



1 October 2025

Brittany Watson  
Consents Planner  
Otago Regional Council  
Private Bag 1954  
**DUNEDIN 9054**

Email: [Brittany.watson@orc.govt.nz](mailto:Brittany.watson@orc.govt.nz)

Dear Brittany

## **WASTE MANAGEMENT NZ LIMITED – FAIRFIELD CLOSED LANDFILL APPLICATION (RM24.098) RESPONSE TO TECHNICAL REVIEWS**

### **1.0 Introduction**

Waste Management NZ Limited, now WM New Zealand (WM), lodged a resource consent application with Otago Regional Council (ORC) on 28 February 2024. The application sought four resource consents to authorise discharge and take activities at the Fairfield Closed Landfill (the site, the landfill or the closed landfill) during the landfill's aftercare period. The consents being sought are to replace existing resource consents 95008 and 93540 to 93542.

Following lodgement of the application, and in response to ORC's section 91 Deferral Letter and a subsequent section 92 request for information, three additional resource consents are also being sought. The three additional resource consents are a land use consent and water permit, to authorise the potential 'defence against water', and a land use consent to install an additional landfill gas monitoring well.

On 15 July 2025, WM received four technical reviews prepared by SLR on behalf of ORC as part of the processing of the consent applications. The following technical reviews were provided:

- ✧ *RM24.098 – WM New Zealand, Fairfield Closed Landfill Natural Hazards & Climate Change Technical Peer Review; Dated 15 July 2025. Prepared by SLR.*
- ✧ *RM24.098 – WM New Zealand, Fairfield Closed Landfill Groundwater Technical Peer Review, Dated 11 July 2025. Prepared by SLR.*
- ✧ *RM24.098 – WM New Zealand, Fairfield Closed Landfill Surface Water Technical Peer Review, Dated 11 July 2025. Prepared by SLR.*
- ✧ *RM24.098 – WM New Zealand, Fairfield Closed Landfill Ecology Technical Peer Review, Dated 11 July 2025. Prepared by SLR.*

A subsequent meeting was held between ORC, WM and SLR (author of the surface water technical review only) on 7 August 2025 to clarify aspects of the technical review documents and to identify additional information that WM undertook to provide to ORC. Following this meeting, follow up correspondence

regarding the definition of stormwater, relevant regional plan rules and subsequent confirmation of the stormwater discharge permit being applied for in accordance with the application took place. The outcome of this correspondence is provided under the heading 'Surface Water' below.

This letter contains a 'collated response' to the SLR technical reviews and where applicable additional information has been provided. While the response is WM's response, it is noted that WM, PDP and Planz have had input into the various responses.

## 2.0 Technical Review Response

### 2.1 Ecology

A review of the comments in the technical assessment completed by SLR indicated that they were satisfied with the ecological assessment undertaken, including the additional information provided in the subsequent 'Fairfield Landfill Ecological Assessment' (PDP March 2025<sup>1</sup>) that was provided, and SLR noted that they consider this assessment gives a good understanding of current baseline conditions. This was the intention of the subsequent assessment completed by WM.

Responses to the SLR's assessment, where a response was considered necessary, are provided below. It is noted that a response has not been provided to each question and associated assessment matter as in some cases the author of the technical review was satisfied with the information already provided by WM.

#### **Q46: Do you agree with the assessment of the overall ecological values for the Kaikorai Wetland-Estuary complex and the Kaikorai Stream and Christies Creek, and Coal Creek? Why/why not?**

The author has commented that the assessment did not discuss cumulative effects. However, the author also indicated that as the landfill is now closed with no new direct ecological impacts, cumulative effects are not a significant consideration for flora or fauna. The author was happy that the monitoring being proposed will determine any cumulative impacts on sediments and surface water quality.

#### **Q47: The Applicant has not concluded what the effects will be on ecology. In your opinion, is there any further investigations/ testing that could be completed to be able to conclude the actual and potential effects on ecology? Please be specific with your answer.**

The author did not directly answer this question, but states the ecological assessment provides suitable baseline data to assess flora and fauna in the receiving environment to track any changes over time. On this basis it is assumed that no further investigations are being recommended by the author.

The environment that the landfill is located is very complex with a number of land use activities in the wider catchment contributing to the degraded state of the estuary. Determining the effects of any leachate from Fairfield Landfill on the ecology in such a complex environment is difficult and this has been recognised by SLR. There is agreement that the baseline data can be used to track any changes to the flora and fauna in the receiving environment and assess whether leachate is having ongoing or more importantly increasing impact on the species present. It is important to recognise that leachate generation within the landfill will decrease overtime and with that thus there is a reduced potential for adverse ecological effects. Decreases of key leachate parameters within the leachate interception system are already being observed and this is expected to continue.

#### **Q48: Is the proposed monitoring programme appropriate for establishing baseline conditions for Ecology? Please include reference to the appropriateness of the location, parameters and frequency. (Groundwater, Surface Water and Landfill Gas Monitoring Plan- Appendix 1).**

---

<sup>1</sup> Fairfield Landfill Ecological Assessment, March 2025, PDP.

The author observed that the proposed monitoring programme varied between what was submitted as part of the original consent application, and the subsequent ecological assessment (PDP March 2025) (and thus the updated consent conditions, dated 13 June 2025, which have been updated to reflect the recommendations of this later assessment).

The author commented that they are supportive of the proposed conditions which require that ecological, surface water and groundwater monitoring continue, for at least 2 years, unless the environmental monitoring data shows that the risk of adverse effects from leachate is minimal, and monitoring can be reduced or ceased at that time (Condition 19 of the water permit). This is part of WM's adaptive monitoring approach where the monitoring programme will be reviewed every 2 years and adjusted, as necessary, based on the risk of adverse effects of the landfill as opposed to purely undertaking monitoring for the purposes of meeting a consent condition. At such point that there is at least 2 years of data showing that the risk of adverse effects from leachate is minimal, a decision to reduce or cease monitoring will be made through a certification process with ORC. However, if the criteria outlined in Condition 19 has not been met then monitoring cannot be reduced or cease in accordance with this proposed condition.

**Q49: Does the monitoring programme or after-care plan have clear thresholds for when correction actions are required? If so, are these thresholds appropriate?**

**Q50: Should adverse effects on ecology be observed through the monitoring programme, are the proposed correction actions appropriate to address adverse effects? (Aftercare Management Plan, Appendix 2).**

Questions Q49 and Q50 both relate to the absence of any threshold levels to action corrective actions in the Aftercare Management Plan (AMP) to address any potential ecological effects on flora and fauna. The proposed AMP does state that corrective action will occur if an 'adverse change' is identified, however, there is uncertainty as to the definition of 'adverse change'. In response to this WM has developed a set of trigger levels and action responses. This is presented in Appendix 1 and will be incorporated into a future updated AMP.

The proposed trigger levels have focused on total ammoniacal nitrogen as the key indicator parameter. This is recognised in the industry as one of the key indicators for leachate and has been shown to be statistically significant in the existing monitoring dataset. It is proposed that the trigger levels are set for short-term spikes and long-term trends for groundwater monitoring results, and short-term spikes are used for surface water monitoring.

It is considered that the monitoring programme, and associated trigger levels, will provide effective oversight of potential adverse ecological effects.

**Q51: Has the Applicant proposed appropriate adaptive management and remedial measures to enable adverse effects identified through monitoring to be addressed?**

The author agreed with the approach of following an adaptive monitoring programme, where monitoring will reduce as a decrease in discharge of contaminants is recorded over time. However, they also commented that if a reduction in contaminants is not observed then corrective measures should be integrated into aftercare management. The reduction in leachate concentrations and therefore reduction in risk will take a number of years to eventuate so there is no intention to apply corrective actions if a reduction of contaminant levels does not occur. Corrective actions, as discussed above in response to Q49 and Q50 (and the AMP procedures contained in Appendix 1 of this document), would only be looked at if there was an adverse change in risk identified to human health and/or the environment (including as a result of climate change). Based on available information for this landfill, and knowledge gained from

working in the industry, it is expected that leachate concentrations will reduce over time (rather than increase). The landfill is closed and is not accepting of any additional waste material.

**Q54: Is the proposed consent conditions appropriate (updated Appendix 8)? If not, please state why.**

The author commented that the conditions proposed for ecology are sufficient to ensure that potential impacts on these are monitored. There was reference to applying trigger levels and response actions to manage any observed effects. WM have responded to this with a proposed trigger level for TAN as an indicator parameter for leachate impacts rather than an ecological trigger level (refer Appendix 1 of this document). Contaminant levels are considered to be more immediate indicator of adverse effects potentially being associated with the closed landfill. The response actions are not specific, rather it triggers a requirement for an investigation to be carried out and based on the outcomes of that assessment remedial works/mitigation measures will be implemented, if required and deemed necessary, based on an increased risk to human health and/or the environment being identified. Having specific response actions for particular scenarios are not favoured by WM as this restricts the mitigation measures that can be implemented and is a one-dimensional approach, particularly as technologies change over time. It is important that the consent conditions and AMP follow an adaptive approach and flexible enough to stand the test of time.

## **2.2 Natural Hazards & Climate Change**

A review of the technical assessment completed by SLR indicates that the Natural Hazards Report has adequately identified the primary risks associated with natural hazards and climate change. The primary comments raised relate to the risks in relation to the increased annual rainfall/change in flood flows/sea level rise/storm surges/king tides, and that WM are proposing to undertake an assessment/modelling, in accordance with a proposed 'Mitigation – Effects from Climate Change' consent condition (Conditions 20 and 21 of the water permit), within 2 years of consent being granted, as opposed to undertaking this assessment now.

Responses to the SLR's assessment, where a response was considered necessary, are provided below. It is noted that a response has not been provided to each question and associated assessment matter as in some cases the author of the technical review was satisfied with the information already provided by WM.

**Q56: Are the proposed mitigation measures to reduce adverse effects due to the effects of natural hazards reasonable/ appropriate? Why/ why not?**

The author summarised the main hazards and the proposed mitigations as outlined in the Natural Hazards Report. This included periodic surveillance to monitor change, which would action a response, as well as undertaking an assessment, within 2 years of the consent being issued, to determine whether any climate change mitigation measures are required (Conditions 20 and 21 of the water permit). The author indicated from a technical perspective they do not have any concerns with the proposed timeframes, but noted that the ORC should have the opportunity to review and approve the report and that any mitigation measures may require their own consent. The author also mentioned that an adaptive management response to climate change would be appropriate.

WM are intending to follow an adaptive management approach, which is particularly relevant for climate related changes given the uncertainty of change being predicted and modifications over time as more data on climate change becomes available. WM acknowledge that the assessment / modelling required by Condition 20 would be provided to the ORC, and if the identified outcome was the proposed 'defence against water' for which resource consent has now been sought, the revised condition wording provided in s92 request (dated 6 June 2025) (and the updated consent conditions dated 13 June 2025) requires the design and construction methodology to be provided to ORC for certification. It is also acknowledged that

some mitigation measures may also trigger additional consenting requirements, beyond those now being sought as part of this application. The purpose of including the assessment in 2 years' time was to show intent that climate change risks will be assessed and mitigation measures implemented, as and when required. This is further discussed in some of the questions below as it was a common theme in the comments from SLR.

**Q57: In your opinion, has the potential landslide risk been addressed adequately?**

The author commented that the risk of slope stability will be addressed by completing a slope stability assessment within 2 years of the consent being issued and every 5 years thereafter (as per Condition 5 of the discharge permit to discharge landfill leachate). Whilst satisfied with the timeframes and methodology proposed, the author recommended that the assessment is completed for the entire landfill and not just the Eastern Landfill as originally proposed by WM. While noting that the greater risk in terms of slope stability is associated with the Eastern Landfill, WM are happy to undertake the slope stability assessment of the entire landfill area being consented provided the physical extent of where the assessment is to be undertaken is clearly defined in the consent conditions.

The author suggested that additional wells be installed within the centre of the landfill to assist with understanding leachate levels in the landfill to support the slope stability assessment. WM do not agree that additional monitoring wells are required within the landfill areas. It is acknowledged that some of the original wells have been destroyed during the filling of the landfill, but the monitoring wells that are remaining, and which are still accessible, are considered adequate for the purposes of understanding leachate levels. The greatest risk of slope instability is associated with the Eastern Landfill given the height and shape of the landfill. However, based on the shape of this landfill (dome) and fact that this landfill area has been adequately capped to minimise rainfall entering the landfill, large leachate level increases that could cause slope stability issues would be very unlikely. Installation of wells within the main landfill mass is difficult as you are drilling directly through waste and such wells have the potential to be damaged over time through settlement processes. WM do not consider that the installation of wells through the middle of the landfill would provide any extra information beyond that already being provided by the current wells.

**Q60: Are there any other matters that appear relevant to you that have not been included? Please specify what additional info you require and why? Please explain why.**

The author commented that the Natural Hazard Report provides a long list of recommended actions related to landfill surveillance inspections that have not been included in the AMP. WM considers that the proposed conditions address all of the actions and surveillance inspections identified in the 'Natural Hazard Report'. However, once consent is granted, and as stated in the draft AMP, the AMP will be updated to address all consent requirements.

**Q61: Are the proposed consent conditions appropriate (updated Appendix 8)? If not, please state why.**

The author commented that Conditions 20 and 21 (water permit) just requires the consent holder to prepare the report but there is no process for ORC to review and make the decision of whether to accept it. WM have already addressed this concern in its section 91 Deferral Letter (dated 10 March 2025) whereby a proposed condition, to be attached to the land use consent for the 'defence against water', provides for certification, by ORC, of the design and construction methodology associated with any such structure (refer to the 13 June 2025 version of the updated consent condition). This is further commented on by the author in Q67.

WM acknowledges that there is an element of uncertainty to the actual physical 'defence against water' that may be constructed. However, WM considers that the proposed conditions ensure that the ORC

retains appropriate oversight and confidence in the final outcome, and this will appropriately manage any uncertainty and ensure environmental and planning outcomes are upheld.

**Q63: The Applicant has proposed a condition of consent which requires the design, including a description of the construction methodology and timeframes, and an assessment and / or modelling of the effects of the associated surface water diversion, to be provided to the ORC, for certification, prior to any construction works commencing. In your opinion, is this an appropriate approach to manage potential adverse effects?**

**Q64: Do you agree with the Applicant assessment of adverse effects as result of the water diversion and construction of a defence against water associated with the increase in the height of the road perimeter? (See AEE in s91 Deferral Letter). Has the applicant identified what the potential adverse effects are and who might be affected by these?**

**Q65: Is the technical information provided in support of the application robust, including being clear about uncertainties and any assumptions? Yes, or no. If not, what are the flaws?**

Questions 63, 64 and 65 relate to the additional resource consents now being sought in response to the section 91 Deferral Letter to construct a ‘defence against water’. As WM has stated in the section 91 Deferral Letter, and the subsequent section 92 RFI Response (dated 6 June 2025), the resource consents that ORC’s section 91 Deferral Letter required WM to seek will only be implemented if the required modelling / assessment (as outlined in Conditions 20 and 21 of the water permit) recommends that raising the height of the perimeter road (and / or any associated armouring) is the best practicable option to mitigate future climate change (and natural hazards) risks on the closed landfill. As stated in these letters to the ORC, WM considered that any required resource consents could be applied for once the modelling / assessment required by Conditions 20 and 21 of the water permit had been completed. However, WM were required, by way of the s92 Deferral Letter, to seek the two additional resource consents for the potential ‘defence against water’.

The author states that the approach proposed by WM, as reflected in the updated consent conditions (dated 13 June 2025), which is to describe the methodology and modelling of the effects in accordance with the proposed conditions of the consents, means that SLR are unable to assess what, if any effects, may occur. Therefore, the author cannot make an assessment at this time.

WM’s position remains consistent with the information provided in the section 91 Deferral Letter and the section 92 RFI Response. That is that the results of the modelling / assessment will dictate the nature of any mitigation measures, which may or may not be the ‘defence against water’ for which resource consents have been sought (i.e., raising the height of the perimeter access road). Being required to model and assess the effects of any potential associated surface water diversion arising from the ‘defence against water’, when the activity itself may or may not proceed, and even if it does proceed where it has not been designed, is considered onerous and inappropriate at this point in time. The updated consent conditions proposed in the section 92 Response, and subsequently provided in the updated set of consent conditions (13 June 2025), allows for the assessment and/or modelling of the effects of the ‘defence against water’ to be constructed to be provided to the ORC for certification prior to any construction works commencing. This provides ORC with the opportunity to approve the proposed design of the ‘defence against water’. WM recognise that this does not allow a comprehensive assessment of effects to be undertaken at this time, but WM also considers that the preliminary effect assessment (refer to the section 91 Deferral Letter), given the nature of the area and the conceptual nature of the ‘defence against water’ for which consent is being sought, appropriately identifies the nature of potential effects associated with the activity. Being tied to a certain ‘consented’ design would be limiting and could result in a variation having to be sought in the future causing further delay and a costly process.

**Q67: If granted, are there any specific conditions that you recommend should be included in the consent beyond what the applicant has proposed**

The author commented that if the consent was granted which required assessments and reports to be issued as part of the resource consent that they are required to be signed off or certified by ORC before being accepted. The updated consent conditions provided in the section 92 Response (and the updated consent conditions dated 13 June 2025) includes provision for certification by ORC, so WM consider that this recommendation is already being met.

**2.3 Groundwater**

A review of the comments in the technical assessment completed by SLR indicated that the groundwater quality assessments provided provide a reasonably thorough assessment of the current state of groundwater quality beneath and in the vicinity of the closed landfill.

There were however some comments and questions that warrant a response from WM to provide clarity and assist in the processing of the consent. These are outlined below.

**Q2: Do you agree that the average mass discharge of TAN (Total Ammonia Nitrogen) indicates the interception drainage system is intercepting roughly between 95.4% and 99.4% of the leachate being generated? If not, please detail why.**

The author agrees with the approach taken by PDP to calculate the mass discharge.

However, the author also commented that there is uncertainty of this rate when the leachate pump station is not operating. WM acknowledge that the pumping station is an integral part to the operation of the leachate control system at the site. Improvements to the pump station reliability are being undertaken by WM to address this and is discussed in more detail under Q6 below.

**Q4: The Applicant has not concluded what the effects will be on groundwater quality. In your opinion, is there any further investigations/ testing that could be completed to be able to conclude the actual and potential effects on groundwater quality? Please be specific with your answer.**

The author commented that the groundwater quality assessments provided provide a reasonably thorough assessment of the current state of groundwater quality beneath and in the vicinity of the closed landfill. The author recommended that a one-off repeat of the estuary/wetland investigation carried out in 2012 be undertaken. Given the proposed monitoring programme is now incorporated into the proposed consent conditions WM does not consider that repeating this investigation is relevant or required.

**Q5: Have the cumulative effects on groundwater quality been adequately addressed?**

The author commented that the application does not specifically address cumulative effects on groundwater, but provides information to show that cumulative effects are not critical to know as the landfill will be having a significantly greater effect on groundwater quality downgradient of the landfill than any of the other surrounding land uses. WM acknowledges that the landfill is causing an effect on groundwater quality directly beneath and in the immediate vicinity of the site. However, other land uses across the wider catchment area are likely also contributing to the overall groundwater quality entering the estuarine environment. Determining the relative contributions of these sources is highly complex, particularly given the limited number of monitoring wells and the lack of comprehensive data for the wider area.

**Q6: Is the proposed management of the interception system appropriate? Noting the Applicant has had recent issued with pump failures.**

The author commented that the management of the current leachate pumping system is not adequate in relation to the pumping system unknowingly failing for long periods of time, alarm systems not working and inspection schedules inadequate. The author also commented that the collection of data is too manual, and the system lacks redundancy.

WM acknowledge the critical nature of the pump to the operation of the leachate system to maintain a depression in the phreatic zone. The leachate system is equipped with a single pump, however, a second pump is kept on standby allowing WM to swiftly replace a pump in the event of a critical failure. These pumps can also be exchanged proactively during the six-monthly service checks. Currently, the system includes an alert feature that sends text messages to WM technical staff at the nearby Green Island Landfill. However, this alert system lacks remote real-time monitoring capabilities. WM recognise the limitations of this system without a permanent presence on site and plans to enhance this monitoring and reporting system by upgrading to a proactive solution, such as a SCADA system or a similar technology as part of the closure management and monitoring plan. WM are currently in discussions with a supplier for the design and installation of an appropriate system. These improvements will significantly enhance the reliability of the system. The integration of telemetry enables continuous monitoring and data collection, not only improving operational oversight and reporting, but also providing valuable diagnostic information in the event of a system failure. This data will support faster identification of issues / failures, inform future design improvements, and strengthen the system's overall resilience.

**Q8: In your opinion, are there any other additional measures that could be adopted to improve leachate interception?**

The author commented that they support the recommendation by PDP relating to remedial works on the laterals within the leachate interception trenches feeding the manholes. WM would like to clarify this, any remedial works on the laterals would only be undertaken on an 'as required basis'. The effectiveness of the laterals is regularly being assessed as part of the water level monitoring programme and has been effective to date to determine when these laterals require remediation. The methodology adopted has been successful to date. In addition, it is noted that proposed Condition 2 of the water permit requires the leachate management system to be operated, and maintained, in a manner that ensure effective management of the leachate system, which includes the lateral drainage network.

The author also commented that they supported the recommendation to raise the perimeter access road, and pump chamber, so that the leachate system is not affected by high estuary levels. This will form part of the outcome of the modelling / assessment being proposed to be undertaken as a consent condition (Conditions 20 and 21 of the water permit).

**Q10: Is the proposed monitoring programme appropriate for establishing baseline conditions of leachate composition, efficiency of the interception system and groundwater quality? Please include reference to the appropriateness of the location, parameters and frequency. (Groundwater, Surface Water and Landfill Gas Monitoring Plan- Appendix 1).**

The author commented that the monitoring programme has been in place for some time and has already provided sufficient data to allow baseline conditions to be determined. However, the author provided the following recommended amendments to the plan (WM responses in *italics*).

Locations:

- ✧ Add an additional upgradient well to the west of the eastern landfill. Currently there is only 1 upgradient well which is insufficient. *WM do not consider that an additional upgradient well will provide any additional data to what is already being captured. There are no upgradient sources that we are currently concerned with.*

- ✧ Investigate feasibility of installing an in-landfill monitoring well to measure leachate head (replacement for well LS4). *Installing wells within a landfill are difficult to achieve both from an installation perspective and in terms of maintaining an operational well through settlement and movement. Furthermore, the Eastern Landfill has been capped so any changes to leachate levels are expected to be relatively minor. WM do not consider that an additional well in the landfill will provide any additional data to what is already being captured.*

Frequency:

- ✧ The Plan recommends water/leachate levels within EPS42 are recorded with a transducer and download quarterly. Given that the water level in EPS42 is an indication of pump and leachate trench performance, these should be telemetered and form part of the alarm system. *WM are looking to upgrade the monitoring system of the leachate pump with a SCADA system or similar technology (refer Q6). Including telemetry of the water level data can be easily included into that system.*
- ✧ The Applicant proposes to reduce the monitoring frequency from quarterly to six-monthly for groundwater (leachate interception drain wells and wells outside of the landfill). Given that there has been no discernible improvement in off-site groundwater quality, I don't think this is justified and the status-quo (quarterly) should remain in place. *The reason that monitoring frequency was proposed to be changed from 3-monthly to 6-monthly was as a result of the fairly consistent monitoring data over time. A good time series data set has been obtained, and continuing to obtain data at the same frequency will provide little additional information as the rate of change over time has been shown to be relatively low. Surface water monitoring will continue on a 3-monthly basis as this is more responsive and variable to change.*
- ✧ I also note that leachate quality in EPS42 is only required annually. In 2024, because the pump was not operating, the sample was not representative. I recommend that a requirement for re-sampling is incorporated into the monitoring plan. *WM accepts this recommendation and this will be incorporated into the monitoring plan. It is important that the quality of the leachate is monitored over time, and the sample collected when the pump was off was not considered representative. This is more important when it is only sampled annually.*

**Q11: Does the monitoring programme or after-care plan have clear thresholds for when correction actions are required? If so, are these thresholds appropriate?**

**Q12: Should adverse effects be observed through the monitoring programme, is the proposed Contingency and Response Guidelines appropriate to address adverse effects?**

**Q13: Has the Applicant proposed appropriate adaptive management and remedial measures to enable adverse effects identified through monitoring to be addressed?**

Q11 – Q13 relate to applying triggers or proposed corrective actions in the Monitoring Plan. In response to this WM has developed a set of triggers levels and action responses to an exceedance. This is provided in Appendix 1 to this document. As stated within the appendix, the proposed procedures will be incorporated into the updated AMP which will be prepared after the grant of the resource consents being sought.

**Q16: Are the proposed consent conditions appropriate (updated Appendix 8)? If not, please state why.**

The author provided the following comments regarding the consent conditions (WM responses in *italics*).

Water Permit – Take of Groundwater Containing Leachate and Other Groundwater:

- ✧ General: requires a reference to the proposed monitoring protocol. Suggest that this is in accordance with NEMS and undertaken by a suitably qualified person. *WM would be happy to include this into the conditions. It is considered that this addition, or rather further refinement of the proposed conditions, will occur as part of the processing of WM's application.*
- ✧ General: Requires a link back to Appendix I: Monitoring Plan. *WM would be happy to include this into the conditions. As noted above, this addition, or rather further refinement of the proposed conditions, will occur as part of the processing of WM's application.*
- ✧ General: requires a new condition addressing trigger levels for action, or link to it in the Monitoring Plan. *The use of trigger levels has been adopted by WM and as outlined in response to Q11 – Q13 above, the proposed procedures (as provided in Appendix 1 of this document) will be incorporated into the updated AMP which will be prepared after the granting of the resource consents being sought.*
- ✧ Condition 2: I recommend addition of an advice note, or further clause that requires redundancy in the pumping system to be implemented within 6-months. *WM's intention is to make improvements to the pumping system soon so the inclusion of such an advice is considered unnecessary. Also, as noted above in response to Q8, Condition 2 of the water permit requires the leachate management system to be operated, and maintained, in a manner that ensure effective management of the leachate system.*
- ✧ Condition 4: Frequency of inspection of the leachate system to be weekly, unless a reliable telemetered monitoring and alarm system is installed, with redundancy in alarm triggering. *The installation of a SCADA system or a similar technology would address this concern as it would be continuously monitored.*
- ✧ Condition 10: EPS42 level monitoring should be telemetered and form part of the alarm system. The advice note here is not consistent with the requirement to maintain a groundwater level depression within the interception drain system. *The installation of a SCADA system or a similar technology would address this concern as it would be continuously monitored.*
- ✧ Condition 15: Increase monitoring frequency to quarterly. *As outlined in Q10 above, the reduction in frequency from 3-monthly to 6-monthly was associated on the relatively low rate of change observed to date. Increasing the frequency would provide little benefit over time.*

**Q38: The Applicant has undertaken a potholing exercise and has subsequently provided information on the cap over the Western Landfill (s92 response, Q:10 &11). Is the cap depth appropriate to reduce leachate generation? If not, do you recommend any changes to the existing cap?**

The author states the cap depth provided was generally commensurate with the minimum landfill final cap specified in Consent 95007 of 600 mm capping and 200 mm topsoil. However, no supporting information has been provided including the density of potholes and the material properties of capping materials (visual observations, in-situ permeability testing, and/or laboratory testing).

WM notes that the capping on the Western Landfill was not subject to minimum landfill capping requirements of Consent 95007, as this consent authorised the discharge of waste material at the then operational Eastern Landfill (and subsequent closure activities). This consent did not apply to the Western Landfill which closed in 1996.

In relation to the potholing exercise undertaken at the Western Landfill, WM further advises that a total of ten potholes were excavated across the Western Landfill and this exercise identified a consistent cap

thickness of approximately 600 mm. While the material quality varied slightly between locations, it generally aligned with expectations for a cap constructed during the period of landfill closure (1996).

WM further advises that due to budgetary constraints, permeability testing has not been undertaken. However, based on visual inspection and contextual understanding of the cap's composition and construction era, it is the WM's professional opinion that the cap provides adequate protection against stormwater ingress into the Western Landfill.

## 2.4 Surface Water

In relation to stormwater considerations at the site, SLR raised issues in relation to management of 'stormwater' across both landfill areas. This matter was discussed further, in terms of what is overland flow and what constitutes the discharge of stormwater from the site in terms of the resource consent being sought, at the meeting on 7 August 2025. Following further discussions after the meeting between Planz and ORC, ORC confirmed that it is the stormwater discharges from the North and Weighbridge Ponds, not any overland flow, that are subject of this application.

In this context, many of the issues raised by SLR in its assessment are not relevant to the application and therefore a response has not been provided. However, in terms of the matters that remain relevant (i.e., where they relate to the discharge from the ponds), a response to relevant question assessments has been provided below.

### **Q19: Is the proposed stormwater management of the Eastern and Western landfill appropriate?**

The author commented that the stormwater management for the Eastern Landfill would be appropriate if the cutoff drain that was installed on the southern slope of the landfill was directing stormwater to the Weighbridge Pond. As stated above, the stormwater permit being sought by the application is for the two point source discharges; the 'North Pond' and 'Weighbridge Pond'. These are remnants of the infrastructure associated with the operational landfill where runoff from the operational areas would be directed and the discharge controlled, including allowing samples to be collected to monitor quality. Now that the landfill is closed and capped, the requirement for capturing discharges from operational areas is no longer required, but as mentioned in the consent application WM considers that there are benefits to continuing to retain and use the system at the site (particularly in terms of attenuation), at least during the early parts of the aftercare period. Stormwater runoff still enters the North Pond, however, as a result of changes during the capping process, the cutoff drain on the southern slopes of the Eastern Landfill no longer directs surface runoff to the Weighbridge Pond. WM do not consider this to be an issue as the stormwater system is not required for the removal of contaminants from the stormwater runoff as the landfill is no longer operational and is completely capped so any runoff will not have been in contact with waste or leachate. This is consistent with the Western Landfill area.

### **Q20: Has the applicant provided sufficient information to understand the contribution of contaminants from the landfill to the receiving environment?**

### **Q21: Have the cumulative effects on water quality as a result of landfill operation and stormwater discharge been adequately addressed?**

### **Q22: Do you agree with the Applicant assessment and conclusions drawn from the most recent Surface water monitoring results? (2024 Annual Monitoring Results).**

Questions Q20, Q21 and Q22 all relate to the quality of the stormwater prior to being discharged and that monitoring parameters are not sufficient to determine the discharges contribution to the state of the receiving environment. Whilst this comment also included the Western Landfill, this has been

subsequently addressed whereby it has been confirmed that Western Landfill runoff does form part of consent application.

The author commented that although the water quality in the ponds was being sampled quarterly, the parameters being monitored was less than the parameters being sampled in the receiving environment. The parameters being measured and provided with the consent application was consistent with the current consent conditions authorising the discharge, and WM did not consider that heavy metals are a key contaminant of concern in stormwater runoff from a grass covered site. Other sources of heavy metals in the wider catchment (i.e. urban runoff) would be a much higher contributor to heavy metals in the estuarine area.

The contaminant source in terms of the landfill is leachate, and this primarily relates to organics, with TAN being the key indicator parameter for leachate at this site. Monitoring data from the North Pond has shown no evidence of any leachate entering this pond since it has been capped. Given the landfill has been capped, there is no reason for this to change in the future.

**Q23: The PDP report states that there is uncertainty on the location of where groundwater emerges as surface water in the wetland-estuary complex. In your opinion is there any further investigation or testing which may be able to give insight into this?**

The author stated that it would be difficult to identify changes in the water column due to the large volume of water in the estuary and other contaminant sources in the catchment. This supports WM assessment of the complex nature of the catchment and difficulties to accurately reconcile source contributors in such a dynamic system. The author confirmed that the proposed monitoring programme will be suitable for identifying if any changes were to occur as a result of the landfill, which supports the approach WM is taking.

**Q24: The Applicant has not concluded what the effects will be on surface quality. In your opinion, is there any further investigations/ testing that could be completed to be able to conclude the actual and potential effects on surface water quality? Please be specific with your answer.**

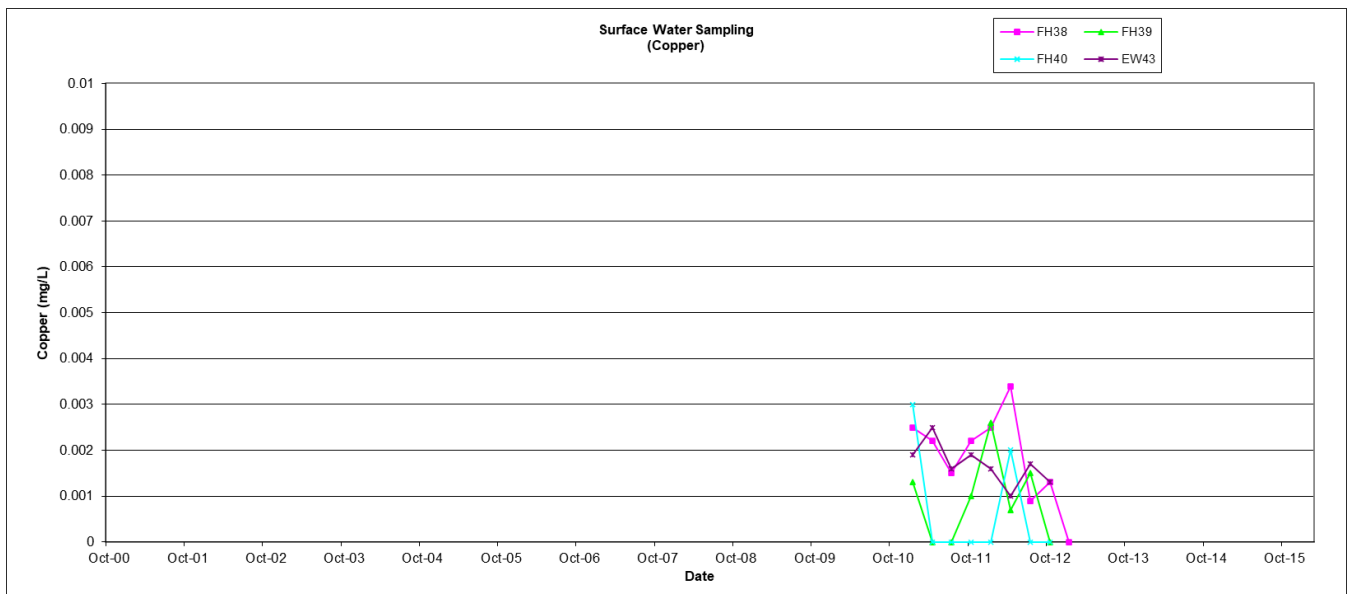
The author has outlined a set of sampling parameters to monitor the quality of the stormwater discharge at the site (for the consent application, via the point discharges). The proposed consent conditions to be attached to the stormwater discharge permit, both within the original application and the updated consent conditions, do not propose any stormwater quality testing from the two ponds given they are no longer required for stormwater treatment, and given that the ponds are present for retention / attenuation purposes only. Sampling results to date have shown no evidence of any leachate in the ponds since the landfill has been capped and the land use activities (on the surface) do no warrant ongoing testing of the discharge quality. WM do not agree that testing of stormwater from the ponds is required as it has been shown by monitoring data that there is no evidence of leachate entering these ponds and that stormwater runoff is from grassed areas.

**Q25: Is the proposed monitoring programme appropriate for establishing baseline conditions for surface water quality? Please include reference to the appropriateness of the location, parameters and frequency. (Groundwater, Surface Water and Landfill Gas Monitoring Plan- Appendix 1)**

The author states, except for the matter noted below and the proposed monitoring of stormwater from the two ponds (which WM have addressed above in response to Q24), that the proposed monitoring programme was appropriate.

The author has recommended that copper should be included in the parameters tested for surface water monitoring. Copper was included into the surface water sampling analytical suite between 2011 and 2012 as a result of copper being identified as being present within the leachate at concentrations exceeding the

ANZECC 2000 guidelines. Sampling results showed non-detectable to low dissolved copper concentrations up to 0.003 mg/L (FH40) (see plot below). Comparison with the ANZECC 2000 guidelines for marine and fresh water (adjusted using the hardness-dependent algorithm for fresh waters) shows acceptable concentrations for 95% level of protection of all species at all four sampling locations. On the basis of these results, copper impacts did not appear to be present in the surface water bodies associated the landfill activities, so copper was removed from the analytical suite. The inclusion of copper into the sampling suite of parameters for the period of time (over and above the consenting monitoring parameters) is an example of how an adaptive monitoring programme can be implemented which is modified based on data being obtained to support the assessment of risk to the environment.



The author commented that each surface water parameter should include a relevant trigger levels. WM has developed a set of trigger levels and action responses (as outlined in Appendix 1 of this document).

The author has indicated that they agree with a 2-year review period where testing parameters can be removed from the sampling programme. This is consistent with WMs approach to an adaptive monitoring approach.

**Q26: Does the monitoring program or after-care plan have clear thresholds for when correction actions are required? If so, are these thresholds appropriate?**

**Q27: Should adverse effects be observed through the monitoring programme, are the proposed correction actions appropriate to address adverse effects? (Aftercare Management Plan, Appendix 2).**

Questions Q26 and Q27 both relate to the application of trigger levels and actions responses. As outlined above, WM has developed a set of trigger levels and action responses (see Appendix 1 of this document) to address these concerns.

**Q31: Has the Applicant proposed appropriate adaptive management and remedial measures to enable adverse effects identified through monitoring to be addressed?**

The author responded 'No' to this question. This is likely related to the absence of any proposed monitoring of the discharge from the stormwater ponds, however, there will continue to be monitoring of the surface water bodies, and trigger levels are being applied to these monitoring points (as provided in Appendix 1 of this document). Part of the response actions of a trigger level exceedance includes an investigation for the possible causes, which will include assessing the site for any obvious discharges. This

would include assessing the stormwater ponds and landfill catchment areas. Appropriate remedial responses would then be applied.

**Q32: Are there any other matters that appear relevant to you that have not been included? Please specify what additional info you require and why. Please explain.**

The author commented that it would be beneficial to sample for *E. Coli* and or enterococci for a period of time to assist in determining whether human contact recreation is affected by discharges from the landfill. These are indicators of faecal bacteria, but are found naturally in the environment, particularly in areas in where there are high levels of birds as is the case within the wetland / estuary. Considering the number of other contributing sources of *E. Coli* and or enterococci into the wetland / estuary, undertaking an assessment of this nature would not provide any reasonable conclusions.

**Q34: If granted, are there any specific conditions that you recommend should be included in the consent beyond what the applicant has proposed?**

The author commented that it would be beneficial to include a condition stating the cutoff drain is re-established to direct stormwater to the weighbridge pond. As outlined above, WM do not consider that stormwater runoff from the landfill needs to be treated so this is considered an unnecessary condition to apply.

### 3.0 Limitations

This letter has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Waste Management NZ Ltd and Planz Consultants. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the letter. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

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

© 2025 Pattle Delamore Partners Limited

Yours faithfully

**PATTLE DELAMORE PARTNERS LIMITED**

Prepared by



**Scott Wilson**

Technical Director Contaminated Land

## **Appendix 1: Trigger Levels and Response Actions**

## **Appendix 1**

### **Aftercare Management Plan - Proposed Adaptive Monitoring and Response Action Procedure**

WM proposes that the following procedure for applying trigger levels and action responses for the receiving environment monitoring programme (groundwater and surface water), will be included in the updated Aftercare Management Plan (AMP) which will be prepared after the granting of the resource consents being sought. This procedure will form part of the landfill site's contingency / incident processes and AMP conditions as outlined on the proposed consent conditions (as updated 13 June 2025).

The purpose of this procedure is to define the trigger levels, and subsequent actions to be taken, if monitoring identifies that the landfill's aftercare activities are causing leachate to adversely affect the environment.

#### **Groundwater and Surface Water Sampling**

The estuarine environment surrounding the landfill is highly complex and dynamic. As such, trigger levels have been refined to focus solely on key landfill leachate indicator parameters. Given that existing monitoring data already show degraded water quality, trigger levels have been developed using the current dataset (where applicable), with the intent of initiating a management response when water quality declines further beyond established baseline conditions.

Compliance monitoring data collected between 2014 and 2025 from surface water and groundwater sites have been utilised for this purpose. Both observational methods and multivariate statistical techniques—specifically ordination and biota–environment matching—were applied in the analysis. These analyses identified total ammoniacal-nitrogen (TAN) as the parameter most strongly representing the variation observed across monitoring sites. Historical data also support TAN as a key indicator of landfill leachate influence, with consistently elevated concentrations recorded at leachate interception drain sites.

Furthermore, TAN levels were found to correlate closely with other potential leachate contaminants, such as iron and pH. As a result, TAN has been selected as the primary indicator parameter for landfill leachate and will be used as the central metric for establishing trigger levels in the proposed monitoring programme.

Shallow groundwater, deep groundwater, and surface water monitoring sites were grouped based on their existing level of leachate impact, as indicated by TAN concentrations. Sites with TAN levels that did not differ significantly—determined through either ANOVA or Mann-Kendall trend tests, depending on the distribution of

model residuals—were assigned to the same group. This grouping approach enables the development of shared trigger levels across sites with similar impact profiles.

For surface water monitoring, sites FH38 and EW43 are considered upgradient reference points and, as such, no trigger levels are proposed for these locations. Additionally, several new sampling points have been included in the updated monitoring plan but since no data currently exist for these sites, trigger levels have not been established at this stage. As monitoring data becomes available, trigger levels for these new locations (where appropriate) will be developed as part of the biennial review process.

The following contaminant trigger levels will be used for the groundwater and surface water sampling results.

## Contaminant Trigger Levels

### Groundwater

Given the complexity of the environment, the already degraded state of groundwater quality, and the presence of multiple contaminant sources across the broader catchment, trigger levels will be established for both short-term spikes and long-term trends. This dual approach will allow for the identification of both immediate changes and gradual shifts in water quality, ensuring timely and appropriate management responses.

- **Short-term leachate contaminant spikes** – 95% tolerance intervals (limit below which 95% of historical concentrations fall) for the key landfill leachate indicator compound (TAN) were modelled (with 95% confidence) for each group of sites (**Error! Reference source not found.**). Contaminant concentrations exceeding upper tolerance limits will trigger the response action, as detailed below.

| Table 1: Groundwater total ammoniacal-nitrogen trigger levels by group. |                |
|-------------------------------------------------------------------------|----------------|
| Group                                                                   | Trigger (mg/L) |
| Group A: LD11, LD17                                                     | 35.9           |
| Group B: LD20, LGS7                                                     | 1.6            |
| Group C: LD8, LS10, LS15, LS19, LS22                                    | 5.4            |

- **Medium-term leachate contaminant trends** – NIWA TimeTends software (version 11 or higher) is to be used to determine temporal change in TAN concentrations in groundwater over two time-periods (five-and ten-years to present). Statistically significant degrading trends in TAN concentrations over either of these periods will trigger the response action below.

## Surface Water

For surface water, due to the high variability in sampling results typical of estuarine environments and the presence of multiple potential contaminant sources within the broader catchment, it is proposed that trigger levels be applied only to short-term spikes in total ammoniacal-nitrogen (TAN) concentrations. Longer-term trends are not considered a reliable basis for triggering responses, given the natural variability of the system.

To inform these trigger levels, 95% tolerance intervals (i.e. the upper limit below which 95% of historical TAN concentrations fall) were modelled with 95% confidence for the two sampling sites representative of surface water downgradient of the Fairfield Closed Landfill (corresponding 'new' sampling names based on the proposed monitoring plan are also shown). These sites include the newly designated monitoring locations. Exceedance of the calculated upper tolerance limits will initiate the specified response actions, as outlined below

| Table 2: Surface water total ammoniacal-nitrogen trigger levels |                |
|-----------------------------------------------------------------|----------------|
| Sampling Locations                                              | Trigger (mg/L) |
| FH39 (SW3B)                                                     | 3.6            |
| FH40 (SW5)                                                      | 2.2            |
| Notes: Proposed sampling locations in brackets)                 |                |

If routine monitoring results show frequent, unexplained exceedances of the established trigger levels, and these exceedances are determined to be unlikely linked to landfill leachate, revising the trigger levels may be considered as part of the two yearly review process. At that time, the potential for establishing trigger levels at additional surface water monitoring locations will also be assessed.

### **Trigger Response Actions**

If any trigger level is exceeded, the following steps will be undertaken:

1. **Initial Assessment:** An investigation will be carried out to determine whether the exceedance falls within the range of historical values (2015–2025 for groundwater sites and 2014–2024 for wetland / estuary sites). If it does, no further action is required. If it exceeds historical levels, steps 2 and 3 below will be initiated.
2. **Follow-up Sampling:** An additional sample will be collected within 15 working days of receiving the laboratory report, from the location where the exceedance occurred. Additional samples may also be taken from other relevant sites if deemed necessary. All samples will be analysed for the same suite of parameters to confirm the exceedance.

3. **Investigation and Reporting:** If the follow-up testing confirms the exceedance, an investigation will be undertaken as to the possible reasons for the exceedance and further action taken or proposed to understand the reason for the exceedance. If landfill leachate is found to be the likely cause of the exceedance the report must include details of any additional monitoring and/or remedial measures that are to be undertaken to mitigate any identified adverse environmental effects from the landfill leachate and the timeframes for implementation. A report will then be prepared and provided to the Otago Regional Council within 30 working days of receipt of the investigation where it has been concluded that the exceedance of the trigger level(s) is associated with leachate from the landfill.