

Appendix P Health Risk Memo

Memorandum

Subject: ARL Project - Human Health Risk
Memorandum

**Reference
No:** 1101798

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1 Introduction

WM New Zealand (WMNZ) has engaged Tonkin & Taylor Ltd (T+T) to prepare technical memoranda for the proposed new solid waste management and disposal facility in the Wayby Valley, north of Auckland ('**ARL**' or '**Project**').

The Project will involve constructing, operating, closing and providing aftercare for a new 24 Mm³ landfill facility and associated infrastructure at Wayby Valley, Wellsford. Ngāti Manuhiri are Project partners and will work with WMNZ on the proposed management and mitigation measures. Once landfilling ceases, the land will be returned to Ngāti Manuhiri as tāngata whenua.

The new landfill will be a Class 1 landfill, as defined in the Technical Guidelines for Disposal to Land (WasteMINZ Technical Guidelines)¹, accepting municipal solid waste. This includes residential and commercial waste, construction and demolition waste, some industrial wastes that meet acceptance criteria, and contaminated soils. Following waste settlement, the landfill cap surface will have a maximum height of 205 m RL.

WMNZ landholdings in the Wayby Valley area comprise a total area of 1020 ha, with the landfill footprint being approximately 60 ha. The WMNZ landholdings have been divided into five general areas; the Eastern Block, the Western Block, the Southern Block, the Waiwhiu Tributary Block and the Waiteraire Tributary Block. The proposed works will involve the following:

- **Site access and operation:** Construction of site access roads, weighbridges, and a vehicle wheel wash.
- **Landfill development:** Major earthworks and the installation of environmental management systems, including a landfill lining system and collection networks for leachate, stormwater, and landfill gas (LFG).
- **Leachate and landfill gas management:** A dedicated leachate management system and a LFG treatment facility, including a LFG flare and a LFG waste-to-energy plant.
- **Support infrastructure:** Facilities for site staff, plant maintenance, and water supply.
- **Terrestrial, freshwater and wetland biodiversity measures:** This includes native revegetation, and a weed and animal pest management programme to offset or compensate for residual adverse effects on terrestrial, freshwater and wetland ecology.

This memorandum provides an outline of the initial findings of the Human Health Risk Assessment and has been prepared for inclusion in an application for Ministerial referral of the Project under the Fast-track Approvals Act 2024 ('**FTAA**'). Specifically, this memorandum responds to the requirements under section 3.4 of the Fast-track Approvals Referral Application Form and section 13(4)(h) of the

¹ Technical Guidelines for Disposal to Land, WasteMINZ, September 2023, Revision 3.1.

FTAA. A full description of the draft proposal is included in the accompanying information attached to the application form for the referral.

2 Summary of findings

A human health risk assessment has been undertaken for the Project, examining the risks from potential exposure to contaminants in landfill gas, leachate and stormwater during both operation and post-closure phases. The results show that potential exposure from these sources will be well within acceptable levels.

The most significant potential pathway for human exposure has been identified as the inhalation of airborne contaminants derived from residual emissions from flares and generators. Even using highly conservative modelling assumptions, potential exposure at the closest sensitive receptors (dwellings) to the proposed landfill are several orders of magnitude below levels considered to require further investigation.

Potential health impacts from exposure to contaminants in leachate, whether through potential groundwater, surface water, or food-chain pathways, have also been found to be negligible. Leachate leakage has been modelled assuming a worst-case scenario of seepage through the liner system. The predicted contaminant concentrations in groundwater and surface water at nearby potential exposure points are also several orders of magnitude below drinking-water and recreational guidelines. Contaminant uptake into home-grown produce, livestock products, and wild foods such as eels and watercress are similarly insignificant.

Particular attention has been given to per- and polyfluoroalkyl substances (PFAS), due to their persistence and potential for bioaccumulation. Modelling, using conservative assumptions, demonstrated that potential PFAS levels in all media (including bore water, fish (eels), and livestock products) are many times lower than Food Standards Australia New Zealand (FSANZ) trigger levels. The cumulative PFAS hazard index has been calculated at 0.00001 compared to an acceptable level of 1, confirming negligible risk.

When all exposure pathways are considered together, the cumulative effects of exposure to contaminants from the landfill is found to be an order of magnitude lower than the generally adopted acceptable risk criteria in New Zealand of 1×10^{-5} (10 per million) for cancer effects and 1.0 for non-cancer (threshold) effects, respectively. As a result, the assessment concludes that the proposed landfill presents no unacceptable health risk to surrounding residents or other receptors, either individually or cumulatively.

3 Assessment methodology

The assessment follows a framework consistent with New Zealand and Australian (Enhealth) guidance for human health risk assessments, adapted for a screening approach. The approach combined site-specific data with conservative assumptions so that any uncertainties in contaminant behaviour or exposure conditions should not underestimate potential risks.

The analysis considers all relevant exposure routes via air, water, soil, and food and draws on environmental transport modelling undertaken to support other technical memoranda, such as Air Quality² and Hydrogeology³ memoranda.

New Zealand-specific exposure parameters, including dietary intake rates, have been used where available. Where New Zealand data was unavailable, published international parameters were used.

² T+T, July 2026. ARL Project – Air Quality Memorandum. Ref: 1101798

³ T+T, July 2026. ARL Project – Hydrogeology Memorandum. Ref: 1101798

The health risk assessment examined both non-threshold carcinogenic contaminants and threshold compounds (which have safe exposure limits). For carcinogens, incremental lifetime cancer risk values were calculated, while threshold compounds were evaluated using hazard quotients (HQ) and aggregated into a cumulative hazard index (HI). Acceptable risk criteria were set at incremental lifetime cancer risk $\leq 1 \times 10^{-5}$ (10 per million) and HI ≤ 1.0 , consistent with New Zealand recommendations.

The assessment adopts an intentionally conservative approach by assuming worst-case source concentrations and emission rates, 100% bioavailability, and simultaneous exposure to multiple pathways. Actual exposures would be well below the levels calculated.

Unplanned events such as liner failure, leachate breakout, or landfill fire have been assessed within a separate risk management framework. With mitigation measures in place, residual risk was determined to be moderate to low, and any consequence would be temporary and readily managed through emergency response procedures.

4 Site and project context

A general description of the site and surrounding locality is included in the accompanying information as part of the referral application. Surrounding land uses are predominantly rural and forested. A key distinguishing feature of the Project is its significant separation distance to sensitive receptors. The nearest residential dwellings are located over 1 km from the southern extent of the landfill footprint.

The landfill will incorporate a composite lining system consisting of a high-density polyethylene geomembrane, a geosynthetic clay liner, and compacted clay layers. This design provides multiple levels of containment, minimising the potential migration of leachate into underlying soils or groundwater. Leachate generated within the landfill will be collected and managed through an engineered collection and recirculation network.

A collection system of wells and pipework will direct gas to electricity generators or flares to destroy methane and volatile organic compounds (VOCs).

Rainfall on active areas will be treated as leachate. All other stormwater will pass through treatment ponds before discharge. Therefore, contaminants in stormwater will be similar to those found in urban stormwater, mainly derived from vehicle use.

Groundwater at the Project site flows westward toward the Hōteio River catchment, and the nearest potable water bore is located on WMNZ's own property, approximately 1.9 kilometres from the landfill footprint.

Comparable human health risk assessments undertaken for other large New Zealand landfills—Hampton Downs and Redvale—demonstrated no unacceptable health effects on adjacent communities. The Project benefits from even greater separation distances than these landfills, further minimising potential risk.

5 Assessment of potential effects

Potential human health effects were evaluated across the full range of potential exposure pathways, including inhalation, ingestion of water, soil and food, and recreational contact. The discussion below summarises the results by pathway (air, leachate/water, food-chain, and recreational exposure).

For airborne emissions, the dispersion modelling predicted that concentrations of volatile organic compounds at the nearest residences would be extremely low. The calculated incremental cancer

risk and hazard index for inhalation exposure were two orders of magnitude lower than the generally adopted acceptable risk criteria.

For potential exposure to contaminants in leachate, theoretical worst-case seepage through the liner system produced groundwater and surface water contaminant concentrations many orders of magnitude below the relevant New Zealand Drinking-water Standards.

With respect to food-chain exposure, uptake modelling indicated that contaminant concentrations in home-grown produce and livestock products would be negligible compared with international food safety guidelines. Modelled PFAS levels in eels from the nearest surface water stream were two orders of magnitude lower than FSANZ trigger points, and contamination levels in milk, beef, and poultry were thousands of times below regulatory concern levels

The potential for incidental ingestion of surface water during contact recreation (swimming or wading) has been assessed. Modelled contaminant concentrations in the Hōteu River were less than 1 percent of the applicable guideline values, confirming that recreational exposure would not present an unacceptable health risk.

Across all scenarios, the cumulative assessment confirmed that combined exposure from all contaminants and pathways would remain well within acceptable levels, even under the most conservative assumptions.

6 Conclusions

When all exposure pathways are considered together, the cumulative effects of exposure to contaminants from the landfill is found to be an order of magnitude lower than the generally adopted acceptable risk criteria in New Zealand of 1×10^{-5} (10 per million) for cancer effects and 1.0 for non-cancer (threshold) effects. Based on this, the Health Risk Assessment demonstrates that the Project can be constructed and operated without creating unacceptable risks to human health.

The use of highly conservative assumptions, including 100% contaminant bioavailability and simultaneous exposure to worst-case releases from landfill gas and leachate, provides a high degree of confidence in these findings.

7 Applicability

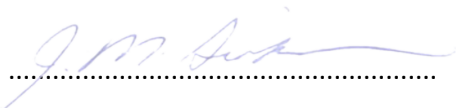
This technical memorandum has been prepared for the exclusive use of our client WMNZ, with respect to the particular brief given to us, and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

We understand and agree that WMNZ will submit this technical memorandum to the Environmental Protection Authority in support of a referral application under the Fast-track Approvals Act 2024 for the works described herein, and that the Environmental Protection Authority will rely on this technical memorandum for the purpose of assessing that application.

Tonkin & Taylor Ltd

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