

To: Shay McDonald
From: Dr Claire Conwell
Company: Otago Regional Council
SLR Consulting New Zealand
cc: Samantha Isles
Date: 24 October 2024
Project No. 875.V13556.00001

**RE: RM23.185 - Green Island Landfill
Surface Water Quality Technical Memorandum 02**

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1.0 Introduction

SLR Consulting New Zealand (SLR) has been engaged by Otago Regional Council (ORC) to conduct a technical review of the resource consent application (including subsequent attachments and request for information (RFI) responses submitted by Dunedin City Council (DCC, the applicant) for the operation, expansion and closure of the Green Island Landfill.

DCC is proposing to continue to extend the life of the Green Island Landfill to allow acceptance of waste until between December 2029 and March 2031, following which closure operations and landfill aftercare will commence.

SLR prepared technical memorandums in late 2023 in response to the application. This included a technical memorandum (hereinafter referred to as the 2023 Surface Water Memo) in relation to surface water quality (authored by Dr Claire Conwell). The 2023 Surface Water Memo raised a number of items requiring further clarification (Section 92). In October 2024, further information was provided by the applicant in response to the SLR technical memorandums. The information supplied included new memorandums, new reports, updated reports, responses to specific queries and proposed consent conditions.

The further information provided has been reviewed. This technical memorandum (herein referred to as the 2024 Surface Water Memo) details the reviewer's (Dr Conwell) opinion as to whether the recently provided information addresses the items raised with respect to surface water quality. Cross reference is also made to the Human Health and Ecological Risk Assessment as it pertains to surface water quality, noting that this is a new report received in the Section 92 tranche of information.

Finally, the 2024 Surface Water Memo details any other items from the recently provided information that require further clarification.

2.0 Scope of Review

2.1 Scope

The scope of this review included;

- Re-familiarisation with the findings of the review that informed the original technical Surface Water 2003 memorandum;
- Review of sections of the documents listed in Section 2.2 (this memo) considered relevant to the questions posed by ORC with respect to surface water quality;

- Review of sections of the documents listed in Section 2.2 (this memo) considered relevant to the questions posed by ORC with respect to additional results of ecotoxicology reporting, and with respect to Human Health and Ecological Risk Assessment; and
- Preparation of this technical memorandum.

2.2 Key Documents Reviewed

2.2.1 Original Resource Consent Application

The following key documents, which were submitted as part of the application in 2023, were reviewed in the development of the 2023 Surface Water Memo:

- Boffa Miskell Limited, *Green Island Landfill Closure, Assessment of Environmental Effects*, Dated March 2023.
- GHD Limited, *Waste Futures – Green Island Landfill Closure Surface Water Report*, Dated 7 March 2023. (submitted as Appendix 06). Referred to herein as the 2023 SW Report.
- GHD Limited, *Waste Futures – Green Island Landfill Closure Groundwater Technical Assessment*, Dated 9 March 2023. (submitted as Appendix 05, reviewed in relation to surface water quality affects).

2.2.2 Section 92 Responses

The following key documents, have been reviewed as part of the 2024 Surface Water Memo to assess if the items requiring clarification from the 2023 Surface Water Memo have been addressed;

- Boffa Miskell Limited, *Green Island Landfill Closure, Assessment of Environmental Effects*, March 2023 (Updated October 2024). Referred to herein as the 2024 AEE.
- GHD Limited, *Waste Futures – Green Island Landfill Closure Surface Water Report – October 2023 Update*, Dated 18 July 2024. Referred to herein as the 2024 SW Report.
- GHD Limited, *Waste Futures – Green Island Landfill Closure Groundwater Technical Assessment – October 2024 Update*, Dated 18 July 2024. Referred to herein as the 2024 GW Report.
- GHD Limited, *Green Island Landfill Interim Human Health and Environmental Risk Assessment*, Dated 20 June 2024. Referred to herein as the HHERA.
- Boffa Miskell Limited, *Green Island Ecological Impact Assessment, 16 March 2023 (Updated October 2024)*. Referred to herein as the 2024 Ecological Impact Assessment.
- Cawthron March 2023, *Report No. 3895, Preliminary assessment of the impacts of the Green Island Landfill leachate on the receiving environment using passive samplers and toxicity testing*. Dated 13 March 2024. In the 2024 Ecological Impact Assessment. Referred to herein as the Cawthorn Report 3895.



- Cawthron ,18 December 2023 Addendum to Cawthron Report 3895. Referred to herein as the Addendum Cawthron Report 3895.
- Dateless excel file without letter head with ten worksheets with filename “MASTER_RM23.185 GILF RFI Jan 2024-Tranche5-6.xlsx” provided to SLR by Shay McDonald of ORC on 10 October 2024. Referred to herein as DCC Comments Response Spreadsheet.
- Dateless PDF document without letter head titled “Green Island Landfill Closure – Draft ORC Conditions of Consent” provided to SLR by Shay McDonald of ORC on 10 October 2024. Referred to herein as the Proposed Conditions of Consent.

3.0 Assessment

The comments and questions from the 2023 Surface Water Memo are included where necessary (and paraphrased in part), along with a summary of the findings from the updated review (the 2024 Surface Water Memo findings).

3.1 General Response

3.1.1 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?

2023 Surface Water Memo Commentary

The issue of hydraulic connectivity has been discussed by Tim Baker in the groundwater review memo to gauge an understanding of the assumptions and reasoning around whether groundwater has the potential to act as a vector for the discharge of leachate contaminant to the surface water receiving environment. I refer to Tim Baker’s memo for further discussion about the hydrogeological model.

For surface water, the key assumption applied to the surface water quality AEE is that all of the leachate generated on site is collected via the collection trench, thus prevents offsite migration. The groundwater technical review finds that this may not be the case – given the collection trench does not extend to the depths of the Abbotsford Mudstone (marine deposit basement), thus there remain the potential for groundwater flow beneath the trench, and above the low permeability mudstone.

The degree to which this contributes to potential for the migration of leachate contaminants to surface water quality in the receiving environment has not been acknowledged. Rather, the surface water report is based on the assumption that there is no leachate migration via groundwater, on the basis that there is no evidence of leachate contaminants exceeding guideline thresholds in surface water sampling programme. It is not correct to assume that if there are no guideline exceedances, this equates to no discharge of leachate.

The migration of leachate offsite is partially discussed in the ecotoxicological assessment report, undertaken by Cawthron¹. This found the presence of leachate organics in groundwater samples, and suggested that there may also be dissolved metals in groundwater contributing to the observed ecotoxicological effects in test species.

¹ Champeau, O. Northcott, G. and Tremblay, L. 2023. Preliminary assessment of the impacts of the Green Island landfill leachate on the receiving environment using passive samplers and toxicity testing. Prepared for Boffa Miskell Limited. Cawthron Report No. 3895, 13p plus appendices. In Appendix 12 Green Island Ecological Impacts Assessment Technical Report. March 2023.



This is pending further assessment but warrants more comprehensive assessment into the overall weight of evidence' approach to the assessment of effects.

2024 Surface Water Memo Commentary

The 2024 GW Memo (Tim Baker, SLR) provides an updated assessment about the hydraulic connectivity between groundwater and surface water. Mr Baker finds;

'The updated 2024 GW Report retains the fundamental assumption that the leachate trench intercepts all groundwater and prevents offsite migration. I remain of the opinion that there is insufficient off-site (being outside of the leachate trench) groundwater quality and groundwater level data to be confident in this conclusion.'

I support the conclusion from this assessment.

3.1.2 **Are there any other matters that appear relevant to you that have not been included? Or is additional information needed? Please specify what additional info you require and why [please explain]**

2023 Surface Water Memo Commentary

Addressed above.

2024 Surface Water Memo Commentary

No further matters other than those addressed in the 2023 Surface Water Memo.

3.1.3 **If granted, are there any specific conditions that you recommend should be included in the consent?**

2023 Surface Water Memo Commentary

With regards to overall receiving environment monitoring, and particularly surface water, I recommend that an Adaptive Monitoring Plan to be developed. This should set out the objectives of the Surface Water Quality Monitoring Programme and identify contingencies to be implemented. These contingencies, for example, should link to the proposed Groundwater Monitoring and Contingency Plan, and Ecological Monitoring Plan [abridged].

2024 Surface Water Memo Commentary

The response provided in DCC Comments Response Spreadsheet states:

'We have not included an adaptive management approach in the monitoring recommendations. We have included the recommendation that the Human Health and Environmental Risk Assessment is reviewed and updated after a further three years of monitoring. This may drive the need for adaptation of the monitoring program.'

Please also refer to the HHERA assessment for further assessment about the caveats to the HHERA process (data management, identification of contaminants of potential concern, and risk assessment procedures). As it stands, the current framework and screening method is not structured to adequately identify and assess risks to receptors (human health or ecological receptors). It is also commented here, the authors of the HHERA are based in Australia, and have relied largely on their working knowledge of the ANZG Water Quality Management Framework, and their working knowledge of current PFAS/PFOA thresholds. The critical and nuanced ecological values and cultural values (including mahinga kai), which are fundamental and integrated into the New Zealand Policy Statement for Freshwater Management, are not accounted for.



The Proposed Conditions of Consent specifies the proposed monitoring in Condition 40, Table 1. It is proposed to reduce the surface water quality monitoring of metal contaminants from a quarterly schedule, to a single grab sample on an annual basis at receiving environment locations (G11, G12, G13, G15, Estuary at Brighton Rd Bridge), the two sedimentation ponds, and three constructed wetlands.

Limitations of the available data for the assessment of risk to human health have been highlighted in this 2024 Surface Water Memo, as well as the 2024 Landfill Memo (James Elliot, SLR). The basis of the HHERA for human health has relied on two data points to assess risk. This is inadequate data set, and the limitation of this has not been accounted for in any of the updated reports provided.

In my opinion, reducing the surface water quality monitoring for key metal contaminants to an annual schedule will mean the data set to inform the HHERA will be significantly compromised, and it will not be possible to inform a scientifically robust HHERA. It follows that this will not be adequate to inform any requirements (whether they are needed or not) to undertake adaptive management responses.

3.2 Surface Water Quality Specific Questions

3.2.1 Does the application appropriately identify sensitive areas including affected water bodies (surface, ground and coastal water), wetlands, bores, drinking water supplies? Yes/no.

2023 Surface Water Memo Commentary

The application has identified the following sensitivities:

- Surface water courses, including the existing estuarine environment, as well as contributing freshwater streams and tributaries.
- The groundwater zone appears to be appropriately identified, and please refer to the groundwater technical assessment for further details and confirmation.

Bores and drinking water supplies are not identified. Given the location of the landfill in the lower catchment, proximity to the estuary and the coastal marine area it is assumed no potable water supplies are present in the vicinity of the landfill CMA.

2024 Surface Water Memo Commentary

The 2024 GW Memo has addressed this comment. This review concluded the conclusions of the updated 2024 GW Report, in terms of providing an updated assessment of neighbouring groundwater use, has satisfactory been addressed, and agreed effects will have negligible, and potentially no, effects on neighbouring groundwater users.

No further assessment is required.

3.2.2 Is the description of the sensitive areas attributes potentially affected by the activity accurate?

2023 Surface Water Memo Commentary

The sensitive areas attributes, with regard to surface water quality, are understood to be:

- The water quality attributes of the Kaikorai Stream; and
- The water quality attributes of the Kaikorai estuary.

[Abridged]



The assessment [of these parameters] has been on the basis of whether attribute National Bottom Line, or default guideline values have been exceeded. As referred to in Question 10, there has been no apparent integrated assessment across the ecological effects for surface water quality, not has cumulative effects been addressed.

It is concluded, therefore, that the current description of the sensitive areas attributes, has not been fully provided.

2024 Surface Water Memo Commentary

An updated Annual Compliance Monitoring Report (2022/2023) was attached to the 2024 SW report. It is noted here that the 2023 SW Report referred to the 2021 Annual Compliance Monitoring Report.

The assessments set out in the 2022/2023 Annual Compliance Monitoring Report have been relied upon as the basis for the updates to the 2024 SW Report. The format and content of the 2022/2023 Annual Compliance Monitoring Report remains consistent with the 2021 Annual Compliance Monitoring Report, and there have been no further aspects in regards to integrated assessment across ecological effects or assessment of cumulative effects integrated in the 2024 SW Report.

The conclusion from the 2023 Surface Water Memo remains; that the current description of the sensitive areas attributes, has not been fully provided.

3.2.3 Has the applicant proposed appropriate methods to limit contaminants, particularly leachate, entering surface water?

2023 Surface Water Memo Commentary

The methods to limit contaminants entering the receiving environment are identified as:

- Leachate collection trench;
- Stormwater management and sediment ponds; and
- Constructed wetlands (Eastern and Western).

Please refer to the Groundwater technical assessment for a full assessment regarding the appropriateness of the leachate collection trench system. The technical review (T. Baker) has identified that the leachate trench may not be a complete hydraulic barrier, and there is a potential pathway for flow beyond and beneath the trench into surface water. As mentioned above – this warrants a re-assessment in the application.

[Abridged]

2024 Surface Water Memo Commentary

As noted in Section 3.1.1, the 2024 GW Memo (Tim Baker, SLR) concluded there is insufficient data to support the conclusions regarding hydraulic connectivity and the performance of the leachate collection trench with respect to the migration of contaminants downgradient of the site.

As noted in the 2024 Landfill Memo (James Elliot, SLR):

- The applicant has committed to the completion of leachate leakage remedial works related to the eastern culvert.
- Runoff from intermediate cover areas should be treated as “leachate” and directed to the leachate collection system not the stormwater management system.



In regards to stormwater management, the 2024 SW Report refers to only 'clean stormwater' as being discharged to the Kaikorai Stream. The proposed monitoring schedule in the Proposed Conditions of Consent of the sedimentation ponds and constructed wetlands, will require annual sampling for the metal suite. I do not believe this will adequately allow for ongoing assessment to be robustly undertaken. A rationale for the ability to assess whether contaminants are being discharged offsite (or not) on the basis of an annual monitoring schedule has not been justified.

3.2.4 **Has the applicant adequately addressed the risk to human health and the environment associated with PFAS?**

2023 Surface Water Memo Commentary

Not reviewed here – pending further data from the Applicant.

2024 Surface Water Memo Commentary

The HHERA sets out an interim assessment of the risks to the receiving environment for human health and ecological receptors. The assessment provided is based on data set out in the 2024 SW report and supplemented with two rounds of PFAS/PFOA results acquired in 2023. The HHERA also cross references the bioassay results set out in Cawthron Report 3895 and Addendum Cawthron Report 3895. The process draws heavily from the ANZG Water Quality Management Framework (WQMF)².

Overall, I agree with the objective of the approach to provide an integrated assessment of risks to both human health and ecological receptors. However, on the basis of the information and the approach provided in the HHERA, it is my opinion that the conclusion in the report that '*the monitoring data does not indicate a discernible impact to surface water quality from the landfill*' has not been robustly supported.

There are several aspects to the framework, data integration and interpretation that are recommended to be addressed in order to support the conclusions set out in the report.

I am in agreement with the conclusion that '*There is some uncertainty associated with the available dataset, as the sampling undertaken to date may not adequately capture situations where pulses of surface water from the landfill ponds flow into the Kaikorai Stream*'.

However, in light of the comments provided in this technical memo, the proposed monitoring detailed in Condition 52 of the Proposed Conditions of Consent will not adequately compensate for the data gaps identified in the HHERA,

The following frameworks are commonly applied for assessing risks:

- Risk management – Guidelines AS ISO 31000:2018 (Standards Australia 2018); and
- EIANZ Ecological Impact Assessment Guidelines (EclA) (Roper-Lindsay et al., 2018).

Combining the two guidelines into the risk assessment process recognises the keys steps in Ecological Impact Assessment as described in the EIANZ guidelines – i.e., assigning an environmental capacity to absorb change (adapted from the EIANZ approach to assigning ecological sensitivity), and assessment of the magnitude of the impact.

² <https://www.waterquality.gov.au/anz-guidelines/framework>



In addition, the HHERA has not incorporated an assessment of risk quotients³, which is a common deterministic tool applied in ecotoxicological risk assessments. The risk quotient is an effective screening tool to estimate low or high risks of contaminants of potential concern.

It is recommended any future updates the HHERA integrate the three approaches above to provide a robust process. These are guidelines – and can be appropriately adapted to suite the site-specific conditions of the catchment.

The framework currently presented falls short of fully integrating the nuanced ecological values, sensitivities, including mahinga kai. If the framework set out in the EIANZ EcIA method is applied, this will go a long way to address this requirement.

The limitations to the available data have been acknowledged in the report but have not been explicitly stated. There is a lack of clarity about the compositing of data to derive 95th percentile statistics, and an inconsistent assessment of whether threshold endpoints have been exceeded on the basis of whether an annual maximum, median, or 95th percentile data comparison is used, and what statistic has been assessed as most appropriate. A defined and consistent approach to adopting appropriate summary statistics is required.

There are some inconsistencies in the endpoints applied – it is largely focused on the benchmarking of single exceedance against the ANZG DGVs, but for ammoniacal nitrogen and nitrate, the assessment has not referred to the National Bottom Lines (NBL) set out in the National Policy Statement for Freshwater Management, which are also relevant thresholds to assess. Given the estuarine environment, and freshwater influence, both marine and freshwater endpoints (including the NBL) are applicable.

Finally, the overall readability can be markedly improved by removing the narrative text taken directly from the ANZG WQMF regarding SSD derivation, and DGV derivation. This text is unnecessary and makes the report cumbersome and the framework difficult to follow.

On the basis of the above, it is my opinion that the risks to human health and the environment, with particular regard to PFAS, but also in regard to metal contaminants, and nutrients (ammoniacal nitrogen and nitrate), have not been robustly assessed. Refining the framework, endpoints, and risk assessment steps are required to improve the scientific justifications to support the conclusions reached in the HHERA.

3.2.5 Have the adverse effects on surface water quality of the discharge of stormwater to Kaikorai Stream been adequately assessed?

2023 Surface Water Memo Commentary

The assessment adverse effects on surface water quality have been assessed via the summary of monitoring data undertaken to date in the sediment retention ponds, and across sites in the Kaikorai Stream / Abbots Creek receiving environment.

[Abridged]

It appeared that results for dissolved zinc concentrations in surface water receiving monitoring locations were not included in the annual report, and were not available to be reviewed. It is requested that these results are also provided.

The analysis has not undertaken any further statistical analyses beyond summary statistics (comparison of monitoring round against historical maximum, minimum, average, and

³ <https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/technical-overview-ecological-risk-assessment-risk> . It is noted this overview is in the context of pesticide screening, but the same principals regarding assessment of target contaminants, in particular PFAS and PFOA contaminants, is applicable for ERA.



number of guideline exceedances. It is recommended that in addition to the plots presented, the data is represented as box plots across sites (to enable assessment of variability across the sites), or that further summary statistics are provided (i.e. 95th percentile of data, median values). Given the timeseries available, it is also recommended to provide a Time Trends analyses, to assess if there are any seasonal effects to trends over time. This would also assist in giving weight to the statements in Section 5.1 of the AEE that discuss the findings of the monitoring programmes, and would assist to confirm these conclusions that on the basis of the monitoring data there are no significant or discernible effects due to any leachate / stormwater discharge from the site.

Time trend analyses would also serve to inform the recommendation for undertaking a cumulative effects risk assessment (see question 10).

2024 Surface Water Memo Commentary

In response to this question, the DCC Comments Response Spreadsheet states:

'Further analysis of the available data has been provided in the updated Surface Water Report'.

It is apparent from the 2024 SW Report that the recommended analyses to include statistical summaries (e.g. median and 95th percentile statistical summaries), Time trends analyses (including seasonal assessment), and the integration of this as it is relevant to the HHERA, has not been undertaken. The available analyses provided in the updated 2024 SW report has only relied on the 2022/2023 Annual Compliance Monitoring Report. This 2022/23 report sets out the reporting requirements in accordance with the current conditions of consent. The 2024 SW Report has not used this data to appropriately set out further analyses which are required to inform the integrated assessment of effects with respect to cumulative effects or inform the HHERA.

It is apparent that there has been no requirement for the quarterly receiving environment surface water analyses to include zinc in the analytical suite. It is not clear in either the 2023 SW Report or 2024 SW Report why this has been the case, and was not commented on in the DCC Comments Response Spreadsheet.

The HHERA, however, presents results of surface water quality monitoring for zinc in the receiving environment. It is unclear where this data has been taken from, as it has not been presented or referred to in the 2024 SW Report, or the 2022/2023 Annual Compliance Monitoring Report. This issue remains unresolved.

3.2.6 Do you consider that the proposed improvements to the leachate system will be effective in improving surface water quality?

2023 Surface Water Memo Commentary

Overall I agree that improvements to the leachate system will be effective in improving surface water quality. The caveats to this are described above, under question 6.

If the leachate system is functioning as per the design (with minimal infiltration to groundwater and ensuring the collection trench is not compromised), this should in effect, reduce contaminant discharge to the receiving environment, and not further degrade the already impacted receiving environment.

The proposed additional mitigation measures outlined in Section 5.3 also identify steps to prevent pond culvert leachate ingress (Section 5.3.3), Emergency Stormwater Management (5.3.4), and response to climate change (Section 5.3.5). These mitigation measures serve to maintain the integrity and function of the leachate collection trench (via flood prevention and overtopping), and identify areas for repairs/remedial works to be carried out.



2024 Surface Water Memo Commentary

The comments above remain unchanged.

3.2.7 **Have the cumulative effects of the discharge activities been appropriately assessed? Do you concur with the assessment? Yes/No**

2023 Surface Water Memo Commentary

Cumulative effects to surface water quality have not been addressed in the AEE. It is recommended that this be undertaken in conjunction with the consent application for the Resource Recovery Park Precinct (RRPP).

[Abridged]

Given the lack of integrated assessment between the ecology AEE and surface water quality AEE that is required for the assessment of cumulative effects, it is recommended that this be addressed.

2024 Surface Water Memo Commentary

In response to this question, the DCC Comments Response Spreadsheet states:

'The Surface Water and Groundwater Reports have been updated to address the issues raised by the reviewers. Cumulative effects have also been discussed in the revised reports. The reviewer is also referred to the Human Health and Environmental Risk Assessment.'

The comment above has not been adequately addressed, and remains unresolved. In my opinion, the HHERA (in its current format) does not contribute to the ability to robustly assess cumulative effects.

The recommendation to address the need for an integrated assessment across the ecological, surface water, and now the HHERA remains consistent with the 2023 SW Memo.

3.2.8 **Has the Applicant proposed appropriate monitoring for the duration of the consent?**

2023 Surface Water Memo Commentary

Monitoring Sites

The applicant has proposed appropriate sites for surface water quality monitoring, these are listed in Section 5.4 of Appendix 06 Surface Water quality report, and are identified as follows (noting the addition of several new sites):

- Surface water monitoring at 5 sites (GI1, GI2, GI3, GI5, GI6 (new site at the Brighton Road Bridge Kaikorai Estuary));
- Eastern Sedimentation Pond;
- Western Sedimentation Pond;
- Three New sites: South Western Pond, Eastern Constructed Wetland, South Eastern Constructed Wetland; and
- Water level monitoring (GI3, also identified as Site ST4 pressure transducer, next to GI3)



Parameters

I have cross referenced the current WasteMINZ guidance⁴ for monitoring parameters, referring to Table 8.2 in the guidelines. This is referred to because the landfill will be accepting municipal water for another 6 years, prior to closure.

It is noted the proposed suite includes major ions (including magnesium and calcium). It is recommended the total hardness also be reported (noting it is a different APHA reporting method, and should be requested separately. This should be included at no cost, as it's a calculation rather than an analytical method).

It is also recommended to include dissolved organic carbon in the laboratory analytical suite. This is to enable DGV for select metals to be adjusted according to local conditions (noting also that there is new guidance on the application of DGV for receiving waters, available from Envirolink⁵).

The metal contaminant copper is missing from the proposed suite – it is recommended this to be included.

Monitoring schedule

Given the continue operation of the landfill, it is recommended that the quarterly monitoring for the following be retained as follows:

- pH
- Electrical conductivity
- Dissolved oxygen
- Major ions sodium, potassium, magnesium, calcium, bicarbonate, sulphate and chloride)
- Nutrients (ammoniacal-nitrogen, nitrate-nitrogen, dissolved reactive phosphorus)
- Metals (aluminium, arsenic, cadmium, chromium, iron, lead, manganese, nickel, zinc, **copper**)
- Boron
- Chemical Oxygen Demands
- Biological oxygen demand
- Hardness (calculated from Mg+Ca)
- Dissolved organic carbon

The current WasteMINZ Guidelines do not include *E. coli* as a routine parameter for monitoring, and it is acknowledged that *E. coli* has not been a parameter in the historical monitoring suite.

It is anticipated that *E. coli* will form part of the monitoring suite required under the RRP consent (as it will include the composting facility), therefore consideration is required to ensure consistency in monitoring across the two consents to avoid double-ups in effort.

⁴

https://www.wasteminz.org.nz/files/Disposal%20to%20Land/TG%20for%20Disposal%20to%20Land_12Oct22_FI_NAL.pdf

⁵ <https://www.envirolink.govt.nz/assets/2307-HZLC166-Implementing-bioavailability-based-toxicity-guideline-values-for-Cu-and-Zn.pdf>



2024 Surface Water Memo Commentary

The Proposed Conditions of Consent include surface and ground water monitoring requirements in Condition 40, Table 1.

The proposed quarterly schedule does not include the metal contaminant suite. The metal suite (proposed for annual monitoring) does not list copper but includes zinc.

It is recommended the analytical suit retains copper (which has been undertaken as part of the routine consent monitoring to date). It is noted that the analytical suite includes zinc; but including this on an annual basis will not provide a scientifically robust data set to inform any updates to the HHERA or subsequent adaptive management recommendations.

It is recommended that the quarterly monitoring schedule retains the analysis of dissolved metals; and includes both copper and zinc along with the other analytes. This data is required to inform updated HHERA assessment frameworks, particularly while the landfill continue to receive waste, and for the immediate period following closure.

The proposed monitoring (as listed in Table 1 of Condition 40) is intended to inform the responses set out in Conditions 47 to 50. On the basis of annual compliance threshold for metal contaminants, it is difficult to follow how an annual monitoring for metal contaminants will robustly inform any assessment of adverse effects to water quality are to be assessed.

Further, the Proposed Conditions of Consent to not explicitly state any requirement to undertake further ecological assessments. I strongly recommend the Conditions of Consent to include a suitable condition to address this aspect.

Condition 52 requires the HHERA to be updated within three years of the consent being granted, but does not require any subsequent reviews. I strongly recommend the condition to be extended to require ongoing periodic reviews for the duration of the consent.

3.2.9 Do you agree with the applicant's conclusions as to the level of adverse effects on surface water?

2023 Surface Water Memo Commentary

Any adverse effects are likely to be a result due to cumulative impacts, rather than acute toxicological effects from the landfill. This is supported by the available water chemistry data which notes very few exceedances of DGV/NBL attribute criteria.

The assessment is confounded to some extent by the influence of the upper catchment contributions of contaminants to the downstream receiving environment, and the limited integration of the surface quality data into the ecological impact assessment.

The assessments have been based on the assumption that there is no discharge of leachate from the site to the receiving environment (i.e. the leachate collection trench is 100% effective), but and uses the rationale that since the guideline thresholds are not exceeded, there is no evidence for leachate contamination in the receiving environment.

I disagree with this logic, as there can be low level and diffuse discharges of leachate contaminants via groundwater, to the surface water receiving environment. This will result in chronic, long term cumulative impacts, which have not been assessed. Further to this, there is some suggestion in the ecotoxicology assessment (included in the Appendix 12 Ecological Impact Assessment Report) that there may be ecotoxicological effects due to leachate entering groundwater in the vicinity of site GI5. This warrants further investigation to determine if this poses a risk to sensitive ecological receptors, beyond the routine assay test organisms in the ecotoxicology assessment.



2024 Surface Water Memo Commentary

The addendum to the ecotoxicology assessment (Cawthron Report 3895) was reviewed considering the comments above. The addendum indicated there were no differences in the response of blue mussel embryo bioassay between the upgradient and down gradient locations. The HHERA has concluded that this demonstrates there is no adverse effect of the landfill leachate. In my opinion, this is an oversimplification of the results of the bioassay. The results presented in the addendum need to be viewed in conjunction with the results of the other two bioassays conducted (microtox and algae), and an assessment provided about the relative sensitivities of each of the bioassays. The HHERA has not acknowledged this aspect, nor have the caveats or data limitations to the Cawthron Report been acknowledged in the HHERA.

The Proposed Conditions of Consent do not explicitly refer to any requirements for the assessment of ecological effects (including ecotoxicological reviews), and the HHERA is limited to a review after three years only. On this basis, the ability to assess that adverse effects to the receiving environment are being managed, have not been adequately accounted for.

The comment above remains unchanged.

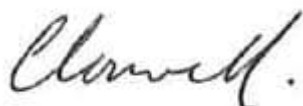
4.0 Closure

In summary, the application with regards to surface water quality covers the broad considerations but there remains broad levels of concern around:

- The assessment of no adverse effects to water quality, in particular in regard to the assessment of cumulative effects, has not been supported on the basis of the current format of the available data. The data requires further interrogation, including assessment of long-term median, 95th percentile, and seasonal time trends analyses, to support the conclusions set out in the 2024 SW report and HHERA.
- The framework and thresholds adopted in the HHERA are incomplete, and the conclusions cannot be supported by the current assessment provided. The framework requires updating to incorporate Australian Standards as well as the EIANZ EclA approach, and a consistent level of data compliance thresholds applied (i.e. median data values and 95th percentile data values). The HHERA also requires the data limitations be fully acknowledged, such as the minimal data requirements to inform the HHERA (including data sets to calculate 95th percentiles), whether site specific modified default guideline values are appropriate (especially considering the estuarine conditions in the downstream receiving environment), incorporation of other lines of evidence to support the risk assessment scientific conclusions (such as incorporating the calculation of risk quotient of target contaminants).

Regards,

SLR Consulting New Zealand



Dr Claire Conwell
Principal Consultant



Emma Trembath
Technical Director – Environmental Services

