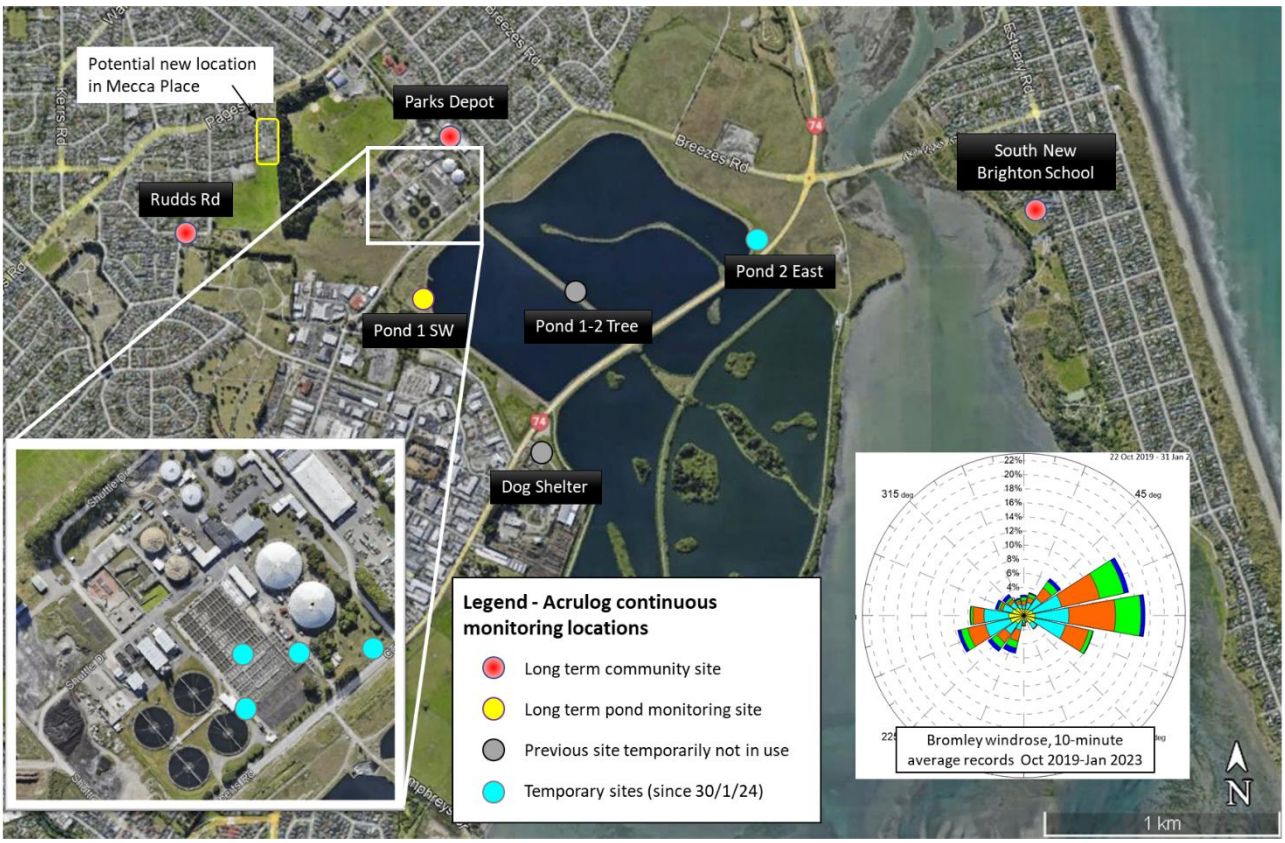


Figure 3: All current (4th March 2024) monitoring locations, and a potential new location in Mecca Place (see Section 3).

3. H_2S Monitoring as a Surrogate for Odour Monitoring

H_2S monitoring is not a surrogate for full odour measurement. This is a common finding during observation of wastewater odours because H_2S is only one chemical in the odorous gases from wastewater treatment. In addition, even though the Acrulogs are specifically designed to detect low concentrations of H_2S they can only detect a minimum of 3 ppb which is higher than the typical odour threshold[1] for H_2S which is 0.5 ppb; this means that H_2S can be detected by the human nose at lower concentrations than can be measured by the Acrulog.

Jacobs has observed odour from the CWTP in the community at times when the H_2S reading was zero (i.e. less than 3 ppb). CCC is mindful in communications with the public that "no measurement of H_2S does not mean there was no odour".

Figure 4(a) shows a graph of the hour of day when H_2S is detected at the Shortland Street and Rudds Road meters for the period 1st January to 27th February 2024. During this period, increased frequencies of "Smelt-It" reports have been registered by ECan. The graph shows that the highest H_2S concentrations are typically detected after about 6pm and before about 8am. This is quite a common feature of odour issues from wastewater treatment plants, as atmospheric dispersion is typically poorer during these overnight hours. The Rudds Road meter shows the same trend, albeit with smaller magnitude of concentrations due to its greater distance from the CWTP.

Figure 4(b) shows a graph of the H_2S concentrations at the Shortland Street and Rudds Road monitoring sites collected over June-September 2023. During this period, CCC was not aware of any elevated concerns about odour beyond the CWTP boundary. Concentrations of H_2S measured at Shortland Street were much lower than measured over Jan-Feb 2024. However, during the winter/spring period lower concentrations would be expected in any case because of the lower ambient temperatures reducing the likelihood of odour emissions from the wastewater treatment processes. It is noted that the higher magnitude H_2S concentration still occur during the same evening hours indicating the dominant effect of nighttime meteorology.

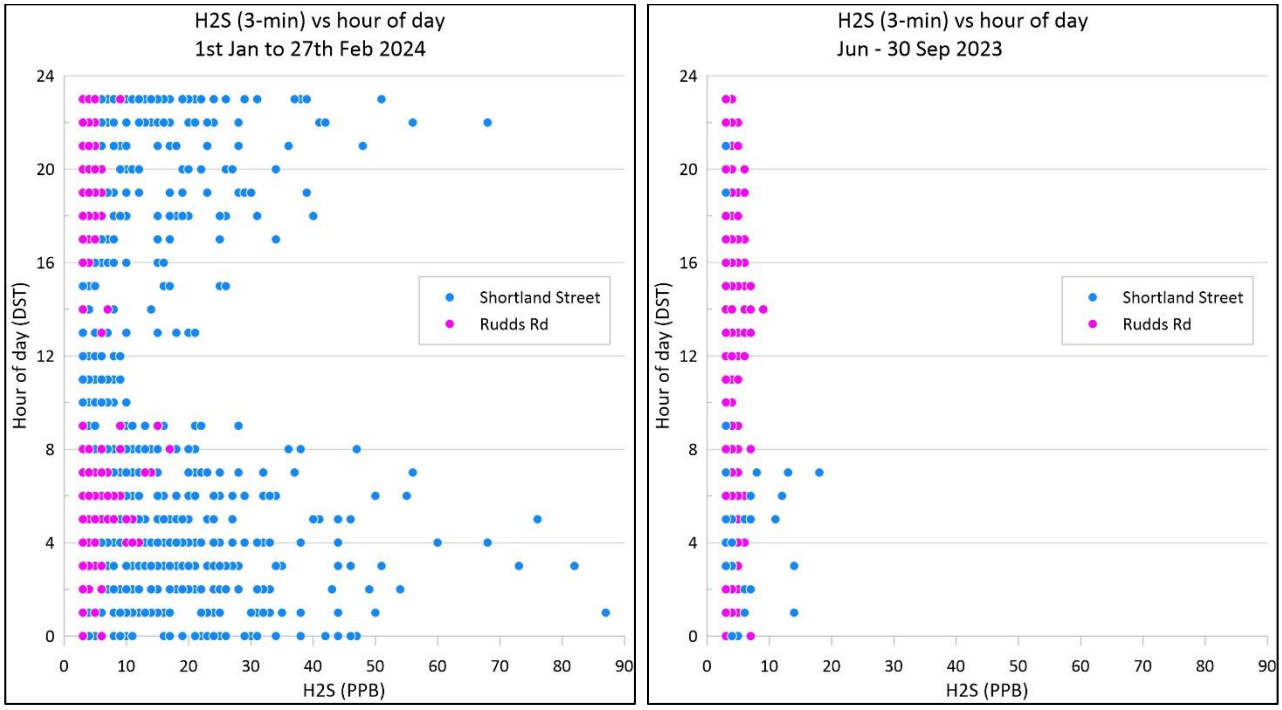
Therefore, increased concentrations of H_2S measured at the community monitoring sites appear to be consistent with increased frequency of reports of unpleasant odour detection by the community (and vice versa), and therefore H_2S may be a reasonable indicator of some of the odour issues when viewed over a period of 2-3 months.

Jacobs recommended that CCC continue the H_2S monitoring programme in the community around the CWTP. The following recommendations have also been made to CCC:

1. The full list of complaints, "Smelt-It" reports, and proactive investigations record from ECan for the last 18 months should be obtained so that a full analysis of H_2S monitoring versus community feedback can be conducted.

2. The H_2S monitoring should be extended to include a site in Mecca Place close to the CWTP end of the street as soon as possible (as indicated in Figure 3), if a suitable site can be identified. ECan has received a high frequency of "Smelt-It" reports from this street. One of the meters currently at the CWTP could be used at this site.

[1] The odour threshold is the term used to define the concentration in air when a chemical compound can be detected by the human nose. The odour threshold varies from person to person and is different for each chemical, and also depends on whether other odorous substances are present in the air that may mask the presence of the chemical.



(a) 1st January to 27th February 2024 **(b) June to 30 September 2023**

Figure 4: H_2S 3-minute average concentrations measured at Shortland Street and Rudds Road, as a function of hour of day when the concentration was measured.

A concentration occurring at "hour 8" (for example) occurs between 8:00 and 8:59am, daylight savings time.

Note - the H_2S concentrations are shown as 3-minute averages not 1-hour averages, and therefore should not be compared with the CCC's adopted health guideline for H_2S exposure of 30 ppb as a 1-hour average.

4. Identification of Potential Odour Sources

Jacobs conducted a site visit to the CWTP on 29th January to observe odour at various locations around the CWTP, identify current potential odour sources, and determine locations for the four Acrulog monitors that were deployed around the plant the following day. During the site visit, strong odours were noticed by Jacobs immediately downwind of the primary sedimentation tanks (PSTs) and, to a lesser extent, the solids contact tanks (SCTs). A thick layer of scum was noticed on the PSTs and operators were actively working to break up and remove the scum.

At the end of the site visit, Jacobs discussed plant operation issues with CWTP staff. In addition to the PSTs and SCTs, the screening room, Biofilter 1 and intermittent emergency venting from the digesters were identified as potential odour sources.

For all of these sources, H_2S is typically expected to be prevalent in the gases emitted from the treatment processes, and therefore should be an appropriate marker to indicate the presence of odour if it is released from the source.

Over the following four weeks, H_2S measurements from the four Acrulog meters deployed to the CWTP were plotted into pollution roses overlaid on an aerial map of the CWTP. Wind direction data was sourced from the Bromley AWS. This allowed visual interpretation of the directions from which H_2S was being detected at each location, and therefore isolation of various odour sources. A map combining all four weeks of data is provided in Figure 5.

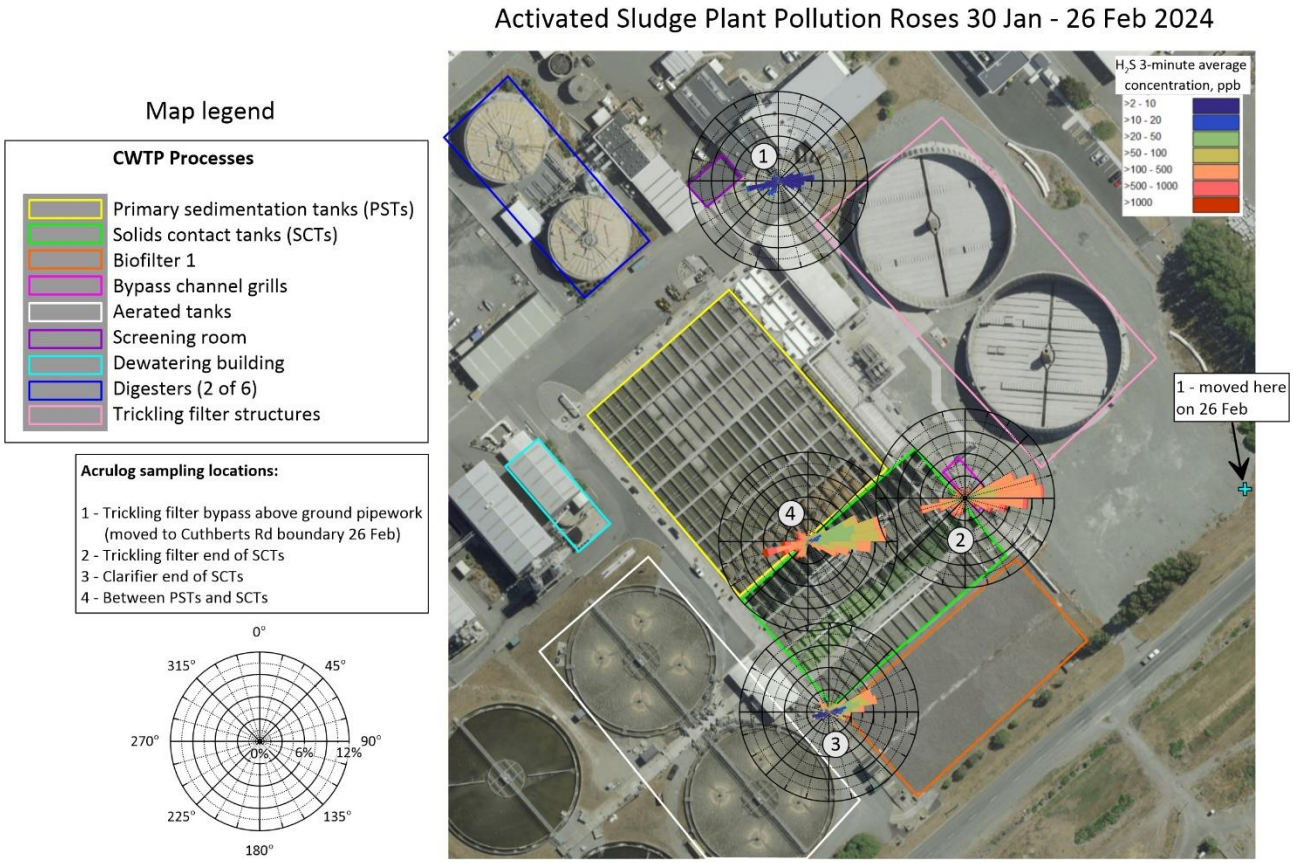


Figure 5: H_2S 3-minute average concentrations measured at CWTP from 30th January to 26th February 2024 as a function of location and wind direction.

The pollution roses clearly showed the following findings:

1. Strong concentrations of H_2S were being emitted from the PSTs.
2. Moderate to strong concentrations of H_2S were also being emitted from the SCTs.
3. The aerated tanks did not appear to be significant sources of H_2S
4. Biofilter 1 is potentially a source of H_2S
5. The bypass channel grills are a source of H_2S

Meter 1 had been located close to the screenings room in an effort to identify whether fugitive emissions of H_2S from the screenings room were contributing to high ambient H_2S concentrations. However, it was logistically difficult to locate the meter in a safe location that would not also pick up H_2S from the PSTs. Whilst meter 1 did not detect high concentrations of H_2S, it is possible that this was due to the meter location not being optimal to detect fugitive emissions from that room.

Meters 2, 3 and 4 all detected high concentrations of H_2S under northwesterly winds, which could be sourced from either the digesters or the PSTs. The monitoring is not able to distinguish whether one of these sources was dominant, however it is likely that the emissions from the PSTs are masking any contributions from the digesters at these locations.

Following the first four weeks of data monitoring, a second site visit was conducted by Jacobs on 26th February 2024 to further identify potential odour sources. The wind was blowing from the east-northeast, and Jacobs started at the northeast corner of the CWTP and moved progressively downwind, isolating each source as far as possible from upwind sources to observe odour. The following sources were identified as being potentially significant and requiring further investigation or action:

- PSTs
- Bypass channel grills
- SCTs
- Biofilter 1
- Dewatering building

The following sources were found to be relatively minor or insignificant odour contributors during the site visits:

- Oxidation ponds
- Aerated tanks and clarifiers
- Dewatered sludge stockpile (although odour from this was masked by odour from the PSTs)
- Sludge drying building and biofilters (although only operating in reduced throughput)
- Biofilter 1 fan and inlet ductwork
- Trickling filter structures

5. Proactive Odour Monitoring To Date

Odour monitoring outside the plant boundary has been conducted by Jacobs on an informal basis at various times since April 2022. However, proactive odour monitoring in the form of field odour assessments (FOAs) for the CWTP had not been carried out by Jacobs on a formalized basis prior to February 2024. The main reasons for this are two-fold:

1. Informal odour scouting by Jacobs had found that it was difficult to time odour surveys with when meteorological conditions were poorest for dispersion, because of the time of day when these conditions occur (typically at and after sunset, or overnight).
2. Surveying only captures small snapshots of odour beyond the site boundary at a time, and a finding of "no odour" on a particular occasion does not mean odour was not present at other times of that day.

Following discussions with CCC, Jacobs has conducted FOAs on 26th February, 29th February and 5th March. These FOAs have confirmed that the odour found beyond the plant boundary was of a character consistent with odour sources at the CWTP (in particular primary treated wastewater), and was noticed at strongest intensity when the observer was directly downwind of the PSTs and SCTs area. The FOAs also found a weaker odour from the oxidation ponds noticeable in some locations that were not also downwind of the CWTP.

6. Odour Mitigation Recommendations

The H_2S monitoring conducted at the CWTP since 30th January, the site visits conducted by Jacobs to the CWTP on 29th January and 26th February, and the proactive odour monitoring conducted on 26th February to 5th March all confirm that odour currently being reported by the community beyond the site boundary appears to be coming primarily from sources within the CWTP in the general area occupied by the PSTs and SCTs which includes the following sources:

- PSTs
- Bypass channel grills
- SCTs
- Biofilter 1

Jacobs conducted further discussions with CCC about the operation of the various processes, and identified that the following processes are also potential odour sources:

- Sludge dewatering building and the dewatered sludge stockpile,
- Digesters, and
- Screenings room.

CCC has identified a mitigation action plan to address the odour emissions from each of these sources, with support and input from Jacobs. Jacobs considers that the mitigation measures proposed in the action plan are likely to significantly reduce the risk of offensive and objectionable odour being experienced by local residents based on the current CWTP operational status. The action plan includes Jacobs' engagement to conduct detailed investigation of process operation and optimisation, which will progress over the coming months and may result in further tasks being added to the mitigation action plan in future.

Jacobs also notes that many of the current issues with odour emissions are intrinsically linked to the temporary process configuration of the CWTP and the lack of resilience and redundancy in wastewater treatment capacity until the trickling filters are restored. The mitigation action plan will need to be regularly reviewed to assess progress and adjust to other operational challenges that may arise.

7. Odour Monitoring Recommendations

A proactive odour monitoring campaign can be helpful to benchmark the existing extent of odour plumes extending beyond the CWTP boundary, and assess the observations in conjunction with the H_2S monitoring data and Smelt-It records. This could then be repeated at future times after various stages in the mitigation action plan has been completed, to monitor the extent of reduction in odour within the community.

Jacobs recommended to CCC, and has been engaged by CCC to implement a short-term proactive odour monitoring campaign to be carried out in the streets around the CWTP over March 2024, with the following objectives:

a. Main purpose is to observe the intensity of odour at the plume centreline at varying distances downwind of the CWTP.

b. Target 2-3 surveillance rounds per week for a 4-week period, although this target could vary depending on the results of the surveys.

c. Surveys to be conducted during daylight hours for the safety of the personnel involved.

d. The timing of each surveillance round should depend on meteorological forecasts to match conditions where Smelt-It records and H_2S monitoring indicate higher likelihood of odour presence.

e. Recording of observations to follow broadly the methodology used by CCC for odour surveying near the Organics Processing Plant, combined with the EPA Victoria recommendations for odour surveillance (EPA Victoria Publication 1881) where appropriate for the purposes of this monitoring campaign.

Jacobs also recommends that a request be made to ECan for access to the Smelt-It real time data service, so that reports of odour can be accessed in real time and surveillance mobilized in response where practicable.

Tracy Freeman
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Appendix C

Location	Problem/issues	Actions	Progress	Term (Long/medium/short)
Digester	Biogas has been identified as being emergency released to atmosphere through the pressure release valves on top of the digesters, which has potentially compounded the overall odour issue through the increased H2S concentration in the biogas following the change in sludge composition post-fire	Undertake a proactive maintenance schedule to regularly clean the pressure release valves to minimise the amount of biogas being released, by enabling the valves to re-seat cleanly following biogas discharges	Started & on-going	Short to Long-term
Inlet Screen Room	Post-fire, the air extraction system in the inlet screen room had to be modified due to the loss of the conveyance system in the fire. This has also been compounded by lower sewer flows over the summer that has resulted in more anaerobic sewerage being conveyed from the reticulation, resulting in elevated H2S in the inlet screen room. To meet the new H&S regulations on H2S exposure additional ventilation is required	Temporary ventilation system has been installed to minimise worker exposure to H2S as per the new regulations	Started & on-going	Short to Medium Term

Odour Control System	The trickling filters, inlet screen room and grit tanks were served by a common odour control system. Following the fire, the system is now not as optimal as it was pre-fire as it is operating away from its original design parameters (e.g. the trickling filters fan room and pipework were destroyed in the fire and are no longer part of the odour control system)	The odour control system had two fans which were set-up as a duty-standby arrangement. The system was modified to enable both fans to operate simultaneously.	Complete	Short-term
Oxidation Ponds	The surface aerators on the Oxidation Ponds have had a number of reliability and performance issues	Staff are working closely with the contractor to ensure the pond aerator reliability improves and that all aerators are available to be operated at the maximum design capacity	Started & on-going	Short to Long-term
Primary Settlement Tank	Lower sewer flows over the summer have resulted in more anaerobic sewerage being conveyed from the reticulation, resulting in more rapidly anaerobic conditions occurring in the primary settlement tanks. This has also resulted in significant accumulation of odourous scum occurring on the top of the primary settlement tanks	Site staff to undertake scum removal daily through manual hosing down.	Started & On-going	Short-term

		Assessed whether contractor could be used to remove the scum utilising specialist machinery. We concluded that it could be done but that it would not be effective in reducing the amount od scum in the tanks, as it would be fed back into the system.	Complete	Short-term
		Assess whether contractor could be used to assess and install an odour containment spray system – we are still investigating this.	Started & On-going	Short to Medium Term

		Reduce the number of primary tanks in service to minimise the retention time of sewage in the tanks, whilst remaining within the design specification of the tanks to enable sufficient primary tank treatment.	Complete	Short-term
Temporary Secondary Treatment	The temporary activated sludge plant underperformed over the summer period.	Consultant has been engaged to review the design parameters and provide operational and troubleshooting documentation	Started & on-going Project initiated (18-week duration)	Medium-term
		Consultant has been engaged to review the system and provide optimisation opportunities	Started & on-going Project initiated (18-week duration)	Medium-term
Trade Waste	Trade waste is generally more organically loaded, resulting in a higher loading being placed on the treatment plant. Higher TradeWaste loads can result in more anaerobic conditions and the generation of odours	Continuously proactively liaise with the trade waste team to ensure the trade waste discharge is within the treatment capability	Started & on-going	On-going
Wastewater Treatment Plant	Treatment Plant Odour	Engage odour consultant to undertake an intensive on-site odour investigation to identify the sources of odour	Started & on-going	Medium/Long-term

Short-term = up until 30th June 2024
Medium-term = 1st July 2024 to 30th June 2025
Long-term = beyond 1st July 2025

Appendix D

Location	Problem/issues	Actions	Progress	Term (Long/medium/short)
Digester	Biogas has been identified as being emergency released to atmosphere through the pressure release valves on top of the digesters, which has potentially compounded the overall odour issue through the increased H2S concentration in the biogas following the change in sludge composition post-fire	There is already a Biogas project to upsize the biogas conveyance pipework system to reduce the emergency release of biogas to atmosphere via the pressure release valves.	Detailed design completed and progressing to the tender stage	Long-term
Inlet Screen Room	Post-fire, the air extraction system in the inlet screen room had to be modified due to the loss of the conveyance system in the fire. This has also been compounded by lower sewer flows over the summer that have resulted in more anaerobic sewerage being conveyed from the reticulation, resulting in elevated H2S in the inlet screen room. To meet the new H&S regulations on H2S exposure additional ventilation is required	A new permanent ventilation system is required to be installed to minimise worker exposure to H2S as per the new regulations. This is being incorporated into the permanent trickling filter replacement project	On-going	Long Term

Odour Filter No.1	The odour filter was partially through a renewal when the fire occurred, so only half the bed media was replaced.	Work is underway to engage a contractor to renew the remaining bed media	On-going	Medium-term
Primary Settlement Tank	Lower sewer flows over the summer have resulted in more anaerobic sewerage being conveyed from the reticulation, resulting in more rapidly anaerobic conditions occurring in the primary settlement tanks. This has also resulted in significant accumulation of odourous scum occurring on the top of the primary settlement tanks	Improve the automatic water spray scum removal installation by increasing the water supply in the treatment plant, to allow the scum removal system to operate across all tanks at once, as opposed to in turn	Request made to asset management and planning team	Long-term
		Assess whether contractor could be used to assess and install an odour containment spray system	Currently engaging with contractor	Short to Medium Term

		Cover chambers where there is significant surface disturbance (e.g., primary bypass and secondary return).	Cover to be made	Short-term
Sludge Dryer	Sludge dryer has experienced a number of reactive maintenance issues resulting in downtime and temporary sludge accumulation outside before the wet biosolids can be removed from site.	The sludge dryers require an extensive maintenance overhaul following their installation 12 years ago.	Project scope has been completed and funding has been approved for next financial year	Medium-term
Oxidation Pond	During the Summer to winter transition, the biology of the pond changes, which in the previous year had generated odour.	Develop Standard Operation Procedure (SOP) to minimise the potential for odour generation during this transition.	SOP to be developed	Short-term

Short-term = up until 30th June 2024
Medium-term = 1st July 2024 to 30th June 2025
Long-term = beyond 1st July 2025