

Appendix F3

Auckland Council consultation

F3

3 June 2026
Job No: 1092369.0000

Auckland Council
135 Albert Street
Auckland 1010

Attention: Warwick Pascoe

Dear Warwick

Redvale Landfill Expansion
Responses to Auckland Council Comments
Tranche 1

This letter provides the first tranche of responses to the comments received from Auckland Council on draft technical reports prepared for WM New Zealand (WMNZ) for inclusion in a proposed substantive application for resource consent under the Fast-Track Approvals Act 2024. The following appendices detail the responses to the comments received from Auckland Council for each specialist area.

This letter includes the following appendices:

- Appendix A: Traffic
- Appendix B: Geotechnical
- Appendix C: Waste Acceptance Criteria
- Appendix D: Hydrogeology

To track responses to Auckland Council, we have provided a table below to identify which comments have been received and what responses are being included in this first tranche.

Specialist Area	Comments received on draft report	Comments received from	Response prepared for Tranche 1	Response prepared by	Meeting
Landfill engineering	Yes (27/03/2026)	Walter Starke (Jacobs)	No		Yes (29/04/26)
Geotechnical	Yes (1/04/2026)	Kyle Li (Auckland Council)	Yes	Andrew Stiles (Tonkin + Taylor)	No
Dam Assessment	N/A		N/A	N/A	
Air Quality					
Health Risk					
Hydrogeology	Yes (1/04/2026)	Stephen Collins (Beca)	Yes	Leon Pemberton (Tonkin + Taylor)	No
Stormwater & ITA	Yes (16/04/24)	Hillary Johnston (Tektus)	No		No
Waste Acceptance	Yes (30/03/2026)	Stanley Howell (Jacobs)	Yes	Penny Kneebone (Tonkin + Taylor)	Yes (24/04/26)
Bond					
Ecology	Yes (13/05/2026)	Jason Smith (Morphum)	No		No
Economics	Yes (9/04/26)	Tim Denne (Resource Economics)	No		Yes (29/01/26)
Landscape & Visual	Yes (20/03/2026)	Peter Kensington (Auckland Council)	No		No
Noise & Vibration	Yes (20/03/2026)	Jon Styles (Auckland Council)	No		Yes (10/04/26)
Traffic/Transport	Yes (27/03/2026)	Philips Augustine (Auckland Council) Neil Stone (Auckland Transport)	Yes	Don McKenzie (Don McKenzie Consulting)	No
Aviation					

Applicability

This report has been prepared for the exclusive use of our client WM New Zealand, 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 our client will share this information as part of engagement regarding an application under the Fast-track Approvals Act 2024 and that Auckland Council may use this information for the purpose of reviewing the application to provide feedback to WM New Zealand.

Tonkin & Taylor Ltd

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3-Jun-26

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Appendix A Traffic

A1 Traffic – Redvale Landfill Expansion

Table A 1: Response (Don McKenzie – Don McKenzie Consulting) to Auckland Transport (Neil Stone) comments on the Draft Traffic Assessment

#	Comments	Applicants' response
1	Our position remains neutral on the proposal, but concerns are raised given the updated transport assessment has not considered AT's initial referral comments.	Comments from referral application documents (including AT's comments) are addressed through a combination of the original assessment and these comments.
2	Albeit located on an arterial road, a site visit has indicated superficial damage to AT assets within Dairy Flat Highway, tapering down approximately 500m in each direction. It is clear that these are caused by the large number of trucks generated by the site sometimes straddling the centre line or the road shoulder. While questions regarding structural damage are not raised, it is expected that the applicant should repair all superficial damage attributed to the land use within 500m of Dairy Flat Highway in each direction from the Landfill Access Road intersection. • Damage to painted line markings that are clearly caused by the proposal which could cause a road safety risk. • Damage to rumble strips in the road, this damage clearly subsides when moving further away from the site and, this is also considered a road safety risk. With regard to Landfill Access Road, this is a local road currently maintained by the applicant. It is likely that maintenance of this road (as per the initial consent) will fall back on AT after the conclusion of the consent. AT recommends that damages to this road be repaired as and when required (as it appears the applicant is already doing) but also that a final inspection and repair prior to handing over maintenance obligations to AT when the consent ceases.	It is not clear on what basis Auckland Transport has concluded that the observed damage to Dairy Flat Highway is attributable to traffic associated with WMNZ's operations, given this is a public road used by a range of vehicles. Notwithstanding this, the maintenance of Dairy Flat Highway sits with Auckland Transport as the road controlling authority. Auckland Transport has a range of regulatory tools and funding mechanisms available to maintain the road to a standard appropriate for its function and level of use. The Redvale Landfill has operated in this location for over 30 years and pre-dates the Auckland Unitary Plan – Operative in Part. The types of defects described (e.g. paint markings and rumble strips) do not indicate structural pavement failure and are typically addressed as part of routine maintenance. In the context of a public road, such effects arise from general traffic use and are not readily attributable to any single activity. As outlined in the ITA supporting the application, traffic associated with the Redvale Landfill is estimated to represent approximately 5–8% of total daily traffic movements on Dairy Flat Highway, and around 30% of heavy vehicle movements. Landfill Access Road is currently managed and maintained by WMNZ. The potential for Landfill Access Road to be transferred to Auckland Council/Auckland Transport is not part of the current application and any future maintenance obligations are to be considered at that time. It is also noted that recent upgrading of the pavement surfacing and linemarking on Dairy Flat Highway has addressed many of these issues as part of standard maintenance already undertaken by AT.

#	Comments	Applicants' response
3	AT's Traffic Engineers agree with the assessment's point that there are no existing crash patterns linked to this land use and note that the volume of trucks is unlikely to increase.	No further action/comment.
4	AT does have a concern with the applicant's assessment of sight distances on Dairy Flat Highway from Landfill Access Road. The applicant's assessment notes 220m of sight distance to the north, but the report's images show (maybe 50m?) when taken from behind the limit line. Therefore, 220m might only be achievable when a truck extends significantly beyond this line. AT recommends that this is investigated further to avoid any possible future road safety issues.	The original photograph included in the draft substantive report, as referenced, includes the presence of a real estate sign at the corner of Landfill Access Road and Dairy Flat Highway. The sign has subsequently been removed and updated photographs are included for reference below, dated 13 April 2026. These photographs have been taken in accordance with standard practice for sight distance measurement (i.e. 5m back from the edge of the eastbound traffic lane). This confirms a minimum site distance of 200 m is provided at the intersection of Landfill Access Road and Dairy Flat Highway. The visibility to the west is confirmed as being in excess of 300m. The sign shown in the attached was not in the control of the Applicant and any concerns with the placement of this should be directed to the landowner of this site. These sight distances are considered appropriate as Austroads recommendation in respect of the measurement of Safe Intersection Sight Distance (SISD) (and Approach Sight Distance (ASD) relevant for visibility of intersections for vehicles approaching along side roads) is given in section 3.2.2 of AUSTROADS Guide to Road Design Part 4A: Unsignalised and Signalised Intersections (and its Figure 3.2) for between 3 and 5m back from the lip of a channel (if there is no edgeline or shoulder) or edge line (if there is a shoulder). In the case of the Dairy Flat Highway / Landfill Access Road intersection, the edge of the eastbound traffic lane can be seen in the photograph included in AT's comment above as being beyond the yellow limit or Stop line. In this regard, the recommended point of measurement for the ASD or SISD is a point 5m back from the edge line (and dashed white continuity line outside the yellow limit line) which is a point approximated by the outer edge of the splitter traffic island - and this was the point used to measure both the photograph used in the original (Feb 2026) and updated (April 2026) photographs. This shows that visibility to approaching westbound traffic (needed for vehicles turning right out of Landfill Access Road) is at least 200m - a point approximately at the point of the school zone signage and associated red pavement marking. Both sight distances exceed the AUSTROADS guideline recommendation for minimum SISD for the 60km/h posted speed limit (outside the periods when the school speed zone applies) (referenced at Table 3.2 of the AUSTROADS guideline) of 123m. Any vegetation within the public road reserve restricting the visibility available from this or any other intersection along Dairy Flat Highway is a matter ordinarily included in the Auckland Transport maintenance responsibilities. It is also noted that since the April 2026 photographs

#	Comments	Applicants' response
		were taken, further trimming of the roadside vegetation has occurred in this location further enhancing the visibility available across the public road reserve towards the north. 

#	Comments	Applicants' response
5	On a site visit I noted a couple of trucks using the on-street parking adjacent to the school, see below location. These stops were of limited time, maybe a few minutes but must be considered and addressed. i.e., potentially a condition requiring/reinforcing truck drivers not to use this parking.	General instructions to operators that utilise Redvale Landfill include instructions to its drivers to avoid parking along Dairy Flat Highway in this location. It is noted that there are several other generators of heavy traffic along the Dairy Flat Highway route, leading to occasional parking, as discussed within the ITA and in response to the above query. Therefore, the parking observed may not necessarily be associated with the landfill. Regardless of the purpose of this use, the presence and use of parking itself is not considered to be an adverse effect, as these are public parking spaces. There may be conflicting demand for such parking within the public road reserve, forcing either parents of the school or truck drivers to make unsafe vehicle manoeuvres but these are impacts from improper use of the road reserve. It is therefore considered that the occasional use of these public parking spaces within the road reserve of Dairy Flat Highway is not a specific effect associated with this Application and does not require a condition of consent.  Additionally, WMNZ is not aware of any adverse comments or concerns expressed by the school itself or other members of the community. As noted in the comment and as is evident in the photograph/Google Streetview image above where there is no parking in this area, the presence of any parking not associated with the school is limited in duration and is typically limited to periods outside of the school's drop-off and pick-up periods on a typical school-term weekday.

Table A 2: Response (Don McKenzie – Don McKenzie Consulting) to Auckland Council (Philips Augustine) comments on Traffic Assessment

#	Comment	Response
1	My main concern is about the Dairy Flat School adjacent to the site access intersection. However, considering: • No specific crash history • Existing intersection design is up to the standard with no recorded issues (CAS) and good visibility • Considering all facilities have been in place/ working for a while with no major recorded issues • Existing on-street parking (prob PUDO arrangement) consists of a well-developed footpath • ~1.7m spacing between the on-street parking space & edge line of Dairy Flat HW to maintain safety • Wider available on-site parking for the school • Required signage for the school zone is present • Dairy Flat HW already consist of heavy vehicles, which can be related to similar safety issues. The only advice is for the consent owner to work with the school management.	As part of the application, WMNZ has been consulting with Dairy Flat School and will continue to discuss the proposal, including traffic movements. Additionally, Dairy Flat School can discuss any transport issue of concern with the Dairy Flat School representatives as part of the Community Liaison Group that meets quarterly.
2	Also noting that construction traffic effects will be further discussed in the final submission.	Construction traffic effects have now been addressed in the updated assessment, and it has been confirmed that this traffic can form part of the proposed 650 truck movements on site. Therefore, there will be no additional effects beyond what has already been discussed within the application.

Appendix B Geotechnical

B1 Geotechnical – Redvale Landfill Expansion

Table B 1: Response (Andrew Stiles) to Auckland Council (Kyle Li) comments on the Draft Geotechnical Assessment

#	Comment	Response												
1	It is noted that the placement of refuse at the site is expected to result in excess pore water pressures being generated within the liner and strata underlying the footprint of the existing landfill. It is also noted that the slope stability analyses, presented within the Draft Tonkin + Taylor Geotechnical Assessment Report, dated March 2026, do not make any allowance for any excess pore water pressures generated from the placement of refuse, i.e. the analyses assumes that any excess pore water pressure will be dissipated instantly, and only the piezometric line is used to determine the pore water pressure within the slope stability analyses. Please provide additional slope stability analyses which consider the effect that the placement of refuse will have on the pore water pressures within the strata underlying the footprint of the existing landfill, i.e. the use of “Piezometric Line with B-bar” analyses within Slope/W. If required, please provide a staging methodology/sequence and associated maximum pore pressures that should not be exceeded beneath the toe bund and landfill during filling and any geotechnical monitoring to be undertaken to measure/monitor pore pressures.	If fill is placed rapidly over low strength, compressible soils then excess pore water pressures can be generated which can affect or reduce the assessed slope stability Factor of Safety (FoS). However, for this project we note that the Landfill has been constructed entirely over unweathered Northland Allochthon Mudstone, Siltstone and Limestone, and Waitemata Group Sandstone, with assessed strengths varying from very weak to moderately strong. All soils, such as Pleistocene Sediments, were removed for the existing landfill prior to any refuse placement, and a similar approach will be adopted for the proposed Class 2 extension works. For the purposes of the Slope/W analyses c' and Φ' drained shear strengths have been assumed, effectively treating the founding subgrade as soils although in practice they are unweathered relatively high strength, low compressibility fractured rock. For waste placed within the landfill, even if it were assumed that placing such waste could potentially induce temporary excess pore water pressures, we consider that there would be negligible adverse effect on slope stability as the waste is totally enclosed within the landfill void. The additional waste to be placed on the (inner) edge of the proposed perimeter bunds, to form the revised (steepened) waste profile could, in theory, induce temporary excess pore water pressures, which could affect the slope stability of the landfill/bund interface. Conservatively, we have assessed the potential for such instability using the “piezometric Line with B-bar” analysis option within Slope/W, as suggested. Analyses were carried out along two representative cross-sections E2 and E3, for the elevated groundwater case, and the Slope/W output plots are attached as Figures Q1-A and Q1-B respectively. The results of the analyses are summarised as: <table><tr><th>Section</th><th>Assessed FoS (No B-bar)</th><th>Assessed FoS (B-bar)</th><th>Meets target FoS?</th></tr><tr><td>E2</td><td>2.213</td><td>1.177</td><td>Yes</td></tr><tr><td>E3</td><td>1.926</td><td>1.239</td><td>Yes</td></tr></table> The analyses show that, as expected from the analysis assumptions, the assessed FoS decrease for B-bar analysis. However, the assessed FoS are greater than the target FoS of >1.1 for elevated groundwater conditions, (see Table 9.1 in the draft Geotechnical Assessment Report). We consider these analyses are conservative for reasons including:	Section	Assessed FoS (No B-bar)	Assessed FoS (B-bar)	Meets target FoS?	E2	2.213	1.177	Yes	E3	1.926	1.239	Yes
Section	Assessed FoS (No B-bar)	Assessed FoS (B-bar)	Meets target FoS?											
E2	2.213	1.177	Yes											
E3	1.926	1.239	Yes											

#	Comment	Response												
		- The bunds will be underlain by rock, with any soils having been removed, and that is conservatively modelled in terms of likely pore pressures by the Slope/W analyses. - The loading on the bunds' inner edge from the landfilling will be gradual as waste is progressively placed up to the final profile, likely over a period of years. If any excess pore water pressures were to develop then they will therefore have time to dissipate as the total final loading will not be instantaneous. - As discussed in the draft Geotechnical Assessment Report, 'worst-case' conditions have generally been assumed for the slope stability analyses along the selected cross-sections, assuming low strengths for the Northland Allochthon mudstone and maximum elevated groundwater levels. In practice ground and groundwater conditions are expected to be better than those assumed 'worst-case' design parameters and conditions. - The check B-bar analyses show that the assessed FoS still meet target values, even with the conservative and unlikely assumptions regarding generation of excess pore water pressures. In view of the above, the actual slope stability FoS for the refuse/bund interface will be greater than indicated by the B-bar analysis and likely similar to the higher currently reported (non-B-bar) analysis results. Our overall conclusion is that the generation of excess pore water pressures, which could potentially adversely affect slope stability, is unlikely, and the current Slope/W model assumptions and analyses are appropriate in view of the conservative assumptions. On the basis of the analysis above, a staging methodology/sequence is considered unnecessary.												
2	It is noted that alluvial sediments were encountered adjacent to the southern edge of the 'Eastern Property' to a depth of circa 10.2 m below the existing ground surface (at the location of Borehole MBH12). It is also noted that Cross Section S1, located along the approximate location of Borehole MBH12, indicates that the southern edge/bund of the 'Eastern Property' is underlain by 'Mudstone N7'-type material. Please update the slope stability analyses, at the location of Cross Section S1, to be in accordance with the EGL ground investigation undertaken along the southern edge/bund of the 'Eastern Property'.	Our response to Question 3, below, provides a geotechnical assessment of proposed undercut excavation and replacement options for construction of the perimeter bund in the vicinity of Cross-section S1. That geotechnical assessment identified several possible construction options, to be confirmed as part of detailed design, namely: - Option 1: Assuming a 10 m depth of Pleistocene Sediments, with the upper 5 m replaced by Type 1C engineered fill. - Option 2: Assuming the full 10 m thickness of Pleistocene Sediments is replaced by Type 1C engineered fill. - Option 3: Assume the assessed 10 m depth of Pleistocene Sediments is left in place. Stability analyses have been carried out for the three options, and the Slope/W stability plots are attached as Figures Q2-A, Q2-B and Q2-C. The results of the analyses show: <table><tr><th>Option</th><th>Full height assessed FoS</th><th>Minimum assessed FoS</th><th>Meets target FoS?</th></tr><tr><td>Option 1</td><td>2.064</td><td>1.812</td><td>Yes</td></tr><tr><td>Option 2</td><td>2.064</td><td>1.812</td><td>Yes</td></tr></table>	Option	Full height assessed FoS	Minimum assessed FoS	Meets target FoS?	Option 1	2.064	1.812	Yes	Option 2	2.064	1.812	Yes
Option	Full height assessed FoS	Minimum assessed FoS	Meets target FoS?											
Option 1	2.064	1.812	Yes											
Option 2	2.064	1.812	Yes											

#	Comment	Response			
		Option 3	2.043	1.812	Yes
		Current design (no undercut)	1.964	1.691	Yes
		Note that for the purposes of this conceptual option assessment, the Pleistocene Sediments and Type 1C fill have been modelled as continuous layers. That is a conservative assumption as the Pleistocene Sediments would have been removed from immediately adjacent to the Landfill cell highwall prior to liner placement and any replacement of Type 1C fill would only extend a finite distance from the southern edge of the perimeter bund. Cross-section S1 was intended as a representative cross-section through the southern boundary, and it is coincidental that MBH12, identifying deep Pleistocene Sediments, lies adjacent to it. The current assessed stability analyses FoS for that general Cross-section S1 is therefore also given in the above Table for comparison. The stability analyses indicate that assessed FoS for the assessed possible construction options comfortably meet the target FoS and are similar to the assessed general cross-section reported FoS.			
3	It is noted that, as discussed in Section 9.3.3, the extent of the Pleistocene Sediments encountered adjacent to the southern edge of the 'Eastern Property', and possible design and construction options for the bund at this location, will require to be considered at detailed design stage. It is noted that, should the Pleistocene Sediments be undercut and replaced with Type 1C fill, as discussed in Section 9.3.1, the existing toe bund and liner system may be adversely affected by slope instability and may not comply with the E12.8.2 assessment in ascertaining that no adverse effects would be created due to earthworks nor the E36.8.2(14) assessment in the storage of hazardous substances on land which may be subject to land instability. It is therefore noted that this cannot be deferred to the detailed design stage. Please provide a geotechnical assessment of the proposed undercut, which should include, but not be limited to, an earthworks methodology and associated slope stability analyses, which minimise the potential for the up to circa 10.2 m depth of cut earthworks adversely affecting the existing toe bund/liner.	Our response to Question 4 below, confirms the Pleistocene Sediments to be generally stiff to very stiff, occasionally hard. That implies undrained shear strengths of 100 to 200 kPa, and effective strength parameters of $c' = 7$ kPa and $\Phi' = 32$ degrees. Such effective strengths are generally similar to those assigned to the Northland Allochthon mudstone ($c' = 6$ kPa and $\Phi' = 22$ degrees) and the Type 1C fill ($c' = 5$ kPa and $\Phi' = 35$ degrees). That suggests that if the Pleistocene Sediments could either be left in place, and/or replaced at least in part by Type 1C fill, the assessed slope stability will be generally similar to that currently reported for the Northland Allochthon mudstone, for which a lower-bound strength has been selected. The log of Borehole MBH12 suggests Pleistocene Sediments up to 10.2 m depth, although we note the log shows core loss from 6.5 m to 9.0 m. Inspection of the log suggests that a channel depth of 10.2 m is unrealistically deep, bearing in mind the overall geomorphology, the depth of other similar channel features encountered during the current landfill's construction, and construction observations for the current cells along the landfill's southern boundary. Based on that, and our Redvale site experience, we consider that the lower part of the borehole may instead represent weathered Northland Allochthon mudstone/siltstone. It should be noted that the area to the immediate south of the landfilled boundary has been extensively modified during the landfill's development, with the construction of ponds and access roads. Some existing sub-excavation and replacement with engineered fill will have occurred as part of those development works. As noted in our response to Question 2, possible design and construction options could be: Option 1: Assume a 10 m depth of Pleistocene Sediments, with the upper 5 m replaced by Type 1C engineered fill. Such a replacement depth better matches the assessed channel depth discussed above; or			

#	Comment	Response
		- Option 2: Assume the full 10 m thickness of Pleistocene Sediments, as identified by Borehole MBH12, is replaced by Type 1C engineered fill. - Option 3: Assume the assessed 10 m depth of Pleistocene Sediments is left in place. However, being alluvial deposits, spatial variation in composition and strength can be expected, and Options 1 and 2 discussed above are considered to give increased confidence in terms of subgrade quality. If this option is considered as part of detailed design, then it will likely require further investigations to confirm consistent ground conditions below the proposed bund alignment. Stability analyses, discussed in our response to Question 2, assessed that FoS for all three proposed construction options comfortably meet the target FoS and are similar to the assessed general cross-section FoS. Therefore, no adverse effects as a result of land instability are anticipated. Our assessment of the likely ground conditions, and the stability of the perimeter bund adjacent to Cross-section S1 shows that the bund can be constructed to meet the target FoS for the proposed waste reprofiling works. The detailed design will be dependent on the results of construction excavation observations, and possibly additional investigations, to confirm the extent and nature of the infilled channel. However, other similar features encountered during the current landfill's construction suggest the channels are steep sided, and of relatively limited extent. Any sub-excavation and replacement of Pleistocene Sediments will be carried out carefully (staged) to avoid affecting the existing landfill's integrity. Construction of any such undercut works and placing of engineered fill will follow the requirements of the current Redvale Technical Specification. We also note that the design and construction works will continue to be overseen by the appointed Peer Review Panel, who will review and approve any design and construction methodology in a similar manner as for the landfill construction to date.
4	It is noted that the cohesive Pleistocene Sediments encountered adjacent to the southern edge of the 'Eastern Property' have been classified as "very stiff to hard" and "relatively high strength" with respect to undrained shear strength. However, no field strength testing, i.e. shear vanes, SPTs and/or CPTs, were undertaken within the Pleistocene Sediments as part of the intrusive field investigation presented in the Draft Tonkin + Taylor Geotechnical Assessment Report, dated March 2026. Please provide justification, in the form of additional intrusive and appropriate geotechnical investigations, i.e. CPTs, for the ""very stiff to hard"" strength classification.	As discussed in the draft Geotechnical Assessment Report, (e.g. in Section 2.3 and Appendix L2.2), prior to the current Landfill's development, Pleistocene Sediments originally mantled the site and formed the immediate surface materials. These were progressively removed as the landfill was developed and have been completely removed within the existing landfill footprint. Similarly, the intention of the proposed development works is that any encountered Pleistocene Sediments would generally be removed below any proposed permanent works, such as the perimeter bunds and the Stage 2 extension, and replaced with Type 1C engineered fill. In view of the overall design intention to remove and replace any encountered Pleistocene Sediments, no historic or recent investigations or field strength testing (e.g. shear vanes, SPTs and/or CPTs) have specifically focussed on that unit. Rather the unit, where present, has been assessed incidentally when carrying out investigations targeting the underlying Northland Allochthon or Waitemata Group bedrock. Those historic investigations have generally assessed the Pleistocene Sediments to be typically firm to stiff, locally very stiff, light grey and light orange-grey and orange mottled, silty Clay with scattered rootlets and organic debris, locally including shattered tree branches, trunks and stumps. A number of representative historic borehole logs are attached supporting such a description, see Figure Q4-A.

#	Comment	Response														
		The recent EGL investigations, (see Appendix K in the draft Geotechnical Assessment Report), only encountered Pleistocene Sediments in their Boreholes MBH10 to MBH13, on the eastern half of the southern boundary. The materials within those three boreholes were assessed by EGL as stiff to very stiff, occasionally hard, which matches our observations during construction of the cells along the landfill’s south-eastern boundary.														
5	It is noted that, where a factor of safety was less than 1.0 was returned for the seismic load cases, the yield acceleration and slope displacement was assessed using 50th percentile values. However, these assessments were not included within the draft Geotechnical Assessment Report. Please provide the yield acceleration and slope displacement assessments for the slope stability analyses undertaken to provide the seismic displacement results presented in the draft Tonkin + Taylor Geotechnical Assessment Report, dated March 2026.	As discussed in Section 9.2.2 of the draft Geotechnical Assessment Report, where a FoS of less than 1.0 is achieved for the seismic loading conditions, the yield acceleration and slope displacement were assessed as recommended by the Auckland Council Code of Practice (2023). Slope stability FoS of less than 1.0 were assessed for 6 No. of the 9 No. cross-sections analysed and the yield (critical) accelerations for those analyses are summarised below: <table><tr><th>Cross-section</th><th>Yield acceleration</th></tr><tr><td>N1</td><td>0.151g</td></tr><tr><td>E1</td><td>0.212g</td></tr><tr><td>E2</td><td>0.188g</td></tr><tr><td>E3</td><td>0.173g</td></tr><tr><td>S1</td><td>0.155g</td></tr><tr><td>MF3</td><td>0.203g</td></tr></table> As noted in the draft Geotechnical Assessment Report, cumulative displacements were assessed using the methods of Ambraseys and Srubulov (1995), Jibson (2007), and Martin and Qiu (2008), in a similar manner as for the recent ARL assessment. The calculations have been carried out using in-house developed spreadsheets which have been rigorously checked and reviewed as part of our internal QA procedures. An example of the calculation inputs and outputs is shown on Figures Q5-A and Q5-B attached.	Cross-section	Yield acceleration	N1	0.151g	E1	0.212g	E2	0.188g	E3	0.173g	S1	0.155g	MF3	0.203g
Cross-section	Yield acceleration															
N1	0.151g															
E1	0.212g															
E2	0.188g															
E3	0.173g															
S1	0.155g															
MF3	0.203g															
6	It is noted that the critical slip circles grid locations for the slope stability analyses Cross Section N2, DBE seismic case and Cross Section MF2, Elevated GW case, are located at the extent of the grid and therefore may not be representative of the ‘worst-case’ factor of safety. Please amend the slope stability analyses to confirm that the ‘worst-case’ factor of safety for each of the foregoing cross sections have been captured.	We have rerun the Slope/W analyses for the two referenced cases, expanding the grid extent to its practical limit. The revised slope stability plots are attached as Figures Q6-A and Q6-B, and will be included in the updated Report, to replace the current plots. Summarising the results of the re-analyses: - Analysis N2-C1 design GW-N7-APS seismic DBE: Minimum assessed FoS changes slightly from 1.338 to 1.337 - Analysis MF2-Elevated-N7-APS: Minimum assessed FoS changes slightly from 1.435 to 1.443														

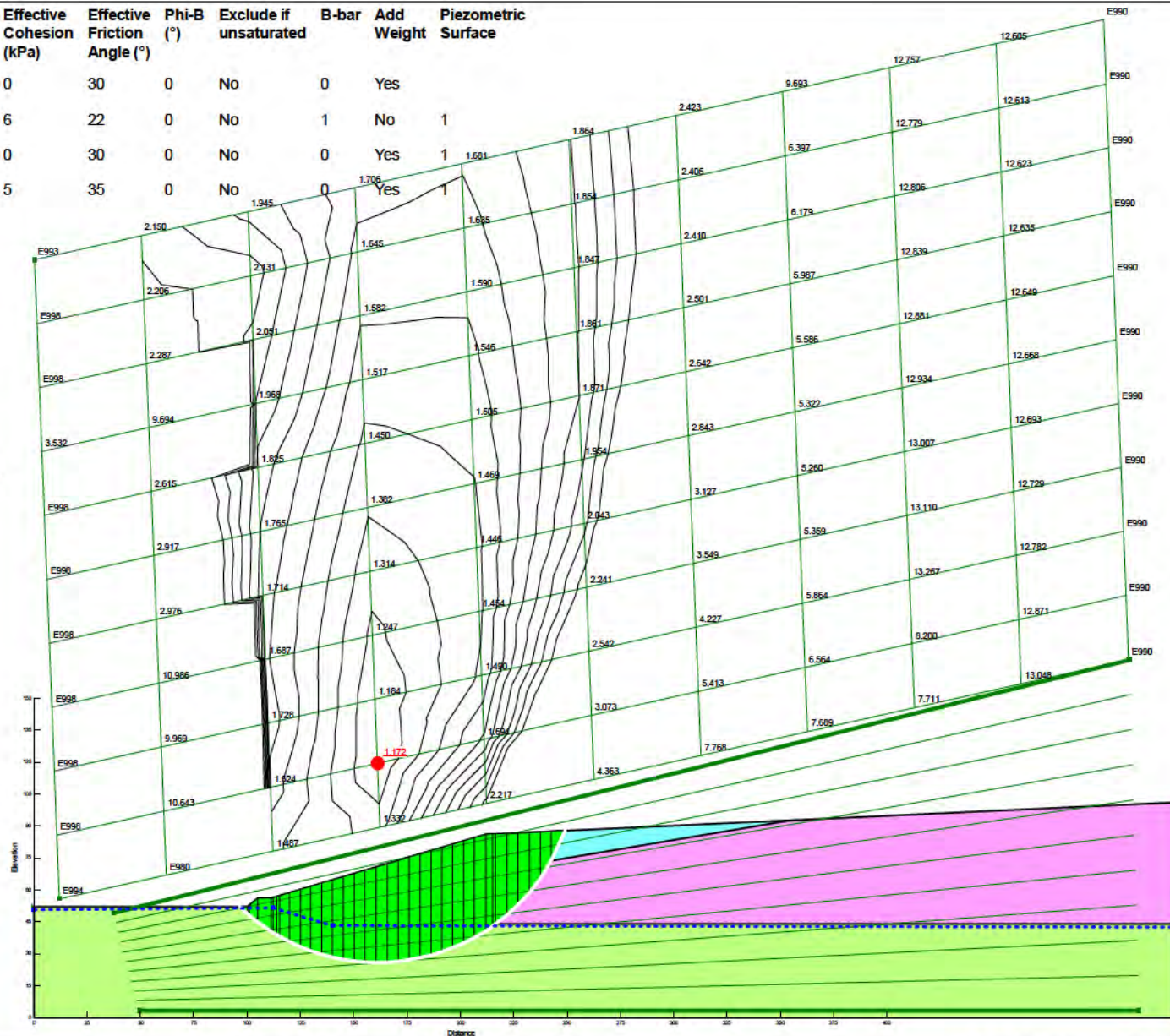
#	Comment	Response
7	It is noted that a “Monitoring Location Plan Figure E3” is discussed in the draft Geotechnical Assessment Report, however, this is not attached to the report. Please provide the monitoring location plan for review.	Please find attached Figure Q7-F3: Monitoring Location Plan which was inadvertently omitted from the draft Geotechnical Assessment Report. It will be included in the updated Report.

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Phi-B (°)	Exclude if unsaturated	B-bar	Add Weight	Piezometric Surface
■	Existing Refuse	Mohr-Coulomb	15	0	30	0	No	0	Yes	
■	Mudstone N7	Mohr-Coulomb	20	6	22	0	No	1	No	1
■	New Refuse	Mohr-Coulomb	15	0	30	0	No	0	Yes	1
■	Type 1C Fill	Mohr-Coulomb	19	5	35	0	No	0	Yes	1

Analysis Notes:

1. Name: E2 - Elevated - JASL B-Bar
2. Method: Morgenstern-Price
3. Direction of movement: Right to Left
4. Search Method: Grid and Radius
5. PWP Conditions from: Piezometric Surfaces with B-bar
6. Optimize Critical Slip Surface: No
7. Tension Crack Option: (none)
8. F of S Calculation Option: Constant
8. Horz Seismic Load:

Horz Seismic Coef.:



Title: Section E2-2025-check.gsz

Job Number: 1092369.2000

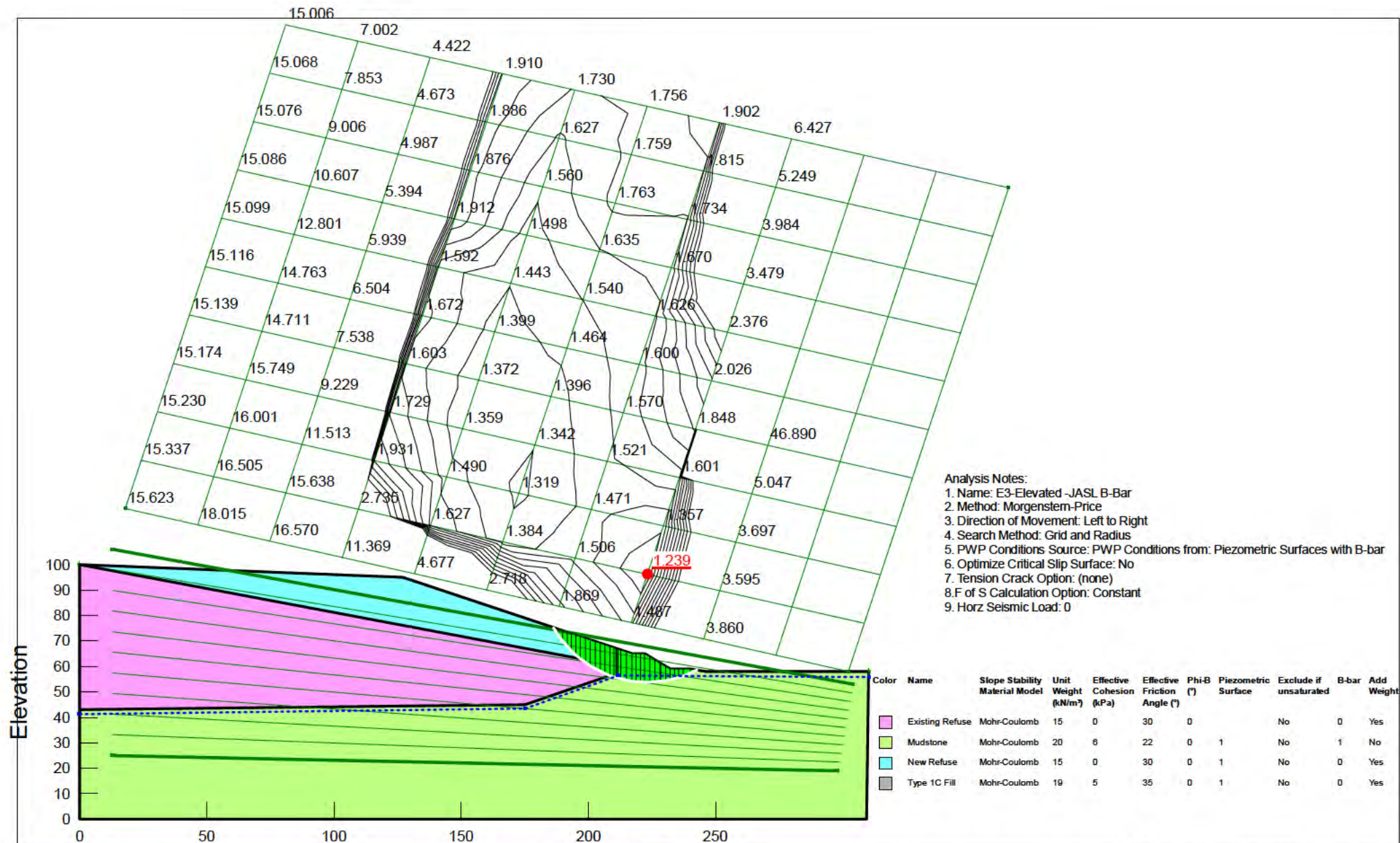
Analysis: E2 - Elevated - JASL B-Bar

Analysed by: Nick Buckton

Comments:

Scale: 1:3,000 @ A4

Checked by: Andrew Stiles



Tonkin+Taylor

Title: Section E3-2025.gsz

Analysis: E3-Elevated -JASL B-Bar

Comments:

Job Number: 1092369.2000

Analysed by: Nick Buckton

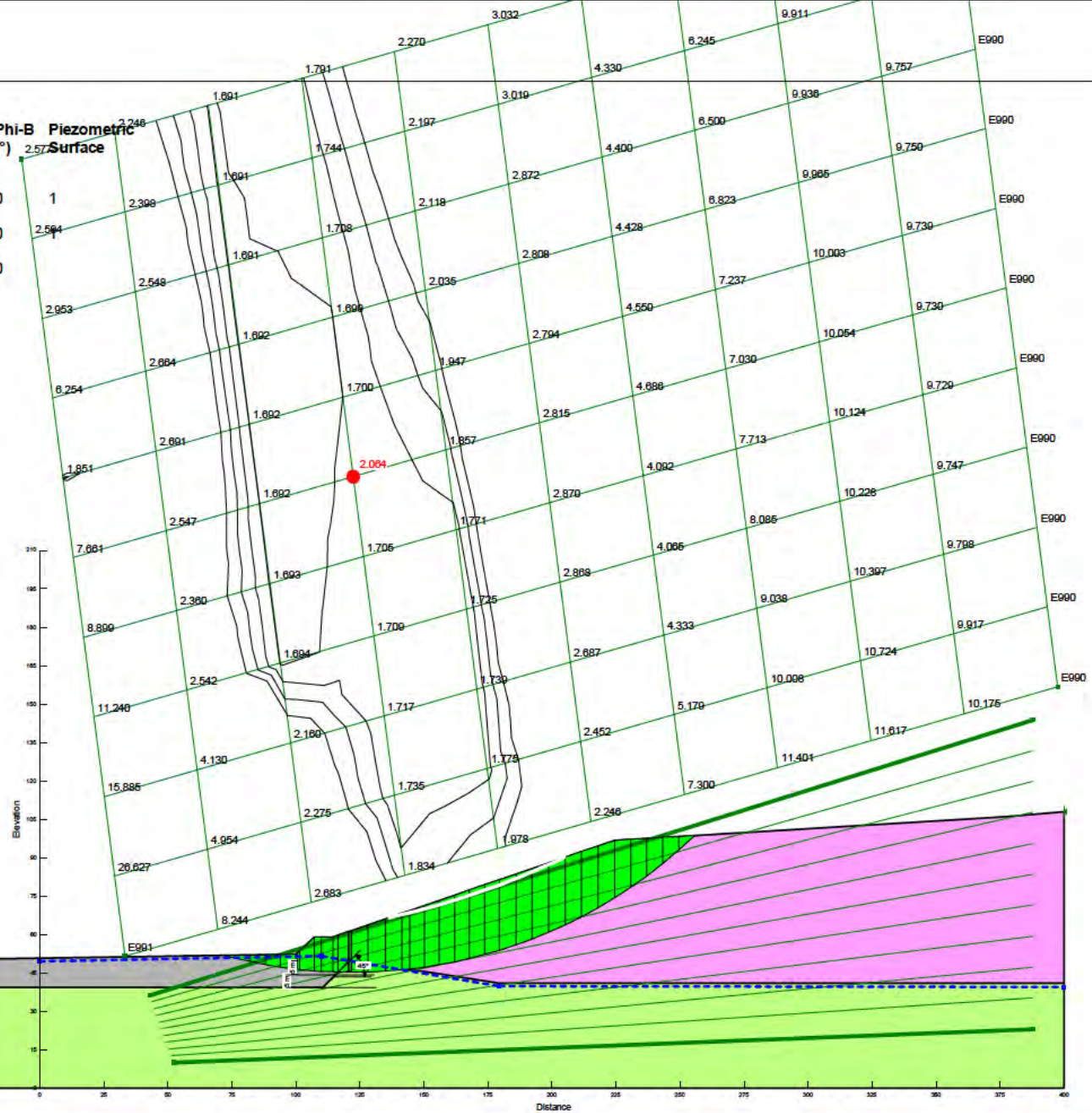
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Checked by: Andrew Stiles

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Surface
■	Mudstone N7	Mohr-Coulomb	20	6	22	0	1
■	Type 1C Fill	Mohr-Coulomb	19	5	35	0	
■	Waste	Mohr-Coulomb	15	0	30	0	

Analysis Notes:

1. Name: S1-Elevated-APS Case A
2. Method: Morgenstern-Price
3. Direction of Movement: Right to Left
4. Search Method: Grid and Radius
5. PWP Conditions Source: PWP Conditions from: Piezometric Surfaces
6. Optimize Critical Slip Surface: No
7. Tension Crack Option: (none)
8. F of S Calculation Option: Constant
9. Horz Seismic Load:



Title: Section S1-2025.gsz

Job Number: 1092369.2000

Analysis: S1-Elevated-APS Case A

Analysed by: Nick Buckton

Comments:

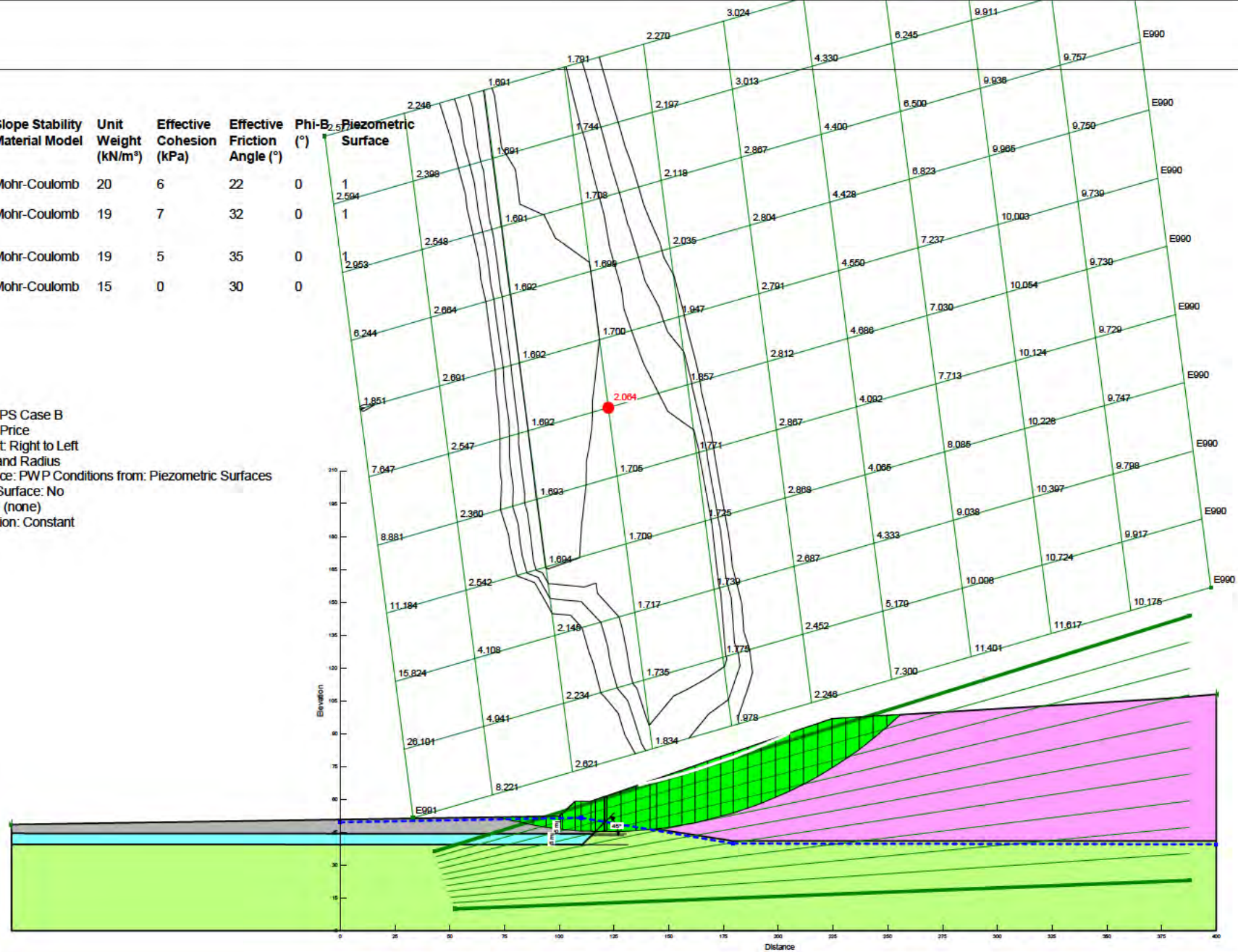
Scale: 1:2,500 @ A4

Checked by: Andrew Stiles

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Phi-B ₂
	Mudstone N7	Mohr-Coulomb	20	6	22	0
	Pleistocene Sediments	Mohr-Coulomb	19	7	32	0
	Type 1C Fill	Mohr-Coulomb	19	5	35	0
	Waste	Mohr-Coulomb	15	0	30	0

Analysis Notes:

1. Name: S1-Elevated-APS Case B
2. Method: Morgenstern-Price
3. Direction of Movement: Right to Left
4. Search Method: Grid and Radius
5. PWP Conditions Source: PWP Conditions from: Piezometric Surfaces
6. Optimize Critical Slip Surface: No
7. Tension Crack Option: (none)
8. F of S Calculation Option: Constant
9. Horz Seismic Load:



Title: Section S1-2025.gsz

Job Number: 1092369.2000

Analysis: S1-Elevated-APS Case B

Analysed by: Nick Buckton

Comments:

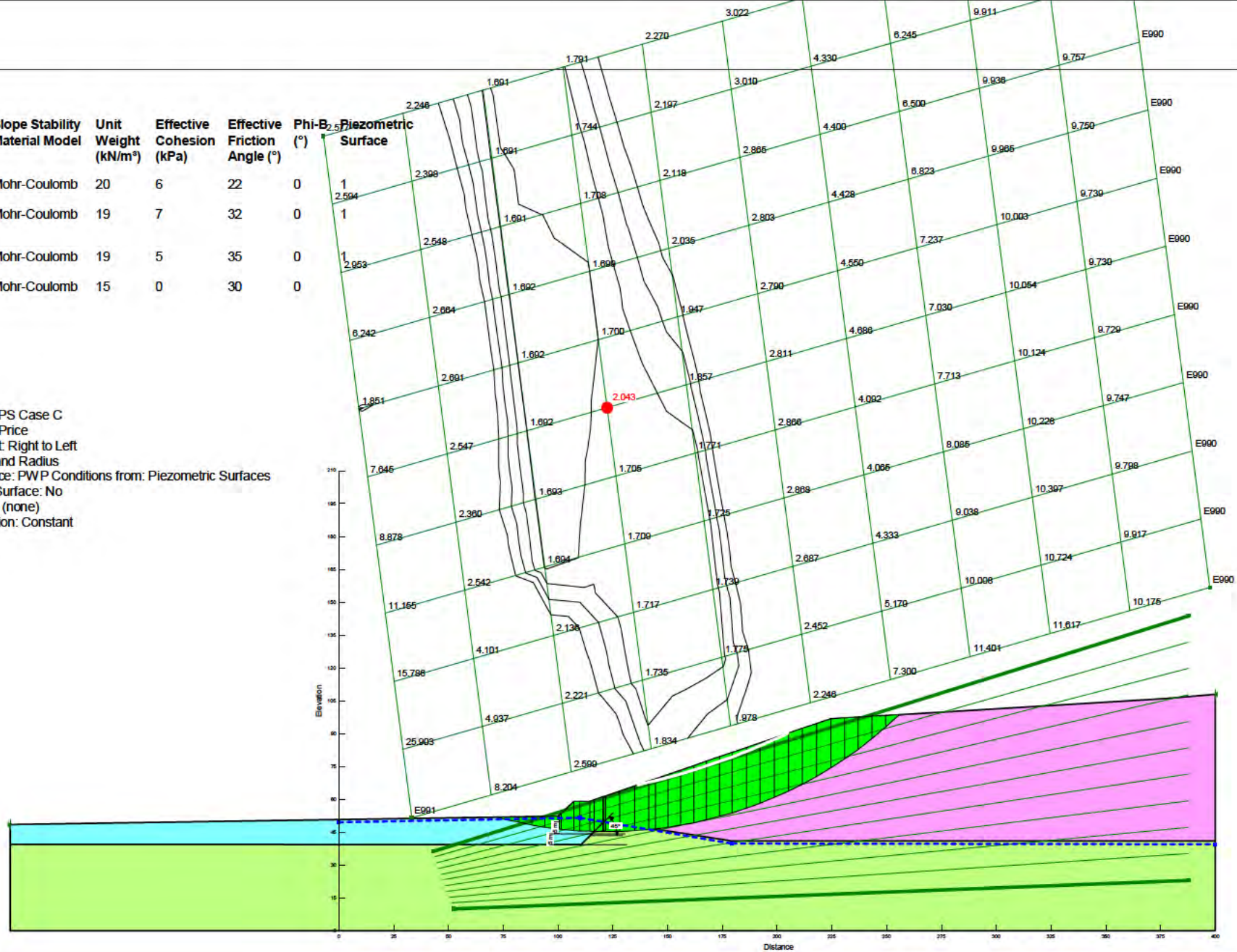
Scale: 1:2,500 @ A4

Checked by: Andrew Stiles

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Phi-B
	Mudstone N7	Mohr-Coulomb	20	6	22	0
	Pleistocene Sediments	Mohr-Coulomb	19	7	32	0
	Type 1C Fill	Mohr-Coulomb	19	5	35	0
	Waste	Mohr-Coulomb	15	0	30	0

Analysis Notes:

1. Name: S1-Elevated-APS Case C
2. Method: Morgenstern-Price
3. Direction of Movement: Right to Left
4. Search Method: Grid and Radius
5. PWP Conditions Source: PWP Conditions from: Piezometric Surfaces
6. Optimize Critical Slip Surface: No
7. Tension Crack Option: (none)
8. F of S Calculation Option: Constant
9. Horz Seismic Load:



Title: Section S1-2025.gsz

Job Number: 1092369.2000

Analysis: S1-Elevated-APS Case C

Analysed by: Nick Buckton

Comments:

Scale: 1:2,500 @ A4

Checked by: Andrew Stiles



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BOREHOLE LOG

BOREHOLE No: BHS
Hole Location: Refer to site plan

SHEET 1 OF 1

PROJECT: FIELDTEST2005				LOCATION:				JOB No: 613998.028													
CO-ORDINATES mN mE				DRILL TYPE: 50mm				HOLE STARTED: 22/08/05													
R.L. m				DRILL METHOD: Hand Auger				HOLE FINISHED: 22/08/05													
DATUM				DRILL FLUID:				DRILLED BY: IWW													
								LOGGED BY: IWW CHECKED:													
GEOLOGICAL				ENGINEERING DESCRIPTION																	
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.				FLUID LOSS	WATER	CORE RECOVERY	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE / WEATHERING CONDITION	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSIVE STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION Soil type, major components, plasticity or particle size, colour. ROCK DESCRIPTION Substance: Rock type, particle size, colour, minor components. Defects: Type, inclination, thickness, roughness, filling	
														GW							GRAVEL
									• 174/102kPa			0.2		ML	M	VSt					SILT, slightly clayey, yellowish brown with light grey, some black streaks, moist.
									• 134/79kPa			0.4									
									• 154/95kPa			0.6									- light grey
									• 114/64kPa			0.8									
									• 95/56kPa			1.0									
									• 84/56kPa			1.2									- slightly sandy (fine)
									• 127/59kPa			1.4									
									• 105/41kPa			1.6									- clayey, slightly plastic
									• 118/53kPa			1.8									
									• 105/45kPa			2.0									- sandy (fine), some yellow streaks
									• 136/41kPa			2.2									
									• 125/56kPa			2.4									- some fine organic fragments
									• 87/53kPa			2.6									
												2.8									
												3.0									- wet
												3.2									
												3.4									
												3.6									
												3.8		ML	M	St					SILT, clayey, light grey with faint organic stain, moist.
												4.0									
												4.2									End of borehole at 4.2m. Refer to sheet SC5 for Scala penetrometer results.
												4.4									
												4.6									
												4.8									
												5									

PROJECT: Redvale Landfill						LOCATION: Western Property		JOB No: 23042									
CO-ORDINATES		724135.23 mN 287421.49 mE		DRILL TYPE: PQ and HQ Core		HOLE STARTED: 31/8/06											
DIRECTION:		Vertical °		DATUM:		HOLE FINISHED: 7/9/06											
ANGLE FROM HORIZ.: -90.00 °				R.L. GROUND: 99.54 m		DRILLED BY: Drillwell Ltd											
				R.L. COLLAR: m		LOGGED BY: APS		CHECKED:									
DESCRIPTION OF CORE				ROCK DEFECTS													
GEOLOGICAL UNIT	ROCK OR SOIL TYPE, WEATHERING, HARDNESS, STRENGTH, COLOUR, LITHOLOGICAL FEATURES (bedding, cement, foliation, mineralogy, texture, etc...)	ROCK WEATHERING	ROCK STRENGTH	P.T. LOAD / UCS TEST (MPa)	CORE LOSS / LIFT (%)	METHOD, CORE & CASING	TEST SYMBOL	DEPTH (m)	GRAPHIC LOG	DEFECT LOG	FRACTURE LOG	SIGNIFICANT JOINTS, BEDDING, CRUSHED AND SHEARED ZONES/SEAMS	DATE / DEPTH	RQD (%)	WATER	DRILL WATER LOSS (%)	CORE BOX
		UN SW NW NE	R ₁ R ₂ R ₃ R ₄														
PLEISTOCENE	CLAY, silty, light grey with orange brown mottling, stiff. Scattered rootlets to top.					PQ	X	1	X			-organic		0	6/09/06		
	-becoming grey brown with mudstone fragments.						X	2	X			-cross-cutting joints with 60° dominant fabric		0			
	MUDSTONE, light grey green to grey, extremely weak to very weak.						X	3	X					0			
	LIMESTONE, micritic, pale cream brown, weak. "Brecciated" texture with up to coarse gravel sized angular clasts of limestone separated by thin irregular lenses, partings and zones of olive green to grey green, firm, becoming stiff clay (weathered mudstone). Becoming calcareous siltstone to base.						X	4	X			-Fe stained fractures		0			
							X	5	X					11			
NORTHLAND ALLOCHTHON	SILTSTONE, clayey, calcareous, light grey green and light grey thinly irregularly banded, weak. In part a clayey (micritic) limestone, with bands and zones of silty calcareous mudstone, generally extremely weak and stiff clay. Rock mass extremely closely fractured and core recovered mainly as angular fragments with poor core recovery.						X	6	X			-extremely closely jointed with 60° dominant set. Joints frequently with clay infill up to 10mm		23			
							X	7	X								
						HQ	X	8	X					0	1/09/2006		
							X	9	X								
							X	10	X								
							X	11	X								
							X	12	X								
							X	13	X								
							X	14	X								
							X	15	X								
							X	16	X								
							X	17	X								
							X	18	X								
							X	19	X								
							X	20	X								
							X	21	X								
							X	22	X								
							X	23	X								
							X	24	X								
							X	25	X								
							X	26	X								
							X	27	X								
							X	28	X								
							X	29	X								
							X	30	X								



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DRILL HOLE LOG

BOREHOLE No: W98

Hole Location: Western Property
Southern Highwall

SHEET 1 OF 2

PROJECT: Redvale Landfill		LOCATION: Western Property		JOB No: 23042																
CO-ORDINATES 724168.08 mN 287324.63 mE		DRILL TYPE: PQ Core		HOLE STARTED: 7/9/06																
DIRECTION: Vertical °		DATUM:		HOLE FINISHED: 8/9/06																
ANGLE FROM HORIZ.: -90.00 °		R.L. GROUND: 109.61 m		DRILLED BY: Drillwell Ltd																
		R.L. COLLAR: m		LOGGED BY: APS CHECKED:																
DESCRIPTION OF CORE		ROCK DEFECTS																		
GEOLOGICAL UNIT	ROCK OR SOIL TYPE, WEATHERING, HARDNESS, STRENGTH, COLOUR, LITHOLOGICAL FEATURES (bedding, cement, foliation, mineralogy, texture, etc.);	ROCK WEATHERING	ROCK STRENGTH	PT LOAD / UCS TEST (MPa)	CORE LOSS / LIFT (%)	METHOD, CORE & CASING	TEST SYMBOL	DEPTH (m)	GRAPHIC LOG	DEFECT LOG	FRACTURE LOG spacing of natural fractures (cm)	SIGNIFICANT JOINTS, BEDDING, CRUSHED AND SHEARED ZONES/SEAMS	DEFECT TYPE, SHAPE, ROUGHNESS, APERTURE, INFILLING, SPACING	ANGLES ARE NORMAL TO CORE AXIS	DATE / DEPTH	RQD (%)	WATER	DRILL WATER LOSS (%)	CORE BOX	RL (m)
		UNW SWW NWW HW	RM R2 R3 R4 R5 R6		3 10 100						50 10 5 1									
PLEISTOCENE SEDIMENTS	CLAY, silty, light grey with orange brown mottling, stiff to very stiff.											-organic with rootlets								
	Occasional mudstone and limestone gravel.																			
NORTHLAND ALLOCHTHON (?)	CLAY, silty, light grey, orange and brown mottled, stiff to very stiff. Increasing proportion of light orange-brown mudstone gravel to depth.																			
	SILT, clayey, slightly sandy, grey, stiff to very stiff. Occasional subangular gravel of weak sandy siltstone and sandstone. In part a silty fine sand/extremely weak sandstone.																			
NORTHLAND ALLOCHTHON (?)	BRECCIA/CONGLOMERATE of angular, grey-green and sub-rounded, purple-grey very weak mudstone and siltstone gravel in a grey-green firm clay matrix.																			
	BRECCIA/CONGLOMERATE (as Sheet 1)																			
NORTHLAND ALLOCHTHON (?)	SANDSTONE, fine, silty and SILTSTONE, sandy, grey, weak. Occasional sub-angular and sub-rounded grey-green mudstone and grey siltstone gravel.																			
	MUDSTONE, grey, green, very weak gravel in firm/stiff clay matrix.																			



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BOREHOLE LOG

BOREHOLE No: **B3 W601**
Hole Location: As surveyed- refer
site plan
SHEET **1** OF **1**

PROJECT: Retaining wall, Redvale landfill		LOCATION: Redvale Landfill		JOB No: 22932.300													
CO-ORDINATES mN mE		DRILL TYPE: Dando Terrier		HOLE STARTED: 29/2/08													
R.L. m		DRILL METHOD: Percussion		HOLE FINISHED: 29/2/08													
DATUM		DRILL FLUID:		DRILLED BY: JRSS													
				LOGGED BY: RBF CHECKED:													
GEOLOGICAL		ENGINEERING DESCRIPTION															
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	FLUID LOSS	WATER	CORE RECOVERY	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE WEATHERING CONDITION	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSIVE STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION Soil type, minor components, plasticity or particle size, colour. ROCK DESCRIPTION Substance: Rock type, particle size, colour minor components. Defects: Type, inclination, thickness, roughness, fill etc.
FILL												M	H				(hole commenced 0.5m below ground level) clayey SILT moderately plastic, yellow -becoming grey-brown at 0.2m
						• UTP			1								1
						• UTP			2								2
ALLUVIUM						• 101/64kPa			3		ML	W	Vst				clayey SILT moderately plastic, light grey mottled yellow
						• 113/64kPa			4		CL						4
											ML						clayey SILT weakly to non plastic, light yellow grey
HUKERENUI MUDSTONE						• 116/80kPa			5								-sharp contact at base CLAYSTONE brecciated and sheared, grey
																	END OF BOREHOLE 5m (target lithology)
									6								

Determine seismic and liquefaction induced lateral displacements using three methods

Purpose

BM3 Section 6.3.2 - assessment of slope or land stability in earthquakes, requires using at least three different commonly accepted methods for the assessment of displacements. This spreadsheet presents the calculations of 3 displacement methods

Displacement methods:

- 1) Ambraseys & Srbulov (1995)
- 2) Jibson (2007)
- 3) Martin & Qiu (NCHRP report 611)

Input	ULS		
PGA (ULS)	0.28 g	Peak ground acceleration (g)	
kmax (ULS)	0.28 g	Design acceleration coefficient	
kc	0.212 g	Yield acceleration coefficient	FoS - 1.0
M	6.3	Magnitude	
R	70 km	Radius to event	
PGV	30 PGA	(30 for distant fault, 60 for near fault - NCHRP 472)	

Displacement Summary

Design conditions (BM3 requirements) Confidence Level		Displacements
		ULS 84%tile (mm)
Methods	Ambraseys & Srbulov (1995)	0.9
	Jibson (2007)	1.4
	Martin & Qiu (NCHRP Report 2008)	1.3

Ambraseys and Srbulov			
q	$\log(D_N)$	Mean D_N (mm)	84%tile DN (mm)
0.1	0.7502	56.3	213.9
0.2	0.308107	20.3	77.3
0.3	-0.0246	9.4	35.9
0.4	-0.32878	4.7	17.8
0.5	-0.63667	2.3	8.8
0.6	-0.97328	1.1	4.0
0.7	-1.3714	0.4	1.6
0.75	-1.611	0.2	0.9
0.8	-1.89543	0.1	0.5
0.85	-2.25213	0.1	0.2
0.9	-2.74233	0.0	0.1
0.95	-3.561	0.0	0.0
0.757	-1.64844	0.2	0.9

Jibson (2007)			
Lateral displacement using Jibson 2007 paper			
	Input		
	ULS		
ac	0.212	g	
amax	0.28	g	
M	6.3		
Number of Standard deviations for upper* displacement level =			1
(Note n=1.64485 relates to 5% Probability of Exceedance)			
		ULS	MCE
Displacement upper*		1	mm
Displacement mean			1 mm
Displacement lower (1 x standard deviation)			0 mm

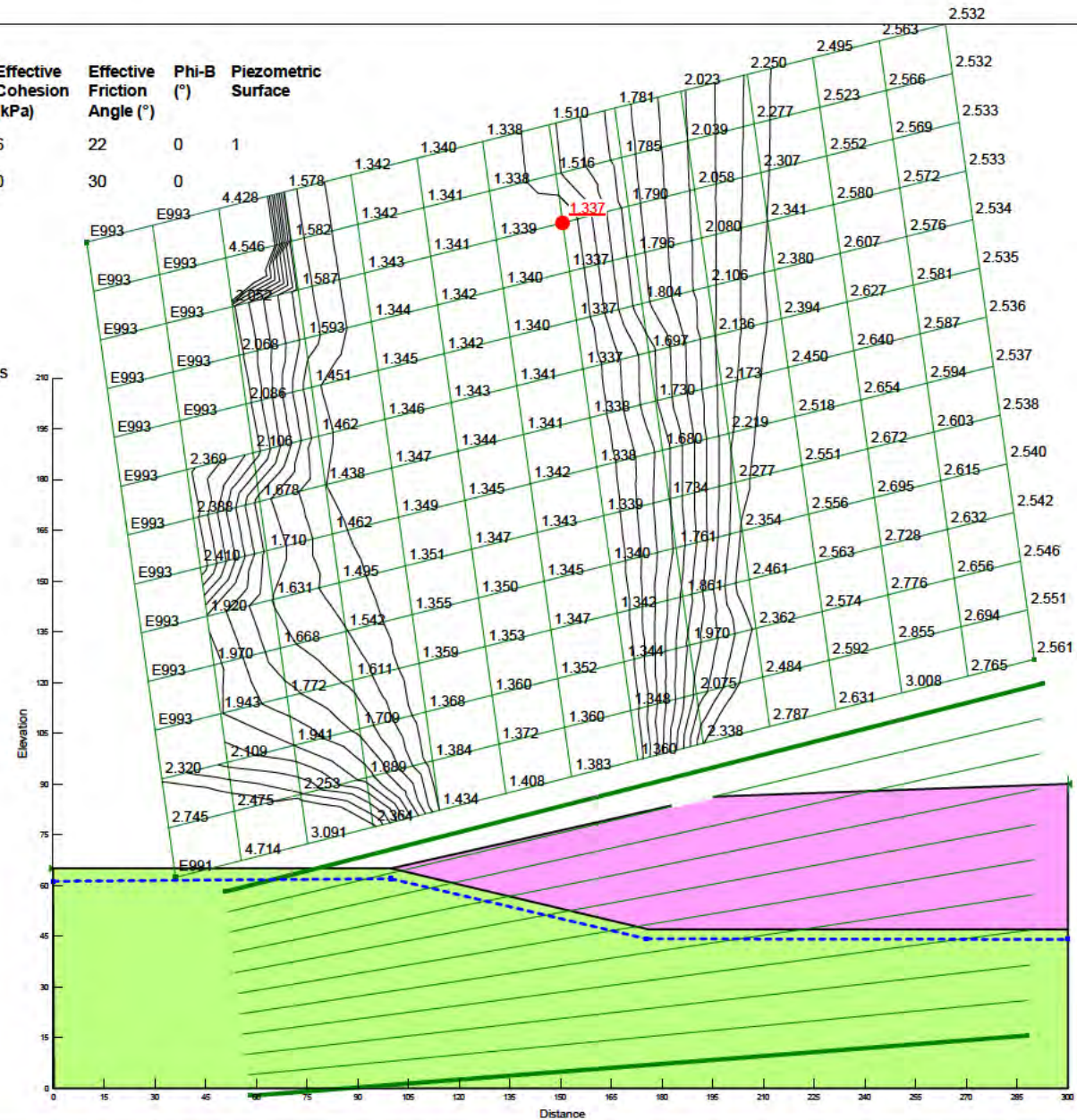
Martin & Qiu NCHRP 2008 using PGV = Faultxkmax

	Unit	ULS	
PGA	g	0.28	
kmax		0.28	
M		6.3	
Kyield		0.21	
ky/kmax		0.7571429	
PGV	in/s	8.40	
PGV=	PGAg	30	
Using Eqn 5-8			
log d		-1.52	
d	in	0.03	
Mean	mm	1	
84%tile	mm	1	

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Surface
■	Mudstone N7	Mohr-Coulomb	20	6	22	0	1
■	Waste	Mohr-Coulomb	15	0	30	0	

Analysis Notes:

1. Name: 2. N2-C1 design GW-N7 -APS seismic DBE
2. Method: Morgenstern-Price
3. Direction of Movement: Right to Left
4. Search Method: Grid and Radius
5. PWP Conditions Source: PWP Conditions from: Piezometric Surfaces
6. Optimize Critical Slip Surface: No
7. Tension Crack Option: (none)
8. F of S Calculation Option: Constant
9. Horz Seismic Load: 0.19



Title: Section N2-2025.gsz

Job Number: 1092369.2000

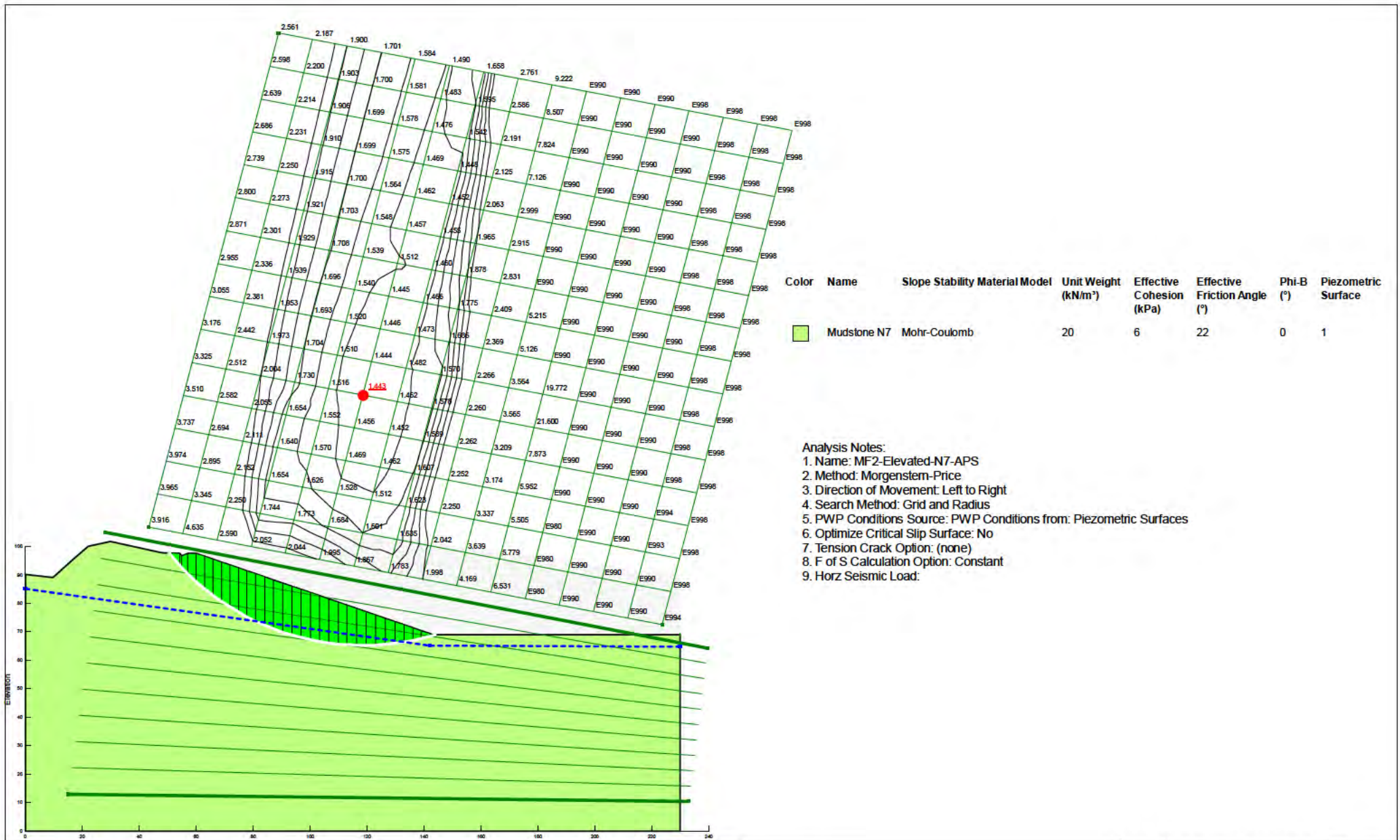
Analysis: 2. N2-C1 design GW-N7 -APS seismic DBE

Analysed by: Nick Buckton

Comments:

Scale: 1:2,000 @ A4

Checked by: Andrew Stiles



Notes:



Issue	Description	approved	Date
01	2024Update		18/04/24
0	2017Update		16/02/17



Operational and Technical Services
Landfill Access Road,
RD 4, Albany 0794, Auckland
Ph +64 (09) 427 0600
www.wastemanagement.co.nz

Surveyed:	Name	Date
Designed:		
Drawn:	DG	16/02/17
Checked:		
Scale	@A3,1:4300	
Project:		

REDALE.LANDFILL MONITORING LOCATIONS 2024

Issued for:

Drawing Number:

Appendix C Waste Acceptance Criteria

C1 Waste Acceptance Criteria – Redvale Landfill Expansion

Table C 1: Response (Penny Kneebone) to Auckland Council (Stanley Howell – Jacobs) comments on the Draft Waste Acceptance Criteria report

#	Comment	Response
1	Please provide a copy of the following documents referenced or relied upon by the WAC report: - Current WAC document - Current and proposed Landfill Management Plan - Hydrogeological Assessment report	An updated Landfill Management Plan will be submitted with the substantive application. The Draft Hydrogeological Assessment report has been provided to Auckland Council and subsequently reviewed by Stephen Collins (Hydrogeologist at Beca).
2	Explain why TCLP limits presented in the Landfill Guidelines are more appropriate than TCLP limits presented in the current WAC document, specifically cyanide, sulphide, polychlorinated biphenyls, toluene, tributyltin oxide, and total xylene.	Text updated to match Table 4.2; one value amended in Table 4.2 (cyanide). The current Redvale Landfill TCLP limits for some contaminants (cyanide, sulphide, polychlorinated biphenyls, toluene, tributyltin oxide, and total xylene) are more stringent than the recommended WasteMINZ Guideline TCLP limits. There is no toxicity-related basis for having more stringent limits than the WasteMINZ Guideline TCLP limits, but WMNZ has elected to retain the more stringent limits it has been working with to date. WMNZ applies a more stringent sulphide limit for operational reasons to manage landfill gas quality.
3	Appropriate specialist to review Hydrogeological Assessment and comment whether values presented in Table 3-1 are appropriate.	N/A - The Draft Hydrogeological Assessment has been provided to Auckland Council.
4	The TCLP limits for inorganic constituents are five to ten times more stringent for Class 2 than Class 1.	Text in the draft WAC report has been amended to reflect that for TCLP Limits based on US toxicity characteristic, inorganics are 5 times more stringent. Other inorganic limits are 10x more stringent.
5	Confirm whether a Class 2 area was consented at Redvale prior to the current expansion consent application.	No, a Class 2 area has not been consented at Redvale prior to this application.
6	To be consistent with the HEPA, for significant concentrations of PFAS beyond PFOS, PFOA and PFHxS, indicate specific criteria or risk assessment will be developed prior to receipt.	No change is proposed as this is already referenced in the first line after bullet list in section 3.3.
7	Considering the varied sorption and leaching characteristics of different types of PFAS, provide additional detail and literature reference to why TCLP is considered adequate	Updated footnote provided in Section 3.3 of the report to clarify why TCLP considered appropriate.
8	Provide documentation how 0.4 mg/L was arrived at for 10-year UCL95. If not included in current WAC, provide background how 500 mg/L was determined for zinc	No changes to the draft report as 95% UCL is calculated as mean plus 2 SD. 500 mg/L is included in the current WAC used at Redvale Landfill.

#	Comment	Response
9	TCLP has been assumed to be the most appropriate leachate method for all new contaminants. This presumption is not necessarily applicable to PFAS, and may not be the most effective leachate method for other new contaminants. Section should be written to include consideration of leachate methods beyond TCLP, depending on chemical and physical characteristics of the contaminant of interest	No change to the draft report as TCLP mimics landfill leachate conditions hence considered the most appropriate.
10	Include bullet point or additional sub-section that describes the review, verification and approval requirements for this process	These processes will be set out in the updated Landfill Management Plan which will be submitted with the substantive application.
11	TCLP limits for inorganic constituents are five to ten times more stringent for the Class 2 landfill.'	This has been updated in the report.
12	For PFAS, the HEPA ASLP leachable concentration waste acceptance criteria for "unlined landfill" are ten times more stringent than the "clay lined landfill" criteria.' This distinction is important because total concentrations are the same for PFOA and marginally different for PFOS + PFHxS	The draft report has been amended to add specific reference to concentration caps in Section 3.3 and Section 3.7.
13	This is the first mention of a recurring theme through the document that requires further discussion or distinction where Class 2 or Managed fill (Class 3) WAC apply.	Added clarification that soil can be accepted in the Class 2 area if it meets either managed fill total concentrations (Table 4.3) or Class 2 TCLP limits (Table 4.2). Also added at end of Section 3.2. [Note, this was already set out in the last line of section 4.1.]
14	Asbestos is not referenced in Table 6-1 of the WasteMINZ Guidelines. Provide additional detail how asbestos will be managed and whether specific WAC for asbestos are appropriate. Include specific reference to the ACOP, NZGAMAs, etc.	No WAC is proposed for asbestos but for clarification have added explicit reference to management controls set out in LMP must be in accordance with ACoP in Section 4.3.
15	Managed fill includes contaminated soil from earthworks and site remediation that meets the total concentration limits set out in the WasteMINZ Guidelines for Class 3 waste.' Will there be the requirement for materials that are accepted as Class 3 waste to also conduct leachate testing? If not, additional details and rationalisation will be necessary.	This is referenced in the last line of Section 4.1. Added clarification that soil can be accepted if it meets either managed fill total concentrations (Table 4-3) or Class 2 TCLP limits (Table 4-2) in Section 3.2 and 3.7. That means either total concentration data that meets the Table 4-3 numbers (i.e., total concentrations are low) or TCLP data that meets the Table 4-2 numbers (i.e., low leachability) could be used to demonstrate acceptability; both are not needed. No specific requirements for leachate testing are proposed in relation to this waste stream, however the Class 2 area will be monitored as detailed in the WAC.
16	This section to be updated following relevant updates to Section 3.	Updated cyanide, PFOA, footnote.
17	Class 2 PFOA leachate limit is 0.00056 mg/L.	Corrected in the report.

#	Comment	Response
18	We recommend TCLP testing is done on any new and different wastes. This statement to be reconsidered following discussion on most appropriate leachate method for PFAS and new contaminants.	No changes are required as the TCLP mimics landfill leachate conditions hence considered the most appropriate.
19	Add foot note that Class 2 leachate concentrations will also require consideration	Added a line to Section 4.6.2: <i>Contaminated soil can be accepted to the Class 2 area if it meets either the TCLP Limits in Table 4.2 or the total concentration limits in Table 4.3.</i>
20	Include additional text that describes the review, verification and approval requirements for this process.	These processes will be set out in the Landfill Management Plan to be submitted with the substantive application.
21	If Class 3 WAC are adopted for managed fill, where does this fit into the pre-acceptance screening process?	The WasteMINZ Guidelines also include total concentration limits for contaminated soil which are acceptable in Class 2 landfills. These are included in the WasteMINZ Guidelines as part of the definition of Class 3 managed fill waste, which is a subset of Class 2 waste. Contaminated soil can be accepted in the Class 2 area if it meets either the managed fill total concentration limits or the Class 2 TCLP limits. Added reference to total concentrations into Figure 4.2. As part of the pre-acceptance testing process, the landfill will ask the customer to provide test results that show that the waste meets the TCLP limits or the total concentration limits for new special waste and soils whose contaminant concentrations cannot otherwise be fairly assessed.

Appendix A Draft Waste Acceptance Criteria report



Waste Acceptance Criteria

Redvale Landfill Expansion

Prepared for

WM New Zealand

Prepared by

Tonkin & Taylor Ltd

Date

June 2026

Job Number

1092369.8000 v5

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sustain a better world*
www.tonkintaylor.com

Document control

Title: Waste Acceptance Criteria – Redvale Landfill Expansion					
Date	Version	Description	Lead author:	Reviewed by:	Authorised by:
08.08.25	1	Draft Waste Acceptance Criteria Report for review	P. Kneebone	S. Eldridge	S. Eldridge
17.09.25	2	Revised draft for review	P. Kneebone	S. Eldridge	S. Eldridge
18.12.25	3	Revised draft for review	P. Kneebone	S. Eldridge	S. Eldridge
02.02.26	4	Revised draft for review	P. Kneebone	S. Eldridge	S. Eldridge
25.04.26	5	Revised draft for review	P. Kneebone	S. Eldridge	S. Eldridge

Distribution:

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1 Introduction

1.1 Background

Tonkin & Taylor Ltd (T+T) has been engaged by WM New Zealand (WMNZ) to undertake a Waste Acceptance Criteria (WAC) Assessment to understand the effects from a proposal to extend the use of Redvale Landfill, north of Auckland (the Project). This report forms part of a suite of technical reports prepared for WMNZ for inclusion in a substantive application for resource consent under the Fast-Track Approvals Act 2024.

The purpose of the WAC is to avoid, minimise or mitigate potential environmental effects arising from placing waste by controlling the type of waste that is accepted, and to ensure compliance with applicable legislation governing acceptance of non-hazardous waste. This report is intended to support the Assessment of Environmental Effects (AEE).

1.2 Scope of work

The scope of this Waste Acceptance Criteria Assessment includes:

- Site description and elements of context that are relevant to selecting the WAC.
- Overall approach to WAC.
- The proposed WAC for the expanded areas, which comprise requirements for:
 - Waste type (relating to sources of waste).
 - Physical characteristics.
 - Limits for contaminants that could leach from the waste, based on the toxicity characteristic leaching procedure (called TCLP limits).
 - Total concentration limits for Class 2 contaminated soils.
 - Other waste acceptance controls to minimise effects.

1.3 Site description

The Redvale Landfill is located in Dairy Flat, to the north of Auckland, approximately 9 km northwest of Albany and 1 km west of State Highway 1. Redvale Landfill, including the existing landfilling area and buffer zones, occupies approximately 59 ha in area. The landfill is divided into five main sub-areas for the purpose of describing the work within this application, known as the Northern, Eastern, Western, South-Western and South-Eastern Property.

The Landfill is accessed from the south-east along Landfill Access Road off Dairy Flat Highway, with Horseshoe Bush Road running along part of the northern boundary of the Landfill area. A tributary of the Rangitopuni Stream runs eastwards along the northern and eastern site boundaries towards the Dairy Flat Highway. A map and full description of the site is provided in the AEE prepared for the project.

1.4 Project description

Redvale Landfill is one of only two landfill sites that can receive >350,000 tonnes of waste annually to service the approximately 1.5 million tonnes of waste that the Auckland Region produces each year. Redvale Landfill is currently scheduled to cease accepting waste in December 2028 and due to a delay in obtaining the resource consents required for the establishment and operation of the replacement Auckland Regional Landfill (ARL), a transition plan is required. To address this potential gap in critical landfill infrastructure for residual waste disposal in the Auckland region, WMNZ is proposing to extend the operation of Redvale to the end of 2036 and develop 4.56 Mm³ of

additional airspace at the existing facility. This includes 3.13 Mm³ in additional Class 1 Landfill expansion on top of the existing Class 1 refuse placement area and 1.43 Mm³ of Class 2 Landfill extension.

The proposed works include the following:

- **Class 1 landfill expansion:** placement of waste within the existing landfill footprint, involving the removal of final cover and steepening of the final cap slope to accommodate additional waste.
- **Class 2 footprint extension:** extension of the existing landfill to the southwest to accommodate disposal of waste meeting Class 2 landfill waste acceptance criteria (WAC).
- **Relocation of ancillary activities:** the relocation of ancillary activities to allow for the placement of waste.
- **Sediment Retention Ponds:** The removal and filling in of Sediment Retention Pond 6 and the Office Pond while enlarging Pond 1 to capture and treat the stormwater from these catchments.

A full description of the proposal is included in the AEE prepared for the project.

1.5 Relevant site features

The existing landfill has been operating for over 30 years. It meets the design criteria for a Class 1 landfill, as defined in the WasteMINZ Technical Guidelines for Disposal to Land (WasteMINZ Guidelines, April 2016, amended September 2023 v3.1). In particular:

- The site has a median inward hydraulic gradient and there is a great depth of naturally very low permeability material underlying the site.
- The compacted clay liner provides additional protection against discharge of contaminants. The consented design required a minimum 200 to 300 mm thick layer of recompacted mudstone. In 1997 the liner thickness was increased to 900 mm everywhere. Based on material testing and compaction methods, the hydraulic conductivity of the liner is less than 1×10^{-9} m/s.
- The sides and floor of the landfill are designed so that leachate flows towards the leachate collector drains, which convey leachate to the leachate sumps. Leachate will continue to be collected and treated.
- Leachate seepage via the lining system to ground is estimated at approximately 1.5 m³/year or 4 L/day (*Leachate and Mounding Flux Assessment*, September 2025).
- The final cover permeability design standard is 1×10^{-9} m/s.

The WAC that have been used at the existing landfill are consistent with criteria for Class 1 landfills. Groundwater monitoring over 30 years shows there are no impacts from operation of the existing landfill on groundwater quality (refer *Hydrogeological Assessment* report). This indicates the current WAC are appropriate for continued operation of the existing landfill. The landfill will continue to only receive non-hazardous municipal solid waste and will not accept any hazardous waste. Treated hazardous waste that meets the TCLP Limits is acceptable.

The Class 2 expansion area will be upgraded to meet the design criteria for a Class 2 Landfill as defined in the WasteMINZ Guidelines. The south lobe will only receive waste meeting Class 2 Landfill WAC. A leachate collection system will be provided for the new Class 2 area.

For both areas, management controls will be implemented to enforce the WAC.

2 Method: approach to develop WAC

The proposed WAC are consistent with the WasteMINZ Guidelines for Class 1 and Class 2 landfills. For the Class 1 area, they are the same as the WAC currently used at Redvale landfill.

The approach to WAC comprises:

- Identify a list of **waste types accepted** (Section 4.1).
- Identify a list of **prohibited wastes** (Section 4.2).
- Identify criteria and controls for **physical characteristics** (e.g., sloppiness) (refer Section 4.3) and **odorous waste** (Section 4.4).
- Provide **TCLP limits** for potentially hazardous waste because **hazardous waste will not be accepted** (Section Error! Reference source not found.). Hazardous waste that has been treated so that it meets the TCLP Limits is acceptable. The basis for the proposed TCLP limits is detailed in Section Error! Reference source not found., including a process to develop TCLP limits for new or emerging contaminants at Section 3.5.
- Provide total contaminant concentrations for Class 2 contaminated soil (Section 3.7).
- Establish a **case-by-case process** for waste that contain contaminants for which there are no TCLP limits (Section 4.6).
- Propose **waste control measures**, which are documented in the Landfill Management Plan (LMP) (Section 5.2).

3 Analysis: TCLP limits

3.1 Appropriateness of current TCLP limits

For the Class 1 area, the proposed TCLP limits are the same as those currently used at Redvale Landfill. Groundwater monitoring over 30 years shows there are no impacts from operation of the existing landfill on groundwater quality, leachate quality monitoring shows leachate quality is relatively consistent, and groundwater modelling shows all contaminants are below water quality guidelines at the nearest receptor (Rangitopuni Stream; refer *Hydrogeological Assessment*). These factors confirm the current TCLP limits are appropriate for the proposed expansion in the Class 1 area.

Most of the TCLP limits are consistent with the WasteMINZ Guidelines, which are considered conservative for this site, given the inward hydraulic gradient (details in Section 3.2). Exceptions are limits proposed in other national guidelines for contaminants not covered by the WasteMINZ guidelines (Section 3.3), and limits for specific long-term waste streams received at Redvale Landfill for which long-term leachate and groundwater monitoring data justify higher limits (Sections 3.4 and 3.5). A process is included to develop TCLP limits for other contaminants, should these be needed for future waste streams (Section 3.6).

The current Redvale Landfill TCLP limits for some contaminants (cyanide, sulphide, polychlorinated biphenyls, toluene, tributyltin oxide, and total xylene) are more stringent than the recommended WasteMINZ Guideline TCLP limits. We consider the WasteMINZ Guideline TCLP limits would be appropriate for these compounds, however the current Redvale Landfill criteria are retained.

~~Redvale Landfill applies a more stringent sulphur limit than the WasteMINZ Guidelines and this is proposed to be maintained.~~

Some TCLP limits for the current Redvale Landfill are less stringent than the WasteMINZ Guideline Class 1 TCLP limits. For zinc, the TCLP limit is related to a specific waste stream, as detailed in Section

3.4. For other metals (antimony, boron, molybdenum, nickel and vanadium) the WasteMINZ Guidelines are proposed.

Some TCLP limits for the current Redvale Landfill are not in the WasteMINZ Guidelines Class 1 WAC because they are naturally occurring (manganese) or are very rare (cobalt, thallium, hexachlorobutadiene). The TCLP limits for these have been taken out of the current Redvale TCLP Limit table.

For the new Class 2 area, the proposed TCLP limits are taken directly from the WasteMINZ Guidelines, as set out in Sections 3.2 and 3.7.

3.2 Applicability of the WasteMINZ Guideline TCLP limits

The WasteMINZ Guideline TCLP limits for a Class 1 landfill are based on a Conceptual Site Model (CSM) of potentially complete and incomplete pathways.

The pathways assessed to be incomplete in the CSM, due to standard engineered controls and operational/institutional controls expected at a Class 1 landfill, are incomplete at Redvale landfill. In particular, controls for erosion and sediment management mean there is no direct runoff to the environment, and operating procedures (including PPE, daily cover, closed-cab machinery) mean there is no direct contact with waste by people onsite or offsite.

For the complete pathways (inhalation, seepage to groundwater, migration to surface water, ingestion of groundwater and surface water), a dilution attenuation factor (DAF) of 100 was used to derive the WasteMINZ Guidelines. Redvale Landfill meets the factors that are critical to making a DAF of 100 conservatively protective (Table 3.1). In particular, Redvale Landfill has a median inward hydraulic gradient, the estimated leachate seepage (liner leakage to ground) and landfill cover permeability is low, and the distance to the nearest sensitive receptor is greater than 100 m. This confirms that the WasteMINZ Guideline Class 1 TCLP limits are appropriate for the expanded Class 1 area.

Table 3.1: Assumptions in TCLP limits (DAF = 100) and comparison with Redvale landfill

Parameter	Assumed range for DAF = 100	Redvale landfill	Comment
Hydraulic conductivity of primary pathways for leachate migration	$> 10^{-9}$ m/s	10^{-8} m/s, but median hydraulic gradient is inward (<i>ref Hydrogeological Assessment</i>)	Because the site has a median inward hydraulic gradient, a higher DAF could be appropriate
Leachate seepage (liner leakage) to ground	10 to 5,000 L/ha/d	< 0.1 L/ha/d	Recent estimation of total outward flux (refer Hydrogeological Assessment report). Original design estimate was < 6 L/ha/d.
Landfill cover permeability	10^{-9} to 10^{-6} m/s	10^{-9} m/s	Specified in design
Distance to receiving environment or sensitive receptor	< 100 m	> 100 m	~480 m to Rangitopuni Stream

The TCLP limits in the WasteMINZ Guidelines for Class 2 landfills are more stringent than for Class 1.

- The TCLP limits for inorganic constituents are five to ten times more stringent for Class 2 than Class 1, because of the lower level of containment provided by a Class 2 lining system compared to a Class 1 lining system. (Five times for limits based on US toxicity characteristic, ten times for other contaminants).
- The TCLP limits for organics are ten times more stringent for Class 2 than Class 1 both because of the lower level of containment and because there is less organic matter in Class 2 waste to attenuate organic contaminants.

The Class 2 TCLP limits from the WasteMINZ Guidelines are considered appropriate for the proposed Class 2 area.

The WasteMINZ Guidelines also include total concentration limits for contaminated soil which are acceptable in Class 2 landfills. These are included in the WasteMINZ Guidelines as part of the definition of Class 3 managed fill waste, which is a subset of Class 2 waste. Contaminated soil can be accepted in the Class 2 area if it meets either the managed fill total concentration limits or the Class 2 TCLP limits.

3.3 TCLP limits for PFAS

The WasteMINZ Guidelines do not include TCLP limits for polyfluoroalkyl substances (PFAS). In January 2020, the Heads of EPA Australia and New Zealand (HEPA) issued *The PFAS National Environmental Management Plan Version 3.0*,¹ which includes landfill acceptance criteria for various landfill types.

The HEPA waste acceptance criteria for “clay/single composite lined landfill” are considered appropriate for the Class 1 area of Redvale Landfill.

The HEPA waste acceptance criteria are a combination of Australian Standard Leaching Procedure² (ASLP) limits and a total concentration cap to align with the low content limit in the Stockholm Convention. These criteria are considered appropriate for the Class 1 area at Redvale, and are:

- 0.0007 mg/L for the leachable concentration of the sum of perfluorooctane sulfonate (PFOS) and perfluorohexane sulfonate (PFHxS).
- 0.0056 mg/L for the leachable concentration of perfluorooctanoic acid (PFOA).
- 50 mg/kg for the total concentration of PFOS, PFHxS, PFOA (including related substances).

If PFAS that are not PFOS, PFHxS, or PFOA are present at significant concentrations, specific criteria should be developed for those substances. PFAS are long lasting in the environment, mobile in groundwater, and bioaccumulative. The main sources of PFAS to the Class 1 landfill are municipal waste, biosolids, and contaminated soil. PFAS are present in municipal waste and biosolids because they are present in consumer products. There is no practical way to remove PFAS from municipal waste or biosolids. Because of the persistence and mobility of PFAS and the ubiquity of PFAS in municipal waste, the safest way to manage PFAS-containing waste is secure containment in a Class 1 landfill with a leachate capture system. It is not intended to test municipal waste for PFAS. PFAS-contaminated soil and biosolids will be tested to confirm compliance with TCLP limits.

Class 2 waste includes materials such as textiles that may contain PFAS. Like municipal waste, these materials are not readily able to be tested using the TCLP method. The HEPA waste acceptance criteria for “unlined landfill” are 10 times more stringent than the “clay/single composite lined

¹ *PFAS National Environmental Management Plan Version 3.0* (March 2025) National Chemicals Working Group of the Heads of EPAs Australia and New Zealand.

² The ASLP method is less aggressive than the TCLP. For most PFAS, TCLP will give higher results. HEPA requires ASLP to ~~but~~ also includes a water extraction step; the acetic acid conditions of TCLP are more representative of the conditions waste will be exposed to in a mature landfill.

landfill” criteria and are considered appropriate for the Class 2 area, which is lined. The corresponding total concentration caps are 20 mg/kg (PFOS+PFHxS) and 50 mg/kg (PFOA).

3.4 Zinc in auto shredder residue

Redvale landfill receives about 5% by weight of auto shredder residue (ASR). A waste-specific TCLP limit for zinc in ASR of 500 mg/L is currently used at Redvale Landfill, which is substantially higher than the WasteMINZ Guideline TCLP limit for zinc (10 mg/L). Review of leachate quality data shows relatively consistent and low zinc concentrations. The 95% upper confidence limit (UCL) on the mean concentration of zinc in leachate at Redvale Landfill over the past 10 years is 0.4 mg/L. Groundwater fate and transport modelling was done assuming a constant source concentration of 0.4 mg/L, and the (conservative) assumption of an outward hydraulic gradient. The modelling showed the predicted concentration in groundwater at the point of exposure (Rangitopuni Stream) is below stream water quality guidelines (refer *Hydrogeological Assessment* for modelling details). Ongoing use of the current TCLP limit for zinc in ASR is considered appropriate.

3.5 Nickel slag waste

Redvale landfill receives monthly containerised shipments of nickel slag waste from New Caledonia, a total of ~16,000 tonnes per year. Sulphide is elevated in the slag, and Redvale currently applies a more stringent acceptance criteria of 5 mg/L (the WasteMINZ guideline is 50 mg/L). The more stringent limit is proposed to be maintained.

A waste-specific TCLP limit for nickel in the slag waste of 1500 mg/L is currently used at Redvale Landfill, which is substantially higher than the WasteMINZ Guideline TCLP limit for nickel (10 mg/L). Nickel concentrations in TCLP on the slag waste has been consistently below 1 mg/L for the past 10 years, so the WasteMINZ guideline of 10 mg/L is proposed.

3.6 Process to develop TCLP limits for new contaminants (Class 1)

Given the relatively short life of the proposed expansion, it is unlikely that TCLP limits for new contaminants will be needed. However, a process is included to consider new contaminants, in case any arise, which includes the following steps:

- Review New Zealand and international regulations and good practice guidelines, to identify whether there are pre-existing TCLP limits for other sites and jurisdictions. For example, the WasteMINZ Guidelines do contain TCLP limits for several other contaminants which could be applied to assess the suitability of incoming waste if needed (i.e., if those contaminants are in the waste-stream).
- If there are pre-existing TCLP limits, compare the conditions under which they were developed with Redvale Landfill conditions. If the assumptions are conservative, they can be adopted.
- If there are no pre-existing criteria, or if the assumptions are not appropriate for Redvale Landfill, develop Redvale-specific criteria.
- Document the criteria and assumptions and update the Landfill Management Plan.

3.7 WAC for Class 2 area

For the Class 2 area, the TCLP limits are more stringent than the WAC for the Class 1 area and are consistent with the WasteMINZ Guidelines and HEPA criteria.

Because of the lower level of containment provided by a Class 2 liner compared to a Class 1 liner, the WasteMINZ Guidelines’ TCLP limits for inorganic constituents are five to ten times more stringent for the Class 2 landfill (five times for limits based on US Toxicity characteristic, ten times for others).

Because of the lower level of containment and because there is less organic matter in the waste to attenuate organic contaminants, the WasteMINZ Guidelines' TCLP limits for organics are ten times more stringent for the Class 2 landfill.

For PFAS, the HEPA [leachability](#) waste acceptance criteria for "unlined landfill" are ten times more stringent than the "clay lined landfill" criteria. [The total concentration caps are 20 mg/kg for sum of PFOS and PFHxS, and 50 mg/kg for PFOA.](#)

Contaminated soil can be accepted as Class 2 waste provided it meets the WasteMINZ Guideline criteria for managed fill. The managed fill criteria include contaminant concentration limits.

[Contaminated soil can be accepted in the Class 2 area if it meets either the managed fill total concentration limits or the Class 2 TCLP limits.](#)

4 Proposed Waste Acceptance Criteria (WAC)

4.1 Acceptable waste

The acceptable waste types are specified in Table 6-1 of the WasteMINZ Guidelines.

For the Class 1 area, acceptable wastes are non-hazardous Municipal Solid Waste (MSW), which includes mixed municipal waste from residential, commercial and industrial sources, as well as soils, rocks, gravel, sand, clay, road sweepings, construction and demolition waste, [and](#) treated hazardous waste that meets the TCLP limits, ~~and asbestos~~ (refer Table 6-1 of the WasteMINZ Guidelines³). Domestic waste may contain residual household hazardous waste, for example, containers with residual amounts of cleaning agents which are a very small proportion of the total waste going to landfill. It is not possible to remove all such items at the landfill, and the WAC do not prohibit domestic waste which ordinarily may contain traces of hazardous waste.

For the Class 2 area, acceptable wastes are construction and demolition (C&D) waste, managed fill, clean fill, and non-putrescible industrial waste. These wastes include plasterboard, Gibraltar board, reinforced concrete, timber, roofing and flooring products, fibreglass, textiles, non-recyclable glass, site clearance and excavation materials, and other materials listed in Table 6-1 of the WasteMINZ Guidelines. The maximum incidental or attached biodegradable material (e.g., vegetation) must be no more than 5% by volume per load. Managed fill includes contaminated soil from earthworks and site remediation that meets the total concentration limits set out in the WasteMINZ Guidelines for Class 3 waste.

4.2 Prohibited wastes

The list of prohibited wastes for Class 1 and Class 2 landfills (Table 4.1) is from Appendix H of the WasteMINZ Guidelines.

Table 4.1: Prohibited waste characteristics

Class	Characteristic
H1	Explosives
H2	Gases
H3	Flammable liquids
H4.1	Flammable solids
H4.2	Substances or wastes liable to spontaneous combustion

³ [We note that Table 6-1 of the WasteMINZ Guidelines does not list individual contaminant types \(e.g., asbestos\).](#)

H5.1	Oxidising substances
H6.2	Infectious substances
H7	Radioactive materials
H8	Corrosives
H10	Liberation of toxic gases in contact with air or water
H13	Capable, by any means after disposal, of yielding another material (i.e., leachate which possesses any of the above characteristics).

4.3 Physical nature of wastes

The landfill will not accept untreated sewage, or bulk liquids.

In accordance with the WasteMINZ Guidelines, the following physical requirements apply:

- All wastes should have an angle of repose of greater than 5 degrees (i.e., “spadeable”) (typically applicable to biosolids); and
- All wastes shall have no free liquid component, which is to be assessed at the point of loading into the truck that delivers it to the tip face.

Additional controls to meet operational requirements include:

- Packaged goods originally intended for domestic use but would be regarded as hazardous if in bulk are acceptable provided that the quantity is less than 0.1% of the daily waste tonnage.
- Some large volume wastes may be monofilled or encapsulated within the waste mass to avoid particular mixing that leads to adverse effects like release of odour or suppression of decomposition, e.g., high sulphate and sulphur wastes.
- Oversize items (e.g., moulds for fibreglass yachts, tree logs, monster truck tyres) will be accepted provided they do not compromise the ability to apply daily cover. For example, WMNZ may choose to apply a time of day restriction to delivery of such wastes.
- Dusty materials will be accepted subject to additional controls to manage safety at the tip face (visibility, dust sticking to compactor windows, inhalation). These controls may include pre-bagging, load covering, dampening at source, or restricting delivery to low-wind days.
- Management controls for asbestos in accordance with WorkSafe’s Approved Code of Practice for Management and Removal of Asbestos (November 2016 amended December 2016) and BRANZ’s New Zealand Guidelines for Assessing and Managing Asbestos in Soil (October 2024).

4.4 Odorous waste (acceptable in Class 1 area only)

The landfill odour management plan is detailed in section 3.6 of the LMP, with waste acceptance controls at section 3.6.3.1.

In the case of a new special waste stream that is odorous, especially waste from a new source or process, the landfill asks the customer to provide information that allows the landfill to assess the odour potential of the waste. Potentially odorous waste is evaluated on a case-by-case basis, by consideration of:

- The odour potential.
- The total volume, rate of delivery, and timing of delivery, and how these tie in with operations at the landfill at the proposed time of delivery. The landfill may request a small-volume trial.

- Whether any pre-treatment has been done (e.g., mixing with lime). Potentially malodorous waste, such as egg wastes or wool scourings, must be pre-treated by the waste generator to reduce odour before delivery (e.g., mixing with lime).

Odorous waste must be buried as soon as possible. Any excavations required to prepare for rapid burial must consider odour potential from the excavation as well as timing of delivery of the waste.

Hours for delivery of odorous waste may be restricted to middle hours of the day when the working face operations and climatic conditions are most favourable for odorous waste management.

4.5 TCLP limits

Hazardous waste is not acceptable. Waste that is potentially hazardous due to toxicity must meet the TCLP limit. The proposed TCLP limits (mg/L) are in Table 4.2.

For the Class 1 area, the proposed TCLP limits are mostly the same as currently used at Redvale Landfill for Class 1 waste, with some adjustments to align with the TCLP limits in the WasteMINZ Guidelines for Class 1 landfills, additional criteria from HEPA for PFAS-containing wastes, and specific values for zinc in ASR and sulphur in nickel slag. The limits for contaminants that have potential to trigger the hazardous waste toxicity characteristic (i.e., the full list of contaminants and TCLP limits included at US 40 CFR §261.24) are mandatory limits which may not be exceeded. The WasteMINZ Guidelines for these contaminants are the same as the limits in 40 CFR §261.24 (except for trichloroethylene, which is likely a transcription error in the WasteMINZ Guidelines). The other limits have typically been applied as guidelines at Redvale Landfill, rather than strict limits. Long term leachate quality data and the median inward hydraulic gradient suggest this practice has not led to adverse leachate quality effects. However, we propose the TCLP limits should be used as limits.

For the Class 2 area, the TCLP limits are more stringent and are consistent with the HEPA and WasteMINZ Guidelines.

Table 4.2: TCLP limits for Class 1 and Class 2 areas (mg/L)

	Class 1			Class 2
	Proposed for ARL-TP	Redvale current	WasteMINZ Guidelines	Proposed for ARL-TP
Limits from WasteMINZ and US toxicity characteristic				
Arsenic	5	5	5	1
Barium	100	100	100	20
Cadmium	1	1	1	0.2
Chromium	5	5	5	1
Mercury	0.2	0.2	0.2	0.04
Selenium	1	1	1	0.2
Silver	5	5	5	1
1,1-dichloroethene	0.7	0.7	0.7	0.07
1,2-dichloroethane	0.5	0.5	0.5	0.05
2,4,5-trichlorophenol	400	400	400	40
2,4,5-trichlorophenoxypropionic acid (Silvex)	1	1	1	0.1
2,4,6-trichlorophenol	2	2	2	0.2
2,4-dichlorophenoxyacetic acid	10	10	10	1

	Class 1			Class 2
	Proposed for ARL-TP	Redvale current	WasteMINZ Guidelines	Proposed for ARL-TP
2,4-dinitrotoluene	0.13	0.13	0.13	0.013
Carbon tetrachloride	0.5	0.5	0.5	0.05
Chlordane	0.03	0.03	0.03	0.003
Chlorobenzene	100	100	100	10
Chloroform	6.0	6.0	6.0	0.6
Endrin	0.02	0.02	0.02	0.002
Heptachlor	0.008	0.008	0.008	0.008
Hexachlorobenzene	0.13	0.13	0.13	0.013
Hexachlorobutadiene	0.5	0.5	0.5	0.05
Hexachloroethane	3	3	3	0.3
Lindane	0.4	0.4	0.4	0.08
m-Cresol	200	200	200	20
Methoxychlor	10	10	10	1
Methylethyl ketone	200	200	200	20
Nitrobenzene	2	2	2	0.2
o-Cresol	200	200	200	20
p-Cresol	200	200	200	20
Pentachlorophenol	100	100	100	10
Pyridine	5	5	5	0.5
Tetrachloroethene	0.7	0.7	0.7	0.07
Total cresol	200	200	200	20
Toxaphene	0.5	0.5	0.5	0.05
Trichloroethylene	0.5	0.5	0.7	0.05
Vinyl chloride	0.2	0.2	0.2	0.02
TCLP Limits from WasteMINZ only				
Antimony	0.6	300	0.6	0.06
Boron	20	9000	20	2
Copper	5	25	5	0.5
Cyanide	50 10	10	50	10
Lead	5	5	5	1
Molybdenum	10	100	10	1
Nickel (incl. slag)	10	1500	10	1
Vanadium	2	1000	2	0.2
1,4-dichlorobenzene	7.5	7.5	7.5	0.75
Benzene	0.5	0.5	0.5	0.05
BTEX total	10	10	-	
DDT	0.02	0.02	-	
Ethylbenzene	5	5	50	5

	Class 1			Class 2
	Proposed for ARL-TP	Redvale current	WasteMINZ Guidelines	Proposed for ARL-TP
Polychlorinated biphenyls	0.0001	0.0001	50	5
Toluene	5	5	100	10
Tributyltin oxide	0.02	0.02	3	0.3
Xylene (m-, o-, p-)	5	5	100	10
Specific waste stream limits				
Sulphide – nickel slag	5	5	50	10
Zinc – ASR {not a WasteMINZ limit}	500	500	10 <u>(zinc)</u>	-
PFAS limits²	Proposed limit for ARL-TP	Redvale current	HEPA Guideline	Proposed limit for ARL-TP
PFOS + PFHxS	0.0007	-	0.0007	0.00007
PFOA	0.0056	-	0.0056	<u>0.00056</u>

Notes:

1. Grey shaded cells show where proposed TCLP limit guidelines are different to current Redvale TCLP limit guidelines.

2. The total concentration caps for PFAS are PFOA 50 mg/kg for Class 1 and Class 2; PFOS + PFHxS 50 mg/kg for Class 1 and 20 mg/kg for Class 2.

4.6 Total concentration limits

4.6.1 Relationship between total concentrations (mg/kg) and TCLP concentrations (mg/L)

The total concentration test is particularly useful because it is faster and less expensive than the TCLP, so that more tests can be done to better characterise a waste. The total concentration test involves boiling a soil sample in strong acid and then testing the acid for contaminants. The result is expressed as mg/kg (mg of contaminant per kg of soil).

The TCLP involves shaking a soil sample in weak acid solution for many hours and then testing the acid solution. Results are expressed as mg/L (mg of contaminant per L of weak acid solution).

Because of the specific quantities of soil and liquid used in the TCLP, any sample with total concentrations up to 20x the TCLP limit cannot possibly exceed the TCLP limit. Samples with concentrations higher than 20x the TCLP limit could exceed the limit if a high proportion of the contaminant goes into solution.

Redvale Landfill has used a practice of assuming that for Class 1 waste, total concentrations up to 100x the TCLP limit likely meet the TCLP limit and are therefore acceptable. Data held by Redvale Landfill show that for organic contaminants that adhere to soil and for most metals, this is appropriate for the waste types received. Furthermore, long-term monitoring shows no adverse impacts on leachate quality on waste that have been received to date.

For routine Class 1 waste received at Redvale Landfill, material with total concentrations (in mg/kg) up to 100x the TCLP Limits is acceptable. We recommend TCLP testing is done on any new and different wastes.

4.6.2 Class 2 contaminated soil

Class 2 landfills can accept managed fill, which includes contaminated soil that meets the Class 3 guidelines, as set out below (from Table F-1 WasteMINZ Guidelines). Contaminated soil can be

accepted to the Class 2 area if it meets either the TCLP Limits in Table 4.2 or the total concentration limits in Table 4.3.

Table 4.3: Managed fill WAC

Contaminant	Maximum allowable total concentration (mg/kg)	Contaminant	Maximum allowable total concentration (mg/kg)
Arsenic	140	TPH C7-C9	200
Cadmium	10	TPH C10-C14	600
Chromium	150	Benzene	0.11
Copper	280	Ethylbenzene	10
Lead	460	Toluene	19
Mercury	3	Total xylene	25
Nickel	320	Benzo(a)pyrene (equiv) ¹	125
Zinc	1200	Dieldrin	0.10
		Total DDT ²	2.0

Notes:

1. For benzo(a)pyrene, the equivalent BaP concentration is calculated as the sum of each of the detected concentrations of nine carcinogenic PAHs (benzo(a)anthracene, benzo(b)fluoranthene, benzo(j)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, fluoranthene and indeno(1,2,3-cd) pyrene), multiplied by their respective potency equivalency factors.
2. Sum of six o,p'- and p,p'- isomers of DDT, DDD and DDE

4.7 Case-by-case assessments

Occasionally, applications may be received for disposal of waste that contains substances for which there are no TCLP limits. This will need case-by-case assessment based on the harmfulness of the chemical, the amount of waste to be disposed, and the potential effect of the waste on leachate quality. Special management procedures may include placement in a logged location, immediate burial, or restrictions on the timing of deliveries of material.

5 Mitigation and monitoring

5.1 Decision tree for waste evaluation process

The waste evaluation decision tree is intended to provide a clear, simple to use, evaluation process that minimises risk of inappropriate wastes being accepted. The flow chart in Figure 5.1 illustrates the overall waste application evaluation process.

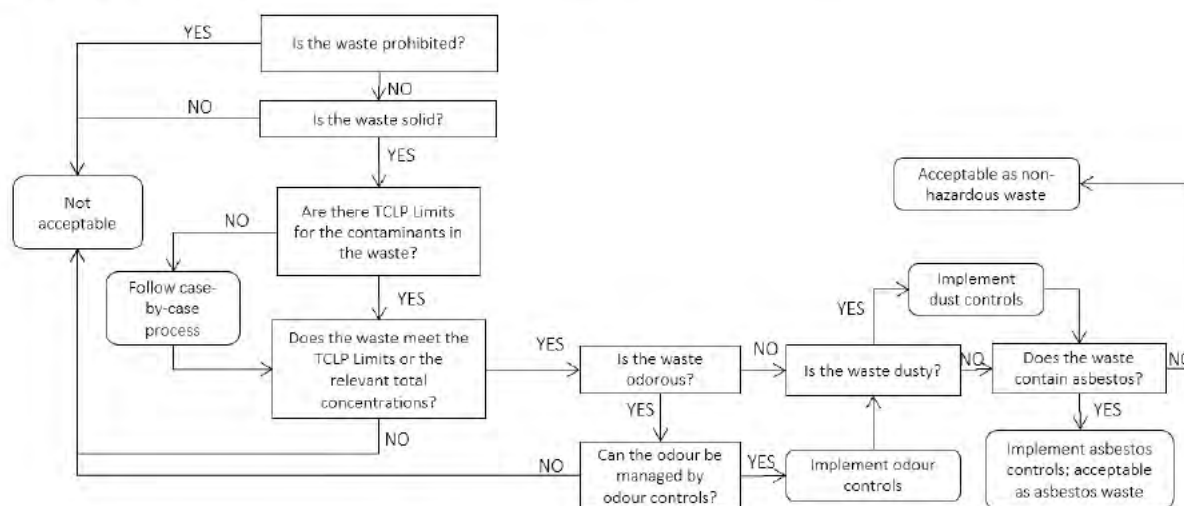


Figure 5.1: Waste pre-acceptance evaluation process

5.2 Elements of waste control

Waste control measures are based on actions and historical performance at other modern landfills. The main elements are:

- Pre-acceptance testing.
- Pre-acceptance agreement.
- Gatehouse controls.
- On-site screen testing.
- Regulatory reporting.

5.2.1 Pre-acceptance testing

Pre-acceptance testing is required for all special wastes and soils whose contaminant concentrations cannot otherwise be fairly assessed e.g. by observation, relevant historical records, or good knowledge of the source.

The landfill must keep sufficient records to show that the waste is not hazardous. In the case of any new special waste with potential ecotoxicity, the landfill will ask the customer to provide test results that show that the waste meets the TCLP Limits or the total concentration limits, prior to accepting the application.

The requirements for testing are:

- The testing must be done by an accredited laboratory.
- The sample size must be sufficient to effectively characterise the material.

- The sampling will typically include worst-case and average concentrations, but this is disposer-specific.

In addition to limits set in the contaminant list (Table 5.1), the landfill operator would use discretion and experience to impose limits on any other contaminants or apply customised disposal methods that they deem necessary.

Occasionally, applications will be received for disposal of waste that contains substances for which there are no TCLP limits. The most effective way to assess these wastes is on a case-by-case basis, which considers the harmfulness of the chemical, the amount of waste to be disposed, and the potential effect of the waste on leachate quality.

5.2.2 Pre-acceptance agreement

The customer's application must include:

- Description of the waste and waste generator contact information.
- For potentially hazardous waste, results of any testing on the waste.

For the Class 2 only area, the application must also include confirmation that each load contains less than 5% by volume attached/residual organic material (e.g., vegetation).

Additional requirements for the Class 1 area:

- For potentially malodorous waste, information to allow the landfill to assess whether the waste is acceptable (i.e., odour potential, rate of delivery, timing of delivery, any pre-treatment carried out on the waste).
- For malodorous waste that requires pre-treatment, confirmation that pre-treatment has occurred.

5.2.3 Gatehouse

Every load of special waste must be accompanied by a manifest corresponding to an approved waste application.

Class 1 only: all loads of odorous waste must be covered for transport to the landfill and remain covered as far as the working face or a dedicated de-tarpping area. The gatehouse must notify operators by site radio when the load has arrived at the site. Odorous wastes shall be rejected at the gate if unacceptable.

5.2.4 On-site screen testing

Random load inspections will be carried out at a frequency of approximately 1 in 50 loads. The frequency may be revised (up or down) depending on previous inspection results.

5.2.5 Regulatory reporting

If any waste load is rejected at the gatehouse or removed because it is hazardous, Auckland Council is to be notified within 48 hours.

Waste tonnage tallies will also be reported to Council in accordance with bylaws.

5.3 Leachate quality monitoring

Leachate quality testing is not required by the current consents, but WMNZ does test leachate quality from the existing landfill quarterly, with a broader suite of contaminants tested annually.

Leachate from the new Class 2 area should also be tested quarterly for common and soluble contaminants and ammonia, conductivity and pH. A broader suite of potential contaminants should be tested annually.

The proposed suite of contaminants is set out in Table 5.1.

Table 5.1: Leachate quality monitoring (note: this is not required by current consent)

Contaminant / parameter	Class 1 area	Class 2 area
Metals for which there are leachability limits: • Arsenic • Cadmium • Copper • Chromium • Lead • Nickel • Mercury • Selenium • Silver • Zinc	Annual	Quarterly (including Annual)
Other leachate quality parameters: • pH • Ammonia • Conductivity • Potassium • Chloride	Annual	Quarterly (including Annual)
Organic compounds: • Total petroleum hydrocarbons (TPH) • Benzene • Chlorinated solvents • Organochlorine pesticides, including DDT-compounds • PFAS	Annual	Annual

6 Applicability

This report 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 our client will submit this report as part of an application under the Fast-track Approvals Act 2024 and that an Expert Panel as the consenting authority will use this report for the purpose of assessing that application. We understand and agree that this report will be used by the Expert Panel in undertaking its regulatory functions.

Tonkin & Taylor Ltd
Environmental and Engineering Consultants

Lead author:

Authorised for Tonkin & Taylor Ltd by:

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Penny Kneebone

Principal Environmental Scientist

.....

Simonne Eldridge

Project Director

Appendix A Code of Conduct

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

I am a Technical Director Environmental Science at Tonkin & Taylor Ltd (T+T), where I specialise in environmental management. I have worked at T+T since 2006. In 2021 I was appointed Chief Executive for T+T New Zealand. Prior to joining T+T, I was an environmental consultant at ENVIRON International LLC (now Ramboll).

I have 26 years' experience in assessing and managing the effects of discharges of chemicals into the environment. I have specific experience in environmental management of landfill activities, including development and application of WAC. I hold the following qualifications – PhD Environmental Engineering Science; BSc (Hons 1st) Chemistry.

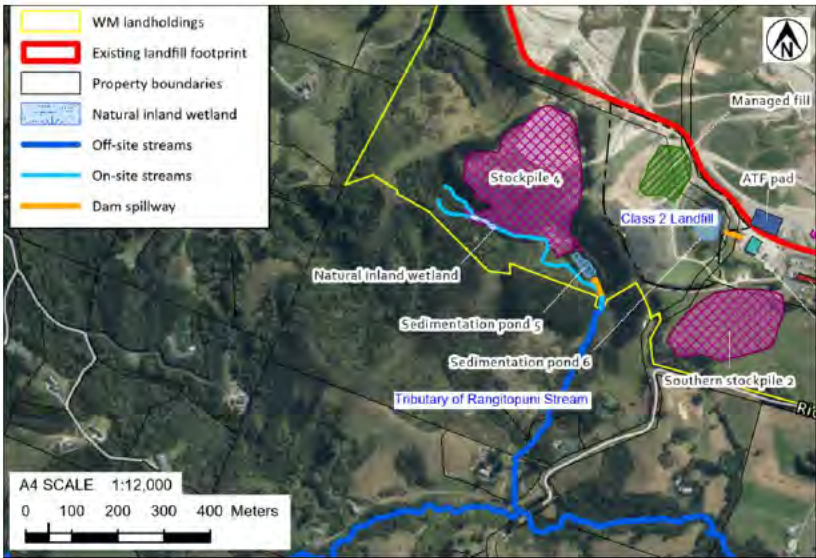
Recent relevant projects and services that I have been involved with include: developing and applying WAC for Silverstream Landfill and Bluegums Landfill, prepared WAC for Hutt City Council's landfills and advised Wellington City Council on WAC for Southern Landfill. I have developed, reviewed, and revised environmental monitoring programmes for operating and closed landfills, particularly programmes that are designed to identify impacts of landfill leachate on groundwater and surface water.

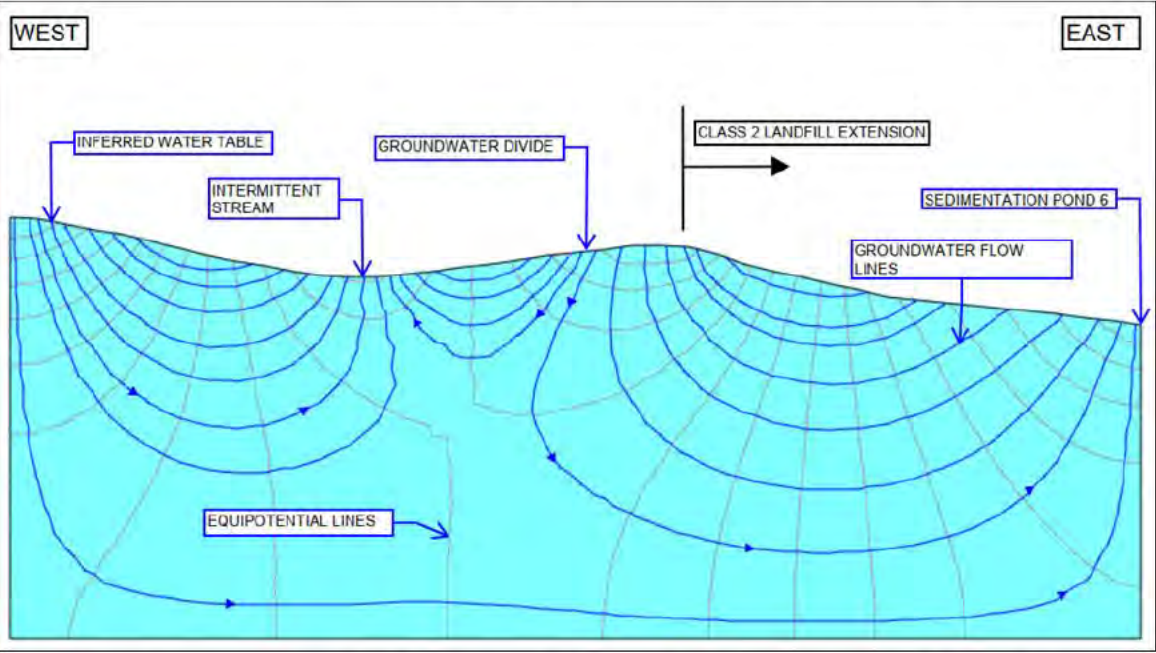
.....
Penny Kneebone
Principal Environmental Scientist

Appendix D Hydrogeology

D1 Hydrogeology – Redvale Landfill Expansion

Table D 1: Responses (Leon Pemberton) to Auckland Council (Stephen Collins – Beca) comments on the Draft Hydrogeological Assessment

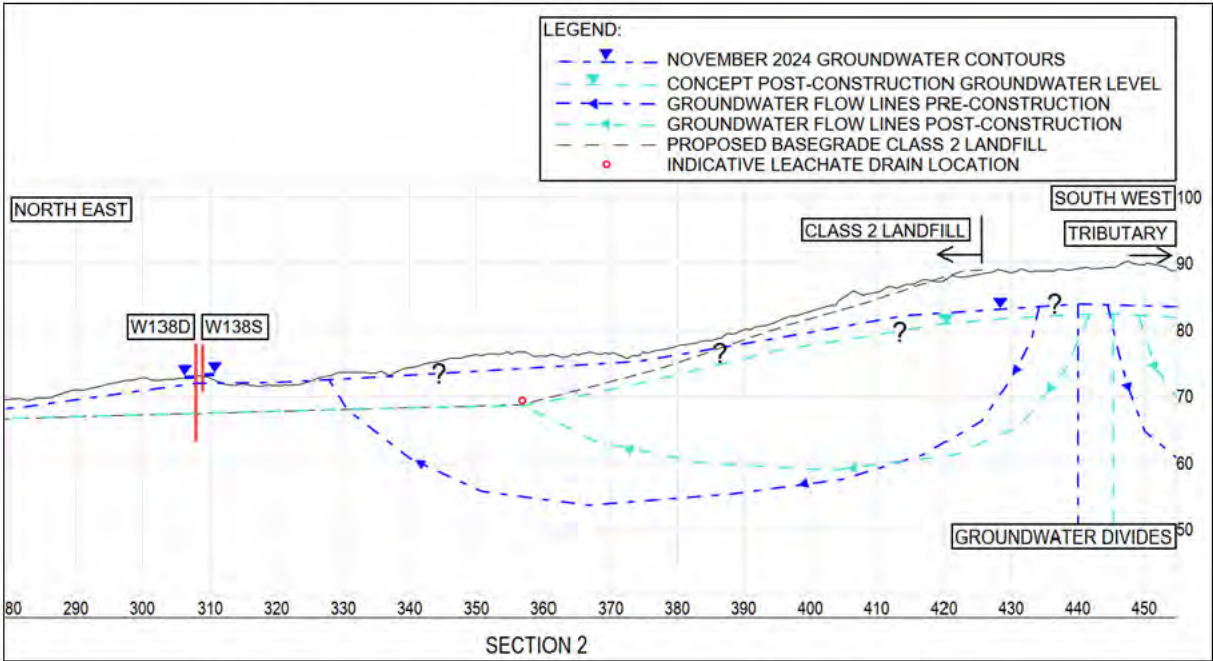
#	Comment	Response
1	A single intermittent tributary of the Rangitopuni Stream is not considered as a potential receptor, despite being adjacent to the Class 2 landfill. This stream was identified in the Ecology Assessment but not identified in the hydrogeology report.	The intermittent tributary of the Rangitopuni Stream is not a groundwater receptor for the existing landfill footprint and the proposed Class 2 Landfill Extension because groundwater beneath the landfill flows away from the tributary under both existing and post-construction conditions. The tributary is located south of Stockpile 4 and west of the proposed Class 2 extension area (Figure D1). Regional groundwater contouring indicates that groundwater flow in the vicinity of the Class 2 extension is generally toward the south-east. This flow direction is away from the tributary and therefore, does not support groundwater discharge or baseflow contribution to the stream.  Figure D1: Location of the tributary of the Rangitopuni Stream in relation to the Class 2 landfill extension. The yellow line indicates WMNZ landholdings in this area. At the site scale, topographic catchments show that the tributary and the proposed Class 2 extension are separated by a ridgeline and lie within different surface water catchments. Consistent with this catchment separation, the tributary is

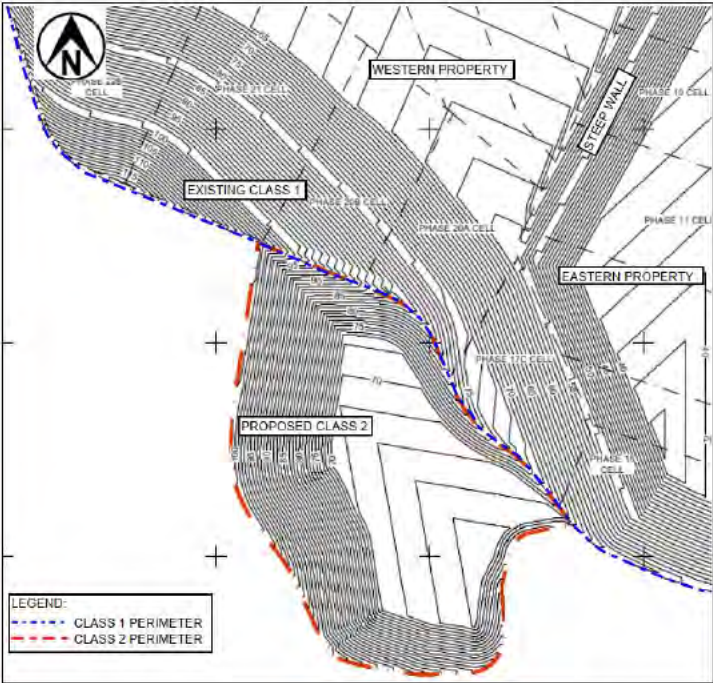
#	Comment	Response
		located at a higher elevation (approximately 72.7 mRL) than the base of the proposed Class 2 extension (approximately 66–67 mRL). This relative elevation relationship indicates that the tributary is hydraulically up-gradient of the Class 2 Landfill extension. Groundwater catchments are reasonably assumed to be a muted reflection of surface topography. On this basis, a groundwater divide is inferred beneath the ridgeline, separating groundwater flow toward the tributary from groundwater flow beneath the proposed Class 2 extension. The groundwater flow expected beneath the intermittent stream and proposed Class 2 extension in the existing setting is illustrated on Figure D2, drawn along line of Section 3 (refer Figure D3).  Figure D2: Inferred groundwater flow lines beneath the water table conceptualised as a muted reflection of topography in the existing setting, generated using TopoDrive proprietary software¹. Arrows indicate the direction of groundwater flow. Construction dewatering associated with the Class 2 extension has been assessed using Anaqsim². The modelling predicts that after 365 days of dewatering, the drawdown extent toward the tributary remains very limited and extends only

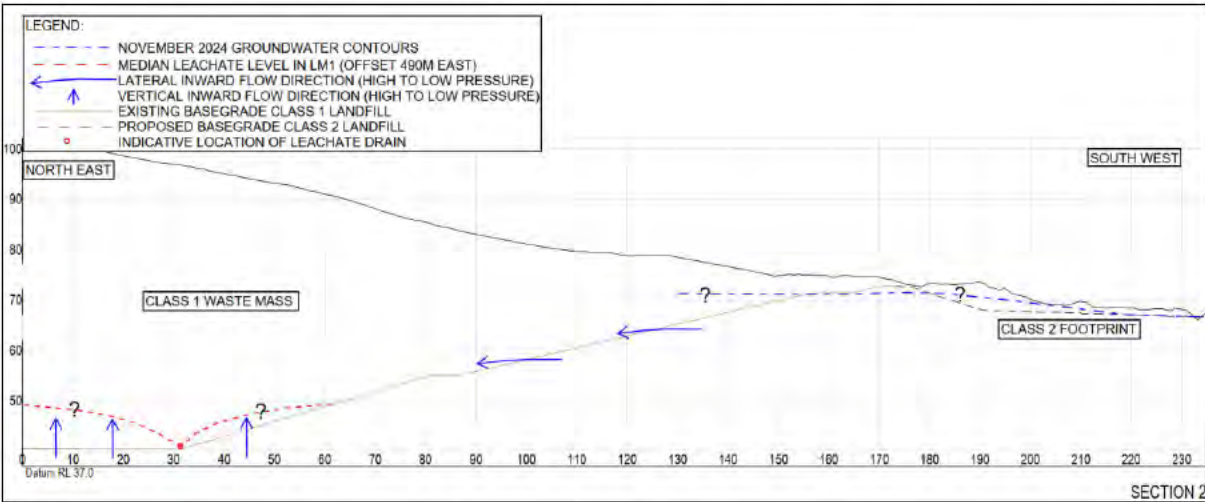
¹ [TopoDrive & ParticleFlow](#)

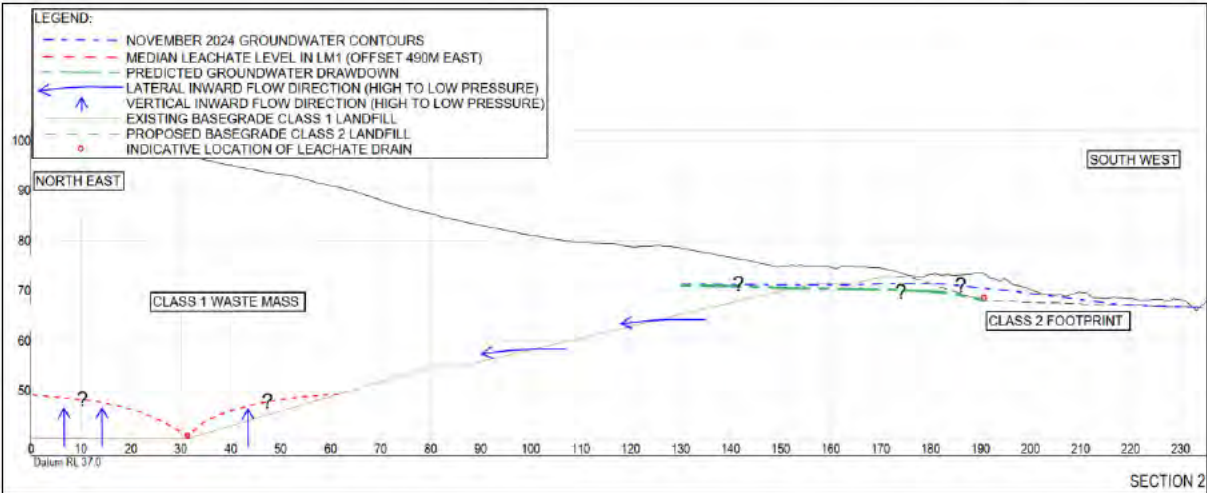
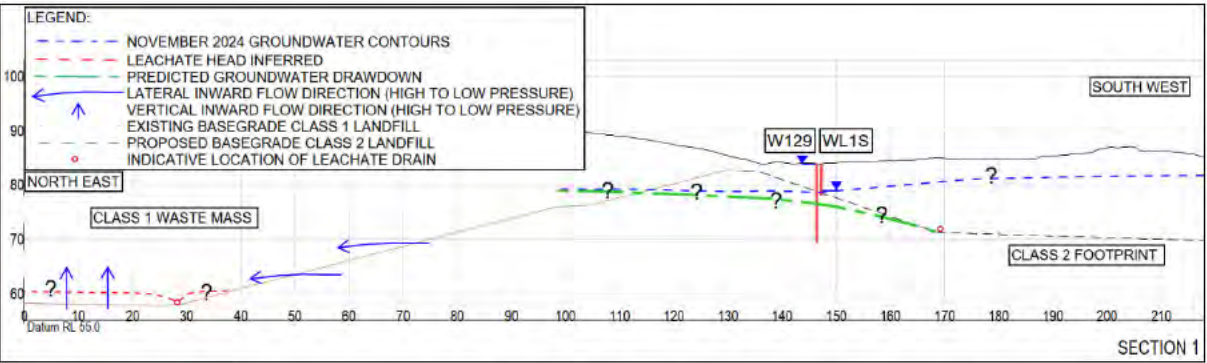
² [Anaqsim - Meshless Groundwater Simulator for Engineers](#)

#	Comment	Response
		marginally beyond the Class 2 extension footprint, approaching but not materially crossing the ridgeline (Figure D3). Dewatering is predicted to slightly steepen the groundwater flow contours toward the excavation and shift the groundwater divide slightly toward the tributary. This change is unlikely to result in groundwater flow beneath the proposed landfill reversing toward the tributary. Groundwater beneath the Class 2 extension is predicted to continue flowing away from the tributary under both existing and dewatered conditions. Post-construction, the lining system of the Class 2 extension will create a low-permeability barrier that will reduce local groundwater recharge currently occurring within the landfill footprint. A reduction in recharge is expected to result in a lowering of groundwater levels adjacent to the Class 2 extension, maintaining the shift in the groundwater divide toward the tributary, created during dewatering. Whilst the divide is likely to move closer to the tributary, groundwater flow beneath the Class 2 extension is unlikely to significantly change compared to the existing setting shown in Figure D2 and is thus expected to continue to flow away from the tributary, as illustrated on Figure D4.  Figure D3: Predicted groundwater drawdown extents around the Class 2 Landfill extension during dewatering. Section line 2 is shown in part on Figure D4.

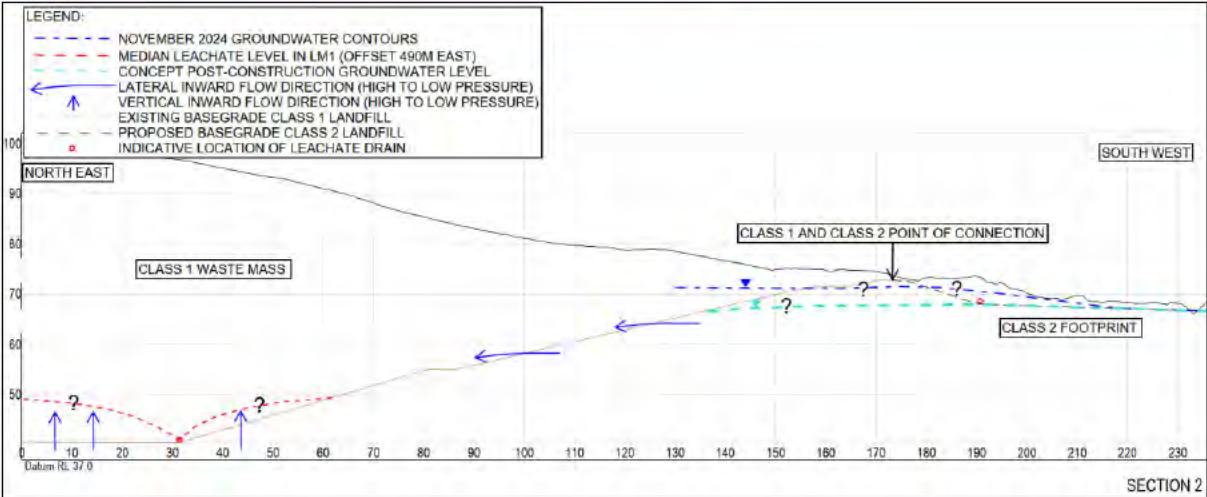
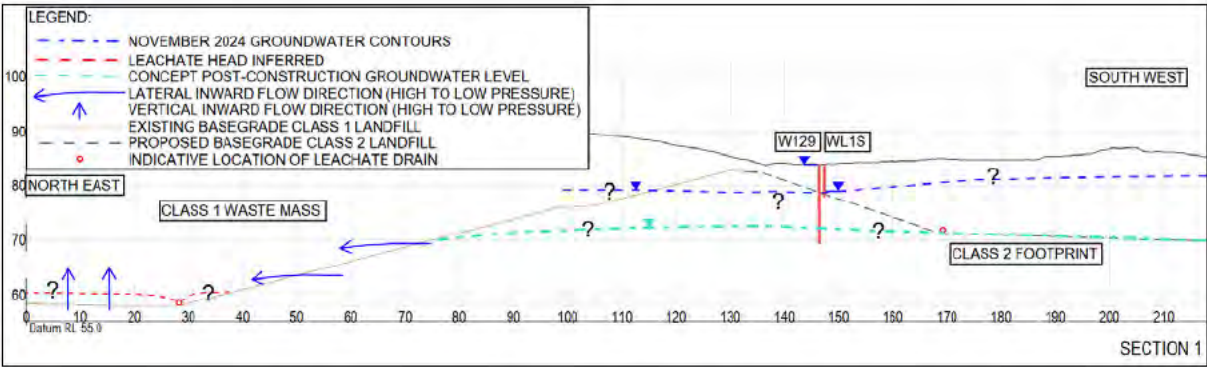
#	Comment	Response
		Based on predicted changes to local groundwater levels during and post-construction of the Class 2 extension, and the relative elevation differences between the tributary and the floor of the landfill, the intermittent tributary of the Rangitopuni Stream was not identified as a potential receptor.  Figure D4: Concept reduction in groundwater levels post-construction of the Class 2 Landfill extension. Dashed black line is the Class 2 extension footprint, the dashed blue line is based on the November 2024 groundwater contours and the dashed cyan line represents the concept post-construction groundwater levels.

#	Comment	Response
2	In addition, there still needs to be further supporting information on whether excavation and dewatering of the Class 2 landfill site will compromise (even temporarily) the inward hydraulic gradient of the site. For example, while the report now outlines groundwater contours under present conditions, it would be useful to map groundwater contours across the site during and following dewatering to demonstrate no reversal in gradient.	In response to Q2, groundwater contours have been mapped under the following conditions: - Existing conditions (using measured groundwater levels). - During site dewatering for construction (based on numerical modelling). - During operation and post-construction filling based on conservative groundwater level assumptions. In all cases an inward groundwater flow towards the Class 1 Landfill adjacent to the Class 2 Extension indicate inward hydraulic gradients are maintained under all phases of the project. Inward hydraulic gradient: Pre-construction conditions Under pre-construction conditions, clear inward lateral and vertical hydraulic gradients exist toward the Class 1 Landfill. The Class 1 Landfill is divided into two areas, identified as the Eastern Property and Western Property. These areas are separated by a steep wall, which at its lowest point rises from 43 mRL to 58 mRL. These features are illustrated on Figure D5.  Figure D1: Class 1 Landfill existing basegrade and Class 2 Landfill extension proposed basegrade (Adapted from Dwg No: 1092369.3000-C11, Basegrade and phase layout). Outline of Class 2 extension is shown as red dashed line and perimeter of the Class 1 Landfill is blue dashed line.

#	Comment	Response
		The proposed Class 2 extension basegrade ranges from approximately 66 mRL in the south to 71 mRL in the north (refer to Figure D1). Groundwater levels contoured from monitoring data collected in June 2021, March 2022, and November 2024 indicate groundwater levels along the eastern margin of the proposed Class 2 extension area typically range from approximately 68 mRL to 78 mRL. These groundwater levels are consistently above the Class 1 Landfill basegrade and the leachate collection system, demonstrating that groundwater flows laterally and vertically inward toward the Class 1 Landfill under existing conditions (Figure D2). This inward hydraulic gradient is present across both the Eastern and Western Properties of the Class 1 Landfill.  Figure D2: Contoured groundwater levels from November 2024 represented in cross section adjacent to the Eastern Property. Extract from Section 2 line illustrated on Figure D3. Inward hydraulic gradient: Construction dewatering Construction dewatering of the Class 2 extension will not reverse the inward hydraulic gradient across either the Eastern or Western Properties of the Class 1 Landfill. Groundwater drawdown during construction has been modelled using Anaqsim, using input parameters previously reported by T+T. The modelling predicts that the zone of influence of dewatering extends approximately 50 m beyond the eastern edge of the proposed Class 2 extension footprint, with maximum drawdown of approximately 2 m at the excavation boundary.

#	Comment	Response
		During dewatering, groundwater contours are predicted to temporarily steepen toward the excavation base. However, groundwater levels are predicted to remain above the floor levels of both the Eastern and Western Properties of the Class 1 Landfill, maintaining inward lateral and vertical hydraulic gradients (Figure D3 and Figure D 4 (green dashed lines).  Figure D3: Predicted change to groundwater level contours adjacent to the Class 1 Landfill Eastern Property from construction dewatering of the Class 2 extension (green dashed line).  Figure D 4: Predicted change to groundwater level contours adjacent to the Class 1 Landfill Western Property from construction dewatering of the Class 2 extension (green dashed line).

#	Comment	Response
		In the absence of leachate level monitoring data for the Eastern Property adjacent to the Class 2 extension, a conservative leachate head of approximately 49.1 mRL (based on median levels in LM1 (offset by 450 m east) has been adopted. Even under this conservative assumption, predicted groundwater levels will remain above leachate levels and does not indicate a reversal of gradient toward the surrounding environment (refer to Figure D3 and the red dashed lines). For the Western Property, leachate levels have been conservatively inferred to be approximately 3 m above the landfill base (refer to Figure D 4 and the red dashed lines). Predicted groundwater drawdown does not reduce groundwater levels below this inferred leachate head. Leachate would need to have a head of over 15 m before reaching the predicted groundwater levels. Accordingly, inward hydraulic gradients are maintained, and reversal is considered highly unlikely during dewatering. Inward hydraulic gradient: Post-construction dewatering Post-construction, the inward hydraulic gradient will continue to be maintained and is not expected to reverse. Following construction, the lining systems of the Class 1 Landfill and Class 2 extension will be joined, creating a combined low-permeability barrier that will reduce groundwater recharge currently occurring within the landfill footprint (Figure D 5). A reduction in recharge is expected to result in a lowering of groundwater levels adjacent to the landfills. A conservative conceptual reduction in groundwater levels of over 4 m has been applied to assess post-construction conditions (coincides with the floor of the Class 2 extension, Figure D 5 and Figure D6). This results in a relatively flat groundwater table extending from the base of the Class 2 extension, rather than the development of outward gradients. Even under this conservative post-construction scenario, groundwater levels are not predicted to fall below the Class 1 Landfill base or inferred leachate levels in a manner that would cause a reversal of lateral or vertical hydraulic gradients. The inward containment function of the Class 1 Landfill is therefore retained post-construction.

#	Comment	Response
		 Figure D 5: Conceptualised change to groundwater level contours adjacent to the Class 1 Eastern Property post-construction of the Class 2 extension.
		 Figure D6: Conceptualised change to groundwater level contours adjacent to the Class 1 Western Property post-construction of the Class 2 extension.

#	Comment	Response
		Based on the following factors, inward hydraulic gradients toward the Class 1 Landfill adjacent to the Class 2 Landfill extension will be maintained under all phases of the project and are not likely to reverse: • Observed groundwater levels. • Numerical modelling of construction dewatering. • Conservative post-construction groundwater level assumptions.

3 July 2026
Job No: 1092369.0000

Auckland Council
135 Albert Street
Auckland 1010

Attention: Warwick Pascoe

Dear Warwick

**Redvale Landfill Expansion
Responses to Auckland Council Comments
Tranche 2**

This letter provides the second tranche of responses to the comments received from Auckland Council on draft technical reports prepared for WM New Zealand (WMNZ) for inclusion in a proposed substantive application for resource consent under the Fast-Track Approvals Act 2024. The following appendices detail the responses to the comments received from Auckland Council for each specialist area.

This letter includes the following appendices:

- Appendix A: Landfill Engineering
- Appendix B: Noise and Vibration
- Appendix C: Landscape and Visual

To track responses to Auckland Council, we have provided a table below to identify which comments have been received and what responses are being included in this second tranche.

Specialist Area	Comments received on draft report	Comments received from	Response prepared for Tranche 1	Response prepared for Tranche 2	Response prepared by	Meeting
Landfill engineering	Yes (27/03/2026)	Walter Starke (Jacobs)	No	Yes	Andrew Shallard (Tonkin + Taylor)	Yes (29/04/26)
Geotechnical	Yes (1/04/2026)	Kyle Li (Auckland Council)	Yes	N/A	Andrew Stiles (Tonkin + Taylor)	No
Dam Assessment	N/A		N/A			
Air Quality	Yes (2/07/2026)	Louis Boamponsem	No	No (Response to be prepared as part of Tranche 3)		
Health Risk						
Hydrogeology	Yes (1/04/2026)	Stephen Collins (Beca)	Yes	N/A	Leon Pemberton (Tonkin + Taylor)	No
Stormwater & ITA	Yes (16/04/24)	Hillary Johnston (Tektus)	No	No (Response to be prepared as part of Tranche 3)		No
Waste Acceptance	Yes (30/03/2026)	Stanley Howell (Jacobs)	Yes	N/A	Penny Kneebone (Tonkin + Taylor)	Yes (24/04/26)
Bond	Yes (21/05/2026)	Compliance Monitoring (Auckland Council)	N/A	N/A		
Ecology	Yes (13/05/2026)	Jason Smith (Morphum)	N/A	N/A		No
Wildlife Hazard Assessment						
Economics	Yes (9/04/26)	Tim Denne (Resource Economics)	No	No (Updated reports to be recirculated shortly)		Yes (29/01/26)

Specialist Area	Comments received on draft report	Comments received from	Response prepared for Tranche 1	Response prepared for Tranche 2	Response prepared by	Meeting
Landscape & Visual	Yes (20/03/2026)	Peter Kensington (Auckland Council)	No	Yes	Tom Lines (Boffa Miskell)	No
Noise & Vibration	Yes (20/03/2026)	Jon Styles (Auckland Council)	No	Yes	Mat Cottle (Marshall Day Acoustics)	Yes (10/04/26)
Traffic/Transport	Yes (27/03/2026)	Philips Augustine (Auckland Council) Neil Stone (Auckland Transport)	Yes	N/A	Don McKenzie (Don McKenzie Consulting)	No
Aviation	N/A					

Applicability

This report has been prepared for the exclusive use of our client WM New Zealand, 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 our client will share this information as part of engagement regarding an application under the Fast-track Approvals Act 2024 and that Auckland Council may use this information for the purpose of reviewing the application to provide feedback to WM New Zealand.

Tonkin & Taylor Ltd

Report prepared by:



Keeley Clayton
Senior Planner

Report prepared by:



Gina Buckland
Planner

Authorised for Tonkin & Taylor Ltd by:



Simonne Eldridge
Project Director

3-Jul-26

Appendix A Landfill Engineering

A1 Landfill Engineering – Redvale Landfill Expansion

Table A1: Response (Andrew Shallard – Tonkin + Taylor) to Auckland Council (Walter Starke) comments on the Draft Landfill Engineering Report

#	Comment	Response
1	<u>Overall:</u> I consider the LER a good report, and as it is an extension landfill, I presume that there are a lot of other documents, in particular management plans (see item 2 below), supporting the existing landfill consent, noting that only some of those management plans are referenced in the LER. In my comments below note that the WasteMINZ Technical Guidelines, refers to the document titled <i>Technical Guidelines for Disposal to Land, Revision 3.1</i>, prepared by Waste Management Institute New Zealand (WasteMINZ), September 2023.	Noted.
2	<u>Management plans:</u> I presume that the management plans listed below, are applicable and referenced in the existing consent conditions for the landfill, and that these management plans, possibly with some amendments, continue to be relevant for the landfill extension. Please clarify if this is correct. Please provide a copy of all management plans. Stormwater Monitoring & Contingency Plan Construction Environmental Management Plan Site Emergency Management Plan Groundwater Monitoring and Contingency Plan Cover Management Plan Industrial and Trade Activities Environmental Management Plan Leachate Monitoring and Contingency Plan Bin Exchange Management Plan Working Face Disposal Plan Odour Management Plan Landfill Gas Management Plan	The list of management plans is correct, apart from the inclusion of a Bin Exchange Management Plan as there is no Bin Exchange on site. The Landfill Management Plan (LMP) is being updated to be submitted as part of the application. Where appropriate, any comments provided will be incorporated into the plan.

#	Comment	Response
3	<u>Fire Management Plan (FMP)</u> : Please clarify if there is a stand-alone FMP, noting that this may be covered in the above-mentioned Site Emergency Management Plan (SEMP) or Construction Environmental Management Plan. Please clarify if the FMP, or fire management section in the existing SEMP/CEMP, has been prepared in consultation with Fire Emergency New Zealand.	The fire management procedures are included in the Site Emergency Management Plan (SEMP) within the LMP. A copy of the SEMP has been provided to Fire and Emergency New Zealand.
4	LER: 2.2- <u>Line A</u> : mentions that the consented landfill footprint is defined by a line known as Line A, that line A corresponds to the full thickness of the liner and limit of refuse, and that Line A is shown on Drawing C10. I appreciate that Line A is identified on Drawing C10, however, it is difficult to distinguish from the other information presented on this drawing and hence I recommend that Line A is identified as a different colour (this would also apply to other drawings in the LER, to show that the, for example, the proposed final contours, are located within Line A.	The drawings have been updated to highlight Line A. This section of the report will also be modified to remove reference to Line A and Drawing C10, since this section is about the original 1992 design, which was different in places. The changes that were made to the consented design since 1992 are summarised in the Landfill Engineering report in Section 3.2.
5	LER: 2.3.3- <u>59 ha footprint</u> : cap development areas (final cap 19 ha and intermediate cover of 36 ha= 55 ha) + area of footprint having no waste (2 ha) provides a total of 55+2 = 57 ha, and does not add up to correspond to total footprint area of 59 ha, unless we assume that the active area with daily cover is around 2 ha, which is 20,000 m ² , which seems very large for a landfill. Please clarify this. (noting that the final footprint may have been reduced from 59 ha to 57 ha, see query below)	The current footprint area is 57 ha as set out in 10 below.
6	LER: 2.3.5- <u>Location of leachate sumps</u> : mentions that the leachate sumps, or Leachate Collection Sumps (LCS) are identified on Drawing C-12. Section 3.3.3, mentions five LCS. It is difficult to identify the five individual LCS as they are grouped with the Leachate Collection Risers (LCR). It is recommended to better identify this on the relevant drawings, e.g., using a different colour for the LCS.	Note that the LCR and LCS risers are in the same order as the labels. Drawing C12 will be updated to highlight the LCS riser labels and differentiate them from the LCR labels. The term Leachate Collection Sump or LCS also refers to the sump at the bottom of the riser. Drawing C12 will be modified to make these sump areas easier to see.
7	LER: 2.3.5- <u>Leachate clean out risers</u> : mentions that leachate pipes are provided with clean out risers so that they can be flushed when required. Please clarify when the clean out risers were last flushed or cleaned, provide evidence that they have been cleaned (e.g., using an external party that has the appropriately flushing/jetting equipment), and how often the clean out risers are cleaned.	WM New Zealand (WMNZ) normally jet flush the pipes on an annual basis. However, actual timing depends on leachate levels, because cleaning is more effective when levels are low. The last cleaning was carried out by Southeys Group on 26 June 2025.
8	LER: 3.1.1: <u>Permeability of soils underlying the landfill</u> : mentions that the Waitemata Group materials, understood to be underlying the site (true?) has a typical permeability of about 1×10^{-6} meters per second (m/s), quite a bit higher	The report will be updated to clarify that Waitemata group materials only underly a small part of the site. Further detail on the geology is contained in the Geotechnical

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	than the Northland Allochthon materials (fine grained mudstone and siltstone) which has a reported permeability of 1×10^{-9} m/s and the limestone which also has a reported inferred bulk permeability of 1×10^{-9} m/s. For the landfill base and sidewall liner leakage assessment, please clarify if the Waitemata Group materials permeability has been used, or if the Northland Allochthon materials or limestone permeability has been used.	Assessment Report. Further detail on the leakage assessment is contained in the Hydrogeological Assessment Report. It should be noted that this section is primarily describing the current consented design, rather than the proposed extended footprint.
9	LER: 3.2: <u>Leachate storage facilities</u> : please clarify what the leachate storage facilities are, where they are located, if there is contingency storage, if there is existing infrastructure to monitor the potential leakage from the leachate storage facilities (e.g., a leak detection drain located beneath the storage facilities, groundwater bores in close proximity, etc.)	There are three 26 m ³ leachate storage tanks at the Leachate Dosing Plant (with the BeneVap). In addition, 30 m ³ and 15 m ³ tanks located at the older leachate evaporator plant in the Energy Centre are used for storing BeneVap concentrate. Both sets of tanks are suitably bunded with level alarms. All rainwater is tested prior to release. In the past, a large bladder has been used on the landfill to temporarily increase leachate storage. The tanks at the Leachate Dosing Plant will need to be relocated when the BeneVap is decommissioned and will be detailed in the Planning Report for the substantive application. Additional tanks may also be required for storage of leachate extracted from the Class 2 Landfill, and the report will be updated to address this. Refer also to Query 61 below.
10	LER: 3.2: <u>59 ha or 57 ha landfill footprint</u> : it is understood that in the 2015 consented design, the overall landfill footprint reduced from 59 ha to 57 ha, is that correct? If so, please clarify where the footprint was reduced.	The footprint was reduced from 59 ha to 57 ha in the early 2000s, and this was later formalised in the 2015 consented design. Most of the reduction was achieved by removing the far western corner from the original design. Although the 2015 application refers to a footprint of 59 ha, the design footprint of 57 ha was shown on the consent drawings.
11	LER: 3.2, <u>Drawing C12 and LCS-1A</u> : mentions LCS-1A: please clarify on a drawing where this is located, as it is understood that this is a separate leachate collection sump to LCS-1.	LCS-1A is a separate sump just to the west of LCS-1. It is shown on Drawing C12, but a leader will be added to connect the label with the line on the drawing.
12	LER: 3.3.1: <u>Peer Review Panel</u> : mentions that the original design was modified with the approval of the Peer Review Panel (PRP). We assume that the current consent conditions specify the role of the PRP and assume that the landfill extension will also include consent conditions that specify the PRPs role in the review and monitoring of the design, construction, operation and maintenance of the landfill.	Yes, the current consent conditions specify a Peer Review Panel, and it is proposed that the new consent will do likewise.
13	LER: 3.3.3: <u>20 ha or 19 ha landfill cap area</u> : mentions a 20 ha final cap area, whereas the AEE mentions 19 ha. Please clarify the discrepancy.	The correct area is 19 ha and the reports will be updated to reflect this.

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14	LER: 3.3.3: <u>concrete lined drains</u> : mentions that there are concrete lined drains on the intermediate cover areas. I presume these are open concrete drains/channels. If so, please clarify if these concrete lined drains suffered from cracking due to settled? And if so, are these drains regularly monitored and repaired? (to minimise surface water infiltration into the landfill, creating unnecessary/excessive leachate)	The main control on infiltration is the intermediate cover. The primary purpose of the concrete lining is to protect the intermediate cover from erosion in areas of concentrated flow and minimise maintenance requirements. WMNZ typically installs geotextile below the concrete to ensure that the drain lining holds together in the event of any cracking. The drains are monitored regularly, with any required repairs carried out during the summer months. The report will be updated to clarify the main purpose of the concrete lining.
15	LER: 3.3.3: <u>monitoring of leachate flows</u> : please clarify if the individual leachate flows from each LCS are monitored, e.g., via a flow meter and/or via individual pump hours and pump rates. I assume that each LCS effectively collects the leachate generated from different areas of the landfill footprint, then knowing the leachate flows from each LCS may assist with identifying which areas of the landfill produce most leachate, which may in turn be due to ineffective landfill cover management and/or large open refuse areas/working areas in certain parts of the landfill.	Leachate volume is only monitored at the Leachate Dosing Plant, and not at the individual leachate sumps. Irrespective, the leachate level in the landfill is well above the high points in the basegrade between sumps, so cannot realistically be separately measured. Further detail on leachate levels within the landfill can be found in the Hydrogeological Assessment Report.
16	<u>Standby Leachate Pumps</u> : please clarify if there are stand-by leachate pumps (submersible pumps?) and if so, how many. The leachate pumps perform a critical operation in removing the leachate from the LCS, and failure of the pump would result in an increased leachate level within the landfill, leading to an increased risk of leachate leakage through the base and sidewall liner system.	Since leachate is extracted from multiple sumps in the existing landfill, they effectively provide standby protection for each other. Each sump is a single pipe, so only one pump can be installed in each sump. Currently there is a spare pump on site for LCS-1, and another that can be used for LCS-2, LCS-3 or LCS-4. The sump proposed for the Class 2 extension will similarly include a single sump pipe, designed to match those in the Class 1 landfill. A full-time installed standby pump is not proposed. As with the existing sumps, a standby pump will be kept available on site, ready to be installed in any of the sumps should a failure occur. Further detail on the potential for leachate leakage from the landfill can be found in the Hydrogeological Assessment Report.
17	<u>Standby power</u> : please clarify if there an independent standby power system at the site, e.g., a diesel generator, that can be used in case of a power outage to operate the leachate pumps (as well as the landfill gas plant, etc.).	WMNZ has a diesel generator on standby to run the site in the event of a power failure. During a network outage all gas is flared.
18	LER: 3.3.3: <u>Leachate storage tanks</u> : see also query under section 3.2 above: mentions (leachate) storage tanks at the leachate treatment plan. Please clarify the location and size of these tanks, whether they are suitably bunded, whether they contain a leachate leak detection system.	Refer to Query 9 above.

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19	LER: 3.3.3: <u>Wastewater treatment facility</u> : mentions that excess leachate (that cannot be treated using the BeneVap) is transported off-site by trucks to an offsite wastewater treatment facility (WWTF). Please clarify which WWTF accepts the leachate.	Leachate is treated on site prior to disposal to trade waste at the Resource Recovery Centre and Transfer Station in Selwood Road, Henderson. Alternatively, it is treated and disposed of at the WMNZ Technical Services plant in Neals Road, East Tamaki.
20	<u>Trade Waste Agreement (TWA)</u> : Please provide evidence that WWTF can accept the landfill leachate, e.g., if there a valid TWA with the WWTF? If so, please provide a copy of the TWA.	The compliance of any wastewater treatment facility is not considered as part of this application. WMNZ has processes in place for relevant suppliers to ensure that these facilities are set up and licensed to accept the waste.
21	<u>PFAS in leachate</u> : Assuming that there is a valid TWA, does it specify information on the specific discharge limits, what the controlled substances are, including the maximum discharge concentrations and/or maximum daily mass discharge limits, specifically for PFAS such as (PFHxS + PFOS) and PFOA	As per Query 20 above.
22	<u>Compliance of PFAS with TWA</u> : Assuming that the valid TWA specifies maximum daily mass discharge limits for PFAS such as (PFHxS + PFOS) and PFOA, please clarify if/how these limits are met, e.g., PFAS concentration times leachate volumes disposed off at the WWTF.	As per Query 20 above.
23	<u>PFAS test results</u> : Assuming that PFAS is monitored in the leachate, please provide the test results for the past 5 years.	As per Query 20 above.
24	<u>PFAS in landfill gas</u> : Please provide a desk top assessment of potential emerging contaminants in landfill gas (e.g., PFAS), and provide a summary of evidence and recommended mitigation measures. [Noting this may be covered in the AQ report]	This is addressed in the Health Risk Assessment which will be provided to Auckland Council for the relevant specialist's review.
25	<u>Methane in leachate</u> : Assuming that there is a valid TWA, please clarify if there is a methane concentration in the controlled substances limit. If so, please clarify if this is monitored in the leachate, and provide test results for the past 5 years.	As per Query 20 above.
26	LER: 3.3.4: <u>Leachate recirculation</u> : mentions that leachate recirculation is currently not undertaken at the site. Please clarify if it is proposed to undertake leachate generation in either the Class 1 extension and/or in the Class 2 extension. If leachate recirculation is used via injection in gas wells, please clarify how this is managed, without flooding the gas wells to such an extent that they may not function as intended, e.g., the ensuring that the slotted pipe section the landfill gas well is not completely covered by leachate.	This is not included in the application, and the report will be amended to reflect this.

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27	LER: 3.3.4: <u>Natural (leachate) generation rate</u> : mentions that the estimated natural generation rate (of leachate) of the whole waste pile is approximately 3%. Please clarify why this is reported as 3%.	As per Query 26 above.
28	LER: 4.2.1: <u>Pre-settlement ground levels</u> : mentions that the post-settlement cap contours are presented on Drawing C14. It is recommended to have a separate drawing showing the pre-settlement contours.	We note that pre-settlement contours do not represent an actual surface. It is an envelope of likely filling levels required to achieve the design cap contours once settlement is complete. Although the current resource consent allows for waste to be placed to a maximum height of RL 120 m, the site is located within the Airport Approach Surface Overlay under the AUP which has a maximum height specification of RL 106.7 m. The design of the expansion is therefore based on this maximum level (RL 106.7 m) along with the grades required to achieve stability and provide drainage off the cap. Currently, the drawings provide final contours based on an expected overall composite settlement for the historic and new waste. Another drawing showing the pre-settlement envelope will be added to set out the maximum levels to which waste can be placed. We expect that the final cap profile will end up somewhere between the pre-settlement envelope and the post-settlement contours. Further detail on settlement is provided in answer to Query 33 below.
29	LER: 4.2.1: <u>Waste thickness contours for the Class 1 extension</u> : it is recommended that a new drawing is prepared showing the additional fill thickness contours (this can possibly be done on Drawing C14), as this will assist in checking the future settlements of the additional fill (e.g., more/thicker fill, more settlement).	The depth of the waste fill does affect the amount of settlement expected. However, the Redvale expansion waste is being placed on a base of existing waste of variable depth and age. Therefore, the overall quantum of settlement cannot easily be determined based on the depth of the expansion waste alone. Hence, the reduced settlement percentage of 5% which has been applied to the total waste depth (including both old and new waste). This is also why a separate waste thickness drawing hasn't been prepared, as the expansion is regarded as just a part of the overall waste mass.
30	LER: 4.2.2: <u>Number of future working/waste filling areas</u> : mentions that the Class 1 waste refers to putrescible and non-putrescible waste. Please clarify if it is proposed to have 3 separate working areas, i.e., 1) a Class 1 Putrescible Waste working area, 2) a Class 1 waste non-Putrescible working area and 3) a Class 2 working area. And if so, please clarify what the maximum allowable working area will be for each of the three types of filling operations.	Three separate working areas are proposed. One each for: Class 1 putrescible waste, Class 1 non-putrescible waste, and Class 2 waste. The maximum allowable open face for each working area will be detailed within the AEE to be submitted with the substantive application. Class 1 putrescible operations will be restricted to 900 m², with the Class 1 non-putrescible and Class 2 working areas limited to 2,500 m² each.
31	LER: 4.2.2.: <u>500 m separation distance</u> : mentions that the Air Quality and Odour Assessment Report describes how a 500 m separation will be maintained between the placement of putrescible waste and the dwellings surrounding the landfill. It is	The proposed 500 m separation distance is described in the Air Quality and Odour Technical Assessment report. It is proposed to help manage odour effects on nearby existing dwellings and will be defined by the location of those dwellings. Since the

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	recommended to provide a new drawing, or possibly amend an existing drawing assuming that such a drawing doesn't get 'too busy' with other information, showing the 500 m separation line. It is envisaged that such a new drawing would and/or could form part of a resource consent condition, and a useful tool for a Auckland Council monitoring officer checking that no Class 1 putrescible waste is placed within 500 m of dwellings surrounding the landfill.	ownership or existence of nearby dwellings can change over time, it is not proposed to provide a separate drawing which could become a rigid definition of this boundary. The appropriateness of conditions will be addressed in the AEE for the substantive application.
32	LER: 4.2.3: <u>constructability of 1V:3H cap</u> : mentions that the maximum final post settlement (landfill) cap grades have been steepened from 1V:4H to 1V:3H. If the post settlement grade is a maximum of 1H:3H, then the pre-settlement cap grade will be steeper than that. Please clarify what the steepest pre-settlement landfill cap grade will be, and the constructability of this, since the use of large landfill construction/compaction equipment on a steep slope, to meet the landfill cap maximum allowable permeability criteria, may be problematic.	For a cap grade of 1V:3H, lying above a basegrade slope of 1V:3H (landfill sidewall), with an assumed settlement of 5%, the pre-settlement cap grade would be 1V:2.7H. Final cap slopes of this magnitude (and steeper) are regularly used at landfill facilities around the world. The capping can be constructed on these slopes, but activities need to be carefully managed to maintain quality and safety. We also note that the steeper cap slope will tend to shed runoff more effectively, reducing the likelihood of infiltration even if permeability is a little higher on the side slopes.
33	LER: 4.2.3: <u>5% future waste settlement</u> : mentions a reduced settlement percentage of 5% (of waste depth) is the older parts of the landfill, compared to a typically adopted 7.5%. Please clarify these percentages, since the WasteMINZ Technical Guidelines mentions a 10% to 12.5% long-term settlement (noting that 7.5% may appropriate for Redvale, due to the age and type of waste, and the compaction achieved during waste placement).	The revised approach set out under Query 28 above makes the assumed magnitude of settlement less important. However, the following sets out how the assumed settlement percentage was derived. During reconsenting of Redvale back in 2015, we reviewed settlement monitoring data collected from monuments on the east side of the landfill between 1994 and 2014. When considering all of the data (refer chart below), and ignoring a few outliers, it appeared that most monuments predicted a final settlement between about 6 and 9%. Thus 7.5% was adopted. For the current application, existing waste, particularly in eastern parts of the site, will have relatively little settlement remaining, whereas the new waste, which will be filled and capped in a relatively short time, will likely have more than 7.5% - perhaps as much as 10-12%. Therefore, on average, we consider that 5% would be an appropriate percentage to use.

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		Redvale Landfill - Normalised Settlement The graph plots 'Settlement as % of refuse depth' (Y-axis, 0.0% to 14.0%) against 'Years' (X-axis, 0 to 20). Multiple colored lines represent different landfill units (SM001 to SM020). Two horizontal dashed red lines indicate settlement thresholds at 5% and 7.5%. A callout box with an arrow points to a line, stating '→ Shifted by 2 years for late capping'. The legend on the right lists the units: SM001, SM006, peg67, peg70, SM002, IS-91, SM003, SM004, SM005, SM007, SM008, SM009, SM010, SM011, SM012, SM013, SM014, SM015, SM016, SM017, SM019, SM020, 5% Line, and 7.5% Line.
34	LER: 4.2.1: <u>Increase in daily cover and intermediate cover</u>: from the AEE, Section 2.2.10, it is understood that the daily cover will be a minimum of 300 mm thickness (from the existing 150 mm) and that the intermediate cover will be 450 mm thickness (from the 300 mm thickness) after compaction, and that the intermediate cover would be applied where an area is not to be utilised (presumably for waste filling) for a period of 6 months. Please clarify if this will be addressed in the consent conditions. It is also recommended that this is discussed in Section 4.2 of the LER, possibly under Section 4.2.1, as current this only appears in the AEE.	The cover depths are proposed to be increased as described in the query, and these will be put forward as a resource consent condition. The report will be updated to reflect the increased cover thicknesses.
35	LER: 4.2.4: <u>Factors of safety for site slopes</u>: it is assumed that the geotechnical stability of the perimeter bund is checked by others, and that the appropriate factors of safety for both temporary and permanent slopes are addressed in the existing and/or amended consent conditions. [noting this may be dealt with in the geotech report]	Geotechnical stability is addressed in the Geotechnical Assessment Report which has been reviewed by the Auckland Council geotechnical specialist.

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36	LER: 4.2.5: <u>Additional drawing with extended leachate collection system through new southern bund</u> : mentions that the existing leachate collection system will be extended through the new southern perimeter bund. It is recommended that a new drawing is prepared, located in the southern to south-eastern part of the new southern perimeter bund, near the current LCS-1, showing the existing site, with existing LCS-1, existing LCR, existing LCR access port, existing perimeter road, and the new details with the southern perimeter bund.	A new typical section will be prepared showing the leachate risers extension under the road.
37	LER: 4.2.5: <u>Leachate interceptor drains</u> : describes that leachate interceptor drains (LIDs) will be installed at intervals over the surface of the existing waste prior to adding on additional waste. Drawing C31 shows these drains on a cross-section, however, drawing C12 does not show these drains in plan-view (on a site plan). It is recommended that the locations of the LIDs are shown on Drawing C12 or on a new drawing.	As discussed at our meeting on 29 April 2026, we will add a note to the drawing indicating the zone where these drains will be added.
38	LER: 4.2.6: <u>Overlay waste tie-in to existing waste</u> : describes the overlay waste tie-in to the existing waste, that the existing cover and final cap material will need to be removed and stockpiled for reuse, but that the existing cover and final cap will need to stay in place as long as possible, to minimise odour and the release of greenhouse gases, and that additional detail is provided in the Air Quality report (I have not seen that report). I concur with that and presume that once the existing cover and/or final cap is removed, this part of the landfill will become a working area/face, and that the maximum allowable working area(s)/face(s) will be specified in the consent conditions for the landfill extension.	The intention is that final cap will be removed ahead of landfilling, to approximate intermediate cover. The remaining cover will be removed on the day of filling, and this area will be considered the active working area to be managed within the specified maximum area. Further detail is provided in the Air Quality and Odour Technical Assessment report.
39	LER: 4.2.7: <u>Use of vertical landfill gas wells and horizontal collectors</u> : I agree that the existing landfill gas extraction wells are extended through the proposed Class 1 landfill expansion, and that additional horizontal collectors are added where required. Class 1 putrescible waste has a relatively high potential for landfill gas generation, and thus odour generation, during the early stages of landfill, and thus careful management, including the use of horizontal collectors, are considered important in the landfill gas management at the site. It is noted that Section 2.3.6 mentions that the horizontal landfill gas collectors are installed at approximately 10 m vertical intervals, which I consider is good industry practice. And since the Class 1 extension waste thickness is at least 20 m in the southern and eastern part of the site (based on that shown in Sections 2 and 4 on Drawing C20), one can expect a minimum of two landfill gas horizontal collectors.	The Class 1 extension waste thickness varies from zero to approximately 25 m thick. While the average vertical spacing between horizontal collectors is 10 m, additional horizontal collectors will need to be installed at variable spacing to ensure that adequate coverage is provided within the new waste zone.

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	I also note that it is difficult to appreciate the Class 1 extension waste thickness from the sections shown on Drawing C20, due to the scale of the drawings. Hence my query above, recommending an additional drawing showing the thickness of additional Class 1 waste.	
40	LER: 4.3.4: <u>Class 2 leachate collection sump</u> : mentions that the Class 2 area will contain a LCS and refers to drawings C12 and C35 for typical details. It is recommended that the Class 2 extension LCS is identified on the drawings, similar to LCS-1 to LCS-5 for the Class 1 area.	LCS-6 in the Class 2 area was not labelled on the drawings. This will be rectified in the next drawing issue.
41	<u>Class 2 extension sump detail</u> : I recommend that an additional drawing is provided showing the Class 2 extension sump detail, with leachate discharge pipe access to the sump to facilitate submersible pump access, etc.	A new typical section will be provided to illustrate the proposed sump and riser design.
42	LER: 4.3.5: <u>Settlement in the Class 2 extension area</u> : It is understood that there will be up to around 30 m thickness of Class 2 waste, using the base grade ground level contours on Drawing C11 and the final ground level contours on Drawing C14. Please clarify how much settlement has been allowed for over the Class 2 fill area, e.g., using a pre-settlement filling site plan, and comparing that to Drawing C14 (the post-settlement filling plan)	Refer also to the answer to Query 28 above. As with the Class 1 expansion, the Class 2 extension is limited by the maximum elevation of RL 106.7 m. The pre-settlement envelope will therefore include this area, setting out the maximum elevation at which waste can be placed. The post-settlement contours assume 5% settlement for the Class 2 area. Unlike the existing Class 1 landfill, this area is expected to be filled relatively quickly increasing the magnitude of residual settlement at closure. However, the relatively inert nature of the waste in comparison with Class 1 waste, means that less settlement would be expected. Therefore, 5% was chosen as a balance based on an assumed 10-12% for Class 1 waste placed over the same timeframe.
43	LER: 4.3.6: <u>Temporary groundwater inflows during Class 2 extension excavation works</u> : For the temporary groundwater inflows, please clarify what ground permeability has been used for the calculation, e.g., the Waitemata Group materials typical permeability of about 1×10^{-6} m/s, versus the Northland Allochthon materials reported permeability of 1×10^{-9} m/s, or the limestone which also has a reported inferred bulk permeability of 1×10^{-9} m/s. (noting that this may be covered in another technical report supporting the consent application, such as the hydrogeological report)	Groundwater inflow to the Class 2 extension is covered in the Hydrogeological Assessment Report which has been reviewed by the Auckland Council hydrogeology specialist.
44	LER: 4.3.6.1 Monitoring of subsoil drains : If temporary subsoil drains are required to drain seepages below the proposed clay lining system to limit buoyance effects lifting the lining system from the subgrade, please comment on the option of not grouting up the subsoil drains, but utilising them to monitor for contaminants that	Leaving the subsoil drains ungrouted is not favoured for the following reasons: One containment benefit of the Redvale site is the largely inwards hydraulic gradient that exists for the existing Class 1 footprint and for the proposed Class 2 extension.

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	may be leaking through the Class 2 base liner system, i.e., the subsoil drain may be utilised as a Class 2 expansion base liner leak detection layer.	Maintaining subsoil drains under this area would not allow the inwards gradient to re-establish. • In addition, long-term drainage of the Class 2 area, could also affect the inwards gradient on the south side of the Class 1 footprint. • Providing drains underneath a soil liner artificially increases the hydraulic gradient across the liner, increasing the rate of any leachate seepage. • A leak detection layer is not a subsoil drainage system. It is a properly engineered secondary liner and collection blanket underlying the whole of the footprint. The secondary liner and collection blanket will contain any increased leachate seepage caused by the increased hydraulic gradient. • The Class 2 extension is designed to contain Class 2 waste with lower contaminant levels than Class 1 waste. The required liner system is therefore simpler and doesn't justify the inclusion of a leak detection layer.
45	LER: 4.3.7: <u>Horizontal collectors below landfill cap in Stage 2 extension</u> : I agree that there is limited landfill gas generation potential of the Class 2 waste, however, agree that horizontal collector pipes should be installed near the surface of the waste, say 1 m below the Class 2 landfill cap, with the option of connecting it to the landfill gas extraction system, e.g., the Class 2 waste may contain elevated levels of the gas Hydrogen Sulphide, that can then be removed in a controlled manner by connecting the horizontal collector pipes to pipework of the existing active landfill gas system.	Noted.
46	LER: 4.4: <u>High-level check of Table 4.1</u>: I've completed a high-level check ('sense-check') on some of the data reported in Table 4.1 (see below), and overall the reported data seems appropriate. Annual waste acceptance rate: Table 1 reports 3.1 million m³ (Mm³) of Class 1 waste for the landfill extension (noting that Section 1 of the LER report 3.13 Mm³, I have used this here) . The landfill extension will operate for 8 years, i.e. from December 2028 to December 2036. Hence the annual Class 1 waste acceptance rate is around $3.13/8 = 0.39$ Mm³ per year. Assuming a Class 1 waste density of approximately 1 ton/m³, the annual Class 1 waste acceptance rate is 0.39 Mton per year.	Noted.

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	Using the same process for the Class 2 extension area: Table 1 reports 1.5 Mm³ per year (noting that Section 1 of the LER report 1.435 Mm³). The Class 2 waste extension will also operate for 8 years. Again, assuming that same waste density of 1 ton/m³, then the annual Class 2 waste acceptance rate is $1.435/8 = 0.18$ Mton per year. Adding the Class 1 and Class 2 annual waste acceptance rates is $0.39 + 0.18 = 0.57$ Mton/per year or 570,000 tons per year. This corresponds reasonably well with the reported 600,000 ton per year waste acceptance rate in the AEE. Landfill cap thickness: Table 1 reports a current landfill area of 57 ha and a proposed landfill area of 63.5 ha. The difference, $63.5 - 57 = 6.5$ ha, is the Class 2 extension area, since the Class 1 area or footprint does not change. Table 1 reports a current landfill cap volume of 0.66 Mm³, and a proposed landfill cap volume of 0.75 Mm³. The difference, $0.75 - 0.66 = 0.09$ Mm³ for the Class 2 extension area. Then the Class 2 extension landfill cap thickness is $0.9 \text{ Mm}^3 / 6.5 \text{ ha} = 1.4 \text{ m}$. The 1.4 m Class 2 landfill cap thickness compares reasonably well with the approx 1.3 m thickness shown on Drawing C33 (daily cover 150 mm, clay final cap 1000 mm and topsoil 150 mm), noting that this would be more if the daily cover of 150 mm thickness is increased to 450 mm for the intermediate cover). How For the Class 1 extension landfill cap thickness, 0.66 Mm³ landfill cap volume, 57 ha area, hence cap thickness 1.2 m, so again similar to the 1.3 m thickness mentioned above (possibly slightly underestimated, since with intermediate cover the cap thickness will be closer to 1.6 m). Waste thickness (average): For the Class 2 extension: 1.435 Mm³ of net airspace (so excluding the Class 2 extension landfill cap), covering an area of 6.5 ha. Class 2 average waste thickness is $1.435/6.5 = 22 \text{ m}$, that seems reasonable, when eye-balling that presented on Drawing C20, Sections 1 and 3. For the Class 1 extension: the area to be filled is not the full 57 ha, but only the light brown coloured area on Drawing C14, which is estimate to be around the 40 ha.	

#	Comment	Response
	Class 1 average waste thickness is $3.13 \text{ Mm}^3/40 \text{ ha} = 8 \text{ m}$, so significantly less than the Class 2 average waste thickness of 22 m. The Class 1 average waste thickness (around 8 m) is not surprising when eye-balling the Class 1 waste thicknesses presented on Drawing C14, Sections 2 and 4. It is considered that site operational controls will need to be carefully managed as there is the potential for odour and landfill gas emissions, and leachate generation, where one operated over a relatively large area (40 ha) but has a relatively thin average waste thickness (8 m).	
47	LER: 4.5.1: <u>Stage 1 construction sequence</u>: I appreciate that a detailed construction sequence is difficult to provide during the consenting process as the actual volumes of Class 1 putrescibles and Class 1 non-putrescibles are unknown at this stage. However, I consider that a site plan showing the anticipated locations/areas of these two Class 1 waste types would be beneficial, and this site plan should include the 500 m separation between putrescible waste activities and neighbouring dwellings. The likely annual volumes of both Class 1 waste types could probably be estimated from the waste data received at the landfill over the past 5 years or so.	A phase layout drawing will be added to the Concept Design Drawings. The phase layout drawing shows four phases for each of: Class 1 putrescible (labelled Phase 1.x); Class 1 non-putrescible (labelled Phase 2.x); and Class 2 waste (labelled Phase 3.x). The 500 m separation distance is discussed under Query 31 above. The quantities of the different waste types disposed at Redvale will need to be managed by WMNZ to match the space available for each type of waste. Additional sorting may be required to maximise the value of the more restrictive areas. However, we note that Class 1 non-putrescible waste can be placed in the Class 1 putrescible area, and Class 2 waste can be placed anywhere within the proposed expanded landfill.
48	LER: 4.6: <u>Relocation of existing facilities and infrastructure in southern part of the landfill</u>: mentions that many facilities lie along the southern side of the Eastern Property and may be able to remain in place until that area is required for the perimeter bund construction and waste filling. I agree, however, depending on the staging plan (see comment above), the existing facilities may require relocation early on in the landfill expansion project, hence the recommendation of providing a high-level Stage 1 expansion construction sequence/staging plan.	The phasing plan is discussed under Query 47 above.
49	LER: 4.6.2: <u>BeneVap decommissioning or relocated</u>: mentions that the BeneVap be decommissioned and removed (once the current BeneVap area will be filled as part of the Stage 1 extension waste filling), however, Drawing C10 shows the proposed relocation of the BeneVap. Please clarify this.	The proposed relocation of the BeneVap is out of date and should have been removed. Drawing C10 will be updated.
50	LER: 4.6.3: <u>run-off from the Approved Transitional Facility (ATF)</u>: mentions that the run-off from the ATF pad will be to stormwater Pond 1. It is understood that the ATF pad is used for decontamination processes. Please clarify why the ATF pad run-off is not directed to the leachate system.	The ATF pad is used for quarantine and decontamination of materials imported into New Zealand posing a potential biosecurity risk. All wastes stored on the ATF pad are in suitable containers. Runoff from the pad is therefore not considered to be leachate.

#	Comment	Response
51	LER: 4.6.5: <u>Secondary wheel wash no longer needed</u> : please clarify why the secondary wheel wash is no longer needed, once the primary wheel wash is upgraded.	The proposed wheel wash system is assessed in the Stormwater, ITA and Sediment Assessment report which has been reviewed by the Auckland Council stormwater specialist.
52	LER: 4.6.6: <u>Wheel wash water supply tanks relocation</u> : please clarify if the wheel wash water supply tanks and/or the site water supply tanks (see Section 4.6.7 of the LER) will be used for landfill fire fighting purposes.	The Emergency Management Plan describes the sources for firefighting water. The sources are hydrants at the workshop, Energy Centre, and wheel wash, and directly from Ponds 1, 2, 3 and 4. Pond 6 is also currently available, but will be decommissioned.
53	LER: 5.2.2: <u>Quality Assurance and Quality Control process for the landfill lining system</u> : mentions that a robust QA and QC control process has been used for the lining constructed to date. I agree with this as this is considered good industry practice, and I presume that this will be covered in future consent conditions for the landfill expansion.	Overall requirements are set out in the LMP, with the specific detail provided in a construction specification that will be reviewed and approved by the Peer Review Panel. This is considered appropriate given the relatively simple Class 2 liner that is proposed for the expansion
54	LER: 5.2.2: <u>1% grade on the landfill floor in the Eastern Property</u> : mentions that the basegrade complies with the 2% grade on the floor of the landfill, as per WasteMINZ Technical Guidelines, however, the landfill primary collection pipes running in a north-south direction are located on the base floor and have a grade of 1% (noting that this is mentioned in Section 3.3.3 of the LER). Presumably this is why in the western part of the Eastern Property, and in the whole Western Property, the landfill base slope was increased from 1% to at least 2%. Please clarify this.	The floor of the landfill needs to have a steeper grade than the leachate drains, so that the floor grades towards the drains. The floor contours are at about 45° to the leachate drains in the East Property. This allows the floor to be a minimum of 2%, while the drain is at a minimum of 1%. The main leachate collector in the western part of the East Property was steepened to 1.5% at WMNZ's direction. The whole Western Property basegrade was redesigned to increase floor slope and reduce flow distances to leachate collector pipes, as described in Section 3.2.
55	LER: 5.2.2: <u>Landfill area and cover in relation to quantity of leachate generated</u> : I agree that the quantity of leachate generated and depth of leachate within the landfill are related to the total area of the landfill and cover practices during operations (and post-operations, hence the importance of appropriate landfill cap cover maintenance). And if the landfill practices will remain similar to or more restrictive than existing practices, I agree that this is not expected to affect the performance of the containment system. It is recommended that these good operational cover practices are referenced in future consent conditions, e.g.: the daily cover, intermediate cover and final cover/capping thickness how these covers are placed, e.g., placement in 150-200 mm loose lift thick layers, using landfill compaction machinery after each layer the soil type for each cover, e.g., low permeability soil	Noted. Cover practices will be outlined in the Landfill Management Plan (e.g. how cover layers are placed, locations and timing).

#	Comment	Response
	the maximum allowable time period that these layers are permitted to be present, e.g., daily cover thickness of 300 mm for a period of 3 months, after that the intermediate cover should be applied the maximum allowable area for a daily cover before the intermediate cover should be applied (e.g., the maximum allowable daily cover no more than 10,000 m²)	
56	LER: 5.4.3: <u>Class 2 extension leachate head</u>: mentions that the Class 2 footprint extension leachate collection system will be designed to maintain a leachate head on the lining system (outside of the leachate sump) below 300 mm. I agree with this as this is recommended in the WasteMINZ Technical Guidelines, and recommend that this is referenced in the consent conditions.	Noted.
57	LER: 5.4.4.1 <u>Table 5.1- leachate infiltration rates</u>: Please clarify the leachate infiltration rates used for the various cover types listed in Table 5.1. As a sense-check, I've used the Australian New South Wales Environmental Protection Agency document titled <i>Environmental Guidelines Solid Waste Landfill</i>, second edition, April 2016. Section 2.3 of the document, copied below, provides some conservative infiltrations percentages, which are quite different from what is presented in Table 5.1. Please justify the infiltration percentages used in Table 5.1. <i>For smaller sites, default rainfall infiltration percentages can be used as an alternative to running a simulation such as the HELP model. Conservative infiltration percentages should be used, for example, 10% to 20% for final capping, 50% for intermediate covering (90% when below the surrounding natural ground level), and 100% for an active area with daily covering. Proponents may propose daily covering materials and practices that will reduce rainfall infiltration, thereby justifying lower infiltration percentages</i>	Section 5.4.4.1 describes the original assessment that was undertaken by Wayne Russell in 1991 prior to development of the landfill. Russell used HELP modelling to calculate the likely leakage rates through various different cover types, including open, daily cover, intermediate cover and final cap. These are shown in Table 5.1. He then used these rates to calculate likely leachate production at various points during the landfill life. These were based on certain assumptions around the phase layout and magnitude of the various cover types. Leachate flows have been recorded throughout the landfill life. These flows have differed from Russell's overall leachate production predictions. However, when Russell's lower bound predictions are adjusted to reflect the actual historical phasing and the open areas used in practice, the predicted leachate production appears to reflect recorded flows. The adjustment was made by taking Russell's rates (from Table 5.1) and multiplying these by the actual areas of each cap type at various historical points in time. This process was used during the consenting in 2015, and has been used again for this assessment. The original Russell assessment of 1991, and the 2015 assessment were both based on average rainfall for the Redvale site. However, it was recognised that the 2022/2023 period was one of exceptionally high rainfall. Adjusting the prediction to allow for this period of higher rainfall gave even better agreement between the predicted production and actual flow rates. This is shown by the close agreement between the two red lines in Figure 5.1. It should be noted that the cover soils used at Redvale are typically very low in permeability, so we consider it unsurprising that the rate of leachate generation is similarly low compared with "typical" cover infiltration rates.

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58	LER: 5.4.4.1 <u>Moisture storage within the landfill</u>: Please clarify how the available 73 m³/day moisture storage is used in the HELP model, and how this may relate to maximum leachate generation rate forecast of being between 30 and 55 m³/day (also mentioned in Section 5.4.4.1).	We do not have access to Russell’s original HELP model, as this was carried out by another company back in 1991. Therefore, we are unable to comment on how the moisture storage was used. However, we have reconstructed the calculation that gave the peak leachate generation rates of 30 to 55 m³/day. The calculation assumes the open areas for each cap as at Phase 8 in 2011, multiplying each of these by the rainfall percentage for that cap type and the average annual rainfall of 1,450 mm/year. The calculation is shown in the table below. <table><tr><th rowspan="2">Cap type</th><th rowspan="2">Area (m²)</th><th colspan="2">Rainfall %</th><th colspan="2">Leachate generation (m³/day)</th></tr><tr><th>Lower bound</th><th>Upper bound</th><th>Lower bound</th><th>Upper bound</th></tr><tr><td>Open refuse</td><td>1,800</td><td>50%</td><td>70%</td><td>3.58</td><td>5.01</td></tr><tr><td>Daily cover</td><td>9,000</td><td>40%</td><td>50%</td><td>14.30</td><td>17.88</td></tr><tr><td>Intermediate cover</td><td>134,140</td><td>1%</td><td>5%</td><td>5.33</td><td>26.64</td></tr><tr><td>Final cap</td><td>203,880</td><td>0.5%</td><td>0.5%</td><td>4.05</td><td>4.05</td></tr><tr><td>Total</td><td>348,820</td><td></td><td></td><td>27.26</td><td>53.58</td></tr></table>	Cap type	Area (m ²)	Rainfall %		Leachate generation (m ³ /day)		Lower bound	Upper bound	Lower bound	Upper bound	Open refuse	1,800	50%	70%	3.58	5.01	Daily cover	9,000	40%	50%	14.30	17.88	Intermediate cover	134,140	1%	5%	5.33	26.64	Final cap	203,880	0.5%	0.5%	4.05	4.05	Total	348,820			27.26	53.58
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59	LER: 5.4.4.2 <u>Size of the open refuse area</u>: mentions that the main change from previous operations is that the open refuse area (also known as the working area or working face) had generally increased substantially to approximately 1 to 3.5 ha from 0.1 ha, that from discussions with WMNZ the recent operational practices within the Class 2 area may have contributed to the increased open refuse area and that changes to operational practices during late 2025 have substantially reduced the open area. Table 5.2 provides an open refuse area of 10,000 m² for January 2026. It is considered that 10,000 m² is a relatively large open refuse area, and that this has the potential to cause landfill gas and odour emissions and create extra leachate (compared to a smaller open refuse area). Please clarify what the proposed maximum open refuse areas are for each of the three working faces, i.e., 1) the Class 1 putrescibles, 2) the Class 1 non-putrescibles, and 3) the Class 2 waste. Note: in the last bullet point in Section 5.4.4.2 it is mentioned that <i>based on these results, Russell’s modified model appears to remain suitable for predicting typical future leachate generation rates – based on the areas required for future operations</i>. Please clarify what the areas are. (presumable the three working faces, as mentioned above).	The January 2026 open refuse area of 10,000 m² is a relatively large area. Proposed conditions will limit the working faces to a total of 5,900 m² as set out in Query 30 above. In addition, daily cover will be increased from 150 mm to 300 mm (or about the same as assumed for “thickened daily cover”). Hence, the 0 m² area for daily cover below. Further detail about the required open area and odour is contained in the Air Quality and Odour Technical Assessment report. The areas assumed for the future leachate generation are: • Open refuse 5,900 m² • Daily cover 0 m² • Thickened daily cover 60,000 m² • Intermediate cover 340,000 m² • Final cap 247,000 m² Based on these assumptions, predicted leachate generation rates are expected to decline from 175 m³/day in 2025 to about 132 m³/day just before closure (allowing for 30% above average annual rainfall between 2026 and closure).																																								
60	<u>Regular aerial monitoring for open refuse areas/working area(s)/face(s)</u>: keeping the open refuse area(s)/working face(s) as small as reasonable practicable is a recommendation in the WasteMINZ Technical Guidelines, since these open areas	We agree with your comments on the importance of the landfill cover and minimising landfill areas with no cover. Since open area is of particular importance to odour, controls around open refuse are addressed in the Air Quality and Odour Technical Assessment																																								

#	Comment	Response
	are known areas of landfill gas and odour emissions, and an area for rainfall and/or surface water infiltration, causing an increased and unnecessary leachate generation. Please clarify if regular aerial photography is carried out, such as weekly drone surveys, that could be used to monitor the size of the open refuse area(s), and if so, if it is proposed to regular report the size of these open refuse areas to the regulatory authority for compliance monitoring. Going back to the comments made in Section 5.2.2 above, that quantity of leachate generated is governed by the total area of the landfill and the landfill cover, and with the objective of minimising leachate generation, I believe it's important to emphasise the importance of the landfill cover, and controlling the size of the landfill areas with no cover (the open refuse areas) and landfill areas with minimal cover (daily cover). Also noting the landfill areas with no cover and minimal cover are likely to contribute to landfill gas and odour emissions from the site (I expect that this will be addressed in the review of the Air Quality and Odour Technical Assessment Report).	report. While limiting rainfall infiltration is also important, in the context of the overall leachate quantity, this is more a matter for good operational practice, than a matter for compliance. We understand that weekly and monthly drone surveys are carried out at the landfill for various reasons. However, we do not consider they would be suitable for determining compliance, because it is often difficult to accurately determine the extent of the active area from an aerial view. While landfill consents often contain a condition limiting open refuse, they do not usually include a regular reporting requirement. Similarly, we are not proposing such a condition for this site, because we consider it would be difficult to monitor accurately, and overly onerous for achieving the key odour objective.
61	LER: 5.4.4.2 <u>Contingency storage of leachate</u>: the last bullet point in Section 5.4.4.2 also mentions that <i>sufficient contingency storage should be available to deal with periods of higher than average rainfall</i>. Please clarify where the leachate contingency storage is or will be (presumably in above-ground and appropriately bunded leachate tanks near the relocated BeneVap?) and how much contingency storage there will be. I note that it would not be good industry practice to store leachate within the landfill itself.	The proposed leachate compliance level of RL51 m is described in the Hydrogeological Assessment report. This is well above the base of the landfill and therefore a large storage tank volume is not required to manage leachate treatment and disposal. The compliance level in the Class 2 extension will be 300 mm above liner level adjacent to the leachate collection sump, and therefore sufficient external storage will be required to manage the Class 2 leachate. An assessment of the storage required, with contingency, bunding and monitoring provisions will be included in the report.
62	<u>Vehicle movements</u>: The AEE, Section 2.2.10, mentions that <i>the existing resource consents limit the vehicle movements to and from the landfill to 650 per day (e.g., a return trip is comprised of two vehicle movements)</i>. Allowing for a maximum leachate removal of 250 m³/day (as shown on Figure 5.1 of the LER) and allowing for a maximum leachate tanker truck volume of 25 m³, this would create an additional 20 vehicle movements per day. Please clarify if this has been allowed for in the vehicle movements and/or traffic assessment. [noting this may be covered in the Transport report]	Vehicle movements are addressed in the Traffic Assessment report which has been separately provided to Council.
63	LER: 5.4.4.2 <u>Deriving leachate generation from pumped leachate volumes</u>: mentions that <i>the depth to which leachate is allowed to pond within the landfill is variable</i>. While storage of leachate within the landfill can affect leachate extraction rates, this effect is considered to be minor in the context of the longer-term data	While leachate levels do fluctuate over the short-term, they are relatively consistent over the long-term. This gives confidence that the volume extracted reflects the actual rate of leachate generation.

#	Comment	Response
	<i>presented in this section.</i> Please clarify this. For example, if one is allowed to store 'extra' leachate within the landfill, one does not have to pump it out, so it reduces the leachate extraction rates (compared to if one were not allowed to store leachate within the landfill). So, to derive the actual leachate generation from the pumped leachate, as shown in Figure 5.1, may be significantly underestimating the actual leachate generation.	
64	LER: 5.5.5.3 <u>Post-closure leachate generation</u> : this is mentioned as expected to be in the order of 13 m ³ /day. As a sense-check, I understand this is derived from an overall site area of 63.5 ha (=Class 1 area + Class 2 area) and an average annual rainfall of 1450 mm/year, and assuming the Table 5.1 reported 0.5% of annual rainfall contributing to the leachate generation, noting that the for the final cap a permeability of <1 x 10 ⁻⁹ m/s is used. Please clarify if this rainfall infiltration percentage should be adjusted for a permeability of <1 x 10 ⁻⁸ m/s, as reported in Section 4.2.3 is used, and clarify if the 0.5% infiltration rate is appropriate to use.	In theory, a higher permeability cap of 1 x 10 ⁻⁸ m/s would allow more rainfall to infiltrate and become leachate. However, in practice, the capping materials used at Redvale tend to exceed 1 x 10 ⁻⁹ m/s, and therefore the 0.5% infiltration rate best reflects the likely situation after closure. We also note that, as set out under Query 57 above, the adopted infiltration rates have been compared with actual leachate flows as a means of calibration. A sensitivity analysis can be carried out by increasing the infiltration rate to match the intermediate cover rates of 1%. The post-closure leachate generation rate under this assumption is 26 m ³ /day. This rate can similarly be managed using existing systems.
65	LER: 5.5: <u>Landfill gas management plan (LFGMP)</u> : this section provides a relatively high-level description of the existing and proposed landfill gas management at the site. There is no reference to a LFGMP, which I anticipate would exist for the existing landfill. Please clarify if there is an existing LFGMP, and if so, if it is appropriate to use for the landfill expansion, whether there need to be amendments to the existing LFGMP, or whether the landfill gas management is addressed elsewhere in the application.	Yes, an existing Landfill Gas Management Plan that forms part of the existing LMP will be updated for the project (to include the new Class 2 expansion).
66	<u>Landfill gas generation</u> : Please clarify if there has been landfill gas generation modelling for the landfill expansion, to demonstrate capacity of the existing landfill gas destruction system (such as the fully enclosed landfill gas flares), use of the landfill gas in the existing generators (mentioned in the AEE), size of the generators, use of the BeneVap or other beneficial uses of the landfill gas generated.	Landfill gas management is addressed in the Air Quality and Odour Technical Assessment report, this will be assessed by the Auckland Council air quality specialist. Current conclusions are that the site is set up to adequately manage landfill gas.
67	<u>Three fully enclosed flares</u> : please provide further details of the three fully enclosed flares references in the AEE, e.g., location, size, monitoring, reporting, etc.	Landfill gas management is addressed in the Landfill Gas Management Plan and Air Quality and Odour Technical Assessment report to be assessed by the Auckland Council air quality specialist.
68	<u>Landfill gas monitoring at the vertical landfill gas extraction wells</u> : I expect that each landfill gas extraction well is monitored on a regular basis for landfill gas concentration and flow rate. Please clarify this.	Extraction wells are monitored monthly as set out in the Landfill Gas Management Plan.

#	Comment	Response
69	<u>Fugitive landfill gas surface emission monitoring</u> : I expect that there will be regular fugitive landfill gas surface emission monitoring in accordance with the NES-Air Quality (2004). Please clarify this, and whether the monitoring follows good industry guidance, such as the document titled <i>Landfill Gas Fugitive Emissions Monitoring Guideline</i> , prepared by the Environmental Protection Authority, Victoria, Australia, February 2018.	Surface emission monitoring is addressed in the Landfill Gas Management Plan and Air Quality and Odour Technical Assessment report.
70	<u>Visual landfill surface inspection</u> : I expect that there will be regular visual landfill surface inspections to check for cracks in the landfill cover/capping, integrity of the landfill gas pipework, subsidence and erosion, leachate breakouts, etc. Please clarify this, and whether the inspections follow good industry practice, such as the UK Environment Agency Guidance LFTGN07 v2 2010.	Weekly walk-over inspections are carried out in accordance with the Landfill Gas Management Plan.
71	<u>Landfill gas migration wells</u> : please clarify if there are existing landfill gas migration wells at the site and/or whether new landfill gas migration wells will be installed for the landfill expansion.	Landfill gas migration is addressed in the Landfill Gas Management Plan. No additional migration wells are planned for the landfill expansion due to the expected low quantity of gas that will be generated by the Class 2 waste.
72	<u>On-site weather station</u> : please provide the location of the on-site weather station on an appropriate site plan, possibly Drawing C10. Please clarify if the weather station includes an ultrasonic anemometer or equivalent measurement device capable of measuring wind speeds at a resolution of no greater than 0.1 m/s and capable of measuring wind direction at a minimum wind speed of no greater than 0.1 m/s, and if the weather station has been installed and is operated in accordance with: AS/NZS 3580.14:2014.	On-site weather data is addressed in the Air Quality and Odour Technical Report and within the Landfill Gas Management Plan. The weather station has been installed and operated in compliance with the existing landfill consents and is currently used for a variety of compliance and record keeping purposes (e.g. rainfall records, investigating odour complaints, and site-specific data for odour modelling). Collected data shows wind speed to the nearest 0.1 m/s. It is mounted on a 10 m high pole just to the north of Pond 1. The location will be added to Drawing C10.

#	Comment	Response
73	<u>Drawing C35- Detail M</u>: this detail shows a typical stormwater diversion bund for the Class 2 landfill area. I agree with the concept of a diversion bund, as this enables to reduce rainfall and/or surface water within large areas of the Class 2 base liner being discharged to leachate, i.e., separate clean and dirty water using temporary stormwater bunds within the landfill footprint. A similar concept applies to the Class 1 expansion area of the landfill, but only where the final landfill cap or intermediate cover has been placed, i.e., where there is a final cap present or intermediate cover present within the Class 1 area, and the ground surface contours are such that the surface water/rainfall can be safely directed to the stormwater system, it should be encouraged as much as possible, to minimise discharging clean water to the leachate system, and thus minimise the risk of 'overloading' the leachate system, or reducing the risk of unnecessarily have a higher level/head of leachate on the Class 1 base liner system (as a high leachate level increases the risk of leachate leakage through the landfill base liner).	We agree that clean water from capped areas should be diverted away from Class 1 expansion waste filling areas. Detail C on Drawing C30 currently shows the equivalent stormwater diversion bund used on the Class 1 liner. This detail is no longer relevant and will be replaced with a typical detail showing a stormwater diversion to be used in the Class 1 expansion area on top of final cap or intermediate cover.
74	<u>Drawing C40: Western area- landfill gas collector in Class 2 if required</u>: please clarify if there are existing landfill gas collectors in the western part of the landfill. Please clarify if this area is underlain by Class 1 waste, and where the boundary of the Class 1 waste and Class 2 waste is. Noting that with nature of Class 2 waste (typically Construction and Demolition waste) there is a greater risk of air intrusion in a sub-surface landfill gas extraction system (if present), increasing the risk of sub-surface landfill fires, when located near Class 1 waste.	The western portion of the existing landfill is used for Class 2 waste, and this extent will be added to Drawing C40. We note that the boundary between the Class 1 and Class 2 facilities includes a layer of daily or intermediate cover to maintain separation between the wastes. There are currently no operational landfill gas horizontal collectors in the existing Class 2 area. These will be installed as necessary. Based on modelling, at current waste placement rates, the methane generation curve shows negligible production in comparison with the Class 1 area. The area will continue to be monitored. Any gas extraction infrastructure installed in the Class 2 waste will be managed separately and detailed in the LMP as required. All gas wells (in both Class 1 and 2 areas) are monitored monthly and adjusted as required to mitigate any air intrusion issues.

#	Comment	Response
75	<u>Landfill Bond</u> : The AEE, Section 2.2.9: I agree with a detailed assessment of the bond, since it appears that the last Bond review was carried out in 2013 and this is considered a relatively long time ago. It is not uncommon for landfill Bond reviews to be carried out every five years. (this may be a new consent condition)	The Bond Assessment has been provided separately and reviewed by Auckland Council.

Appendix B Noise and Vibration

B1 Noise and Vibration – Redvale Landfill Expansion

Table B1: Response (Mat Cottle – Marshall Day Acoustics) to Auckland Council (Jon Styles) comments on the Draft Assessment of Noise Effects report

#	Comment	Response																												
1	Given the non-complying activity status of the proposal, please provide a more fulsome assessment of noise effects including against the relevant objectives and policies and having regard to the noise effects that may arise from activities anticipated in the Rural – Mixed Rural Zone.	We have provided a revised assessment on this basis (see Appendix A). A detailed statutory assessment against the relevant objectives and policies will be provided in the AEE to be submitted with the substantive application.																												
2	If the ‘date stamp’ approach to setting noise limits is adopted for this application, I consider that the applicant and MDA Reports should assess the noise levels and effects over neighbouring vacant land that could be developed to determine whether the application of the date stamp could adversely affect the ability to develop neighbouring land for noise sensitive activities in the future.	This approach is not proposed.																												
3	With respect to historical noise complaints please provide greater detail to remove unstated uncertainty.	We have added more detail into the report included in Section 3.3 of the report.																												
4	Waste bund construction. Please confirm whether this scenario is the operation of machinery behind the bund, or the construction of the bund. If it is the former, please model noise levels of bund construction as well to determine what the noise levels will be, even if the duration of that activity is short relative to the duration of filling.	This scenario relates to the construction of the bund, including the operation of machinery associated with forming the bund. Waste bund construction will comply with the daytime PA noise limit (55 LAeq) under the AUP (as shown in the table below), with construction works undertaken between 7am and 10pm. While construction would not meet the morning noise limits, no construction works will be undertaken during this time. <table><tr><th rowspan="2">ID</th><th rowspan="2">Address</th><th>Noise Limits</th><th colspan="2">Noise Rating Level</th></tr><tr><th>[MS/D/N]</th><th>6-7am</th><th>Daytime</th></tr><tr><td></td><td></td><td>(dB LAeq)</td><td></td><td></td></tr><tr><td>R4</td><td>194A Horseshoe Bush Rd</td><td>43/50/40</td><td>46.7</td><td>51.7</td></tr><tr><td>R5</td><td>188 Horseshoe Bush Rd</td><td>43/50/40</td><td>50.1</td><td>54.2</td></tr><tr><td>R6</td><td>176 Horseshoe Bush Rd</td><td>43/50/40</td><td>49.7</td><td>54</td></tr></table>	ID	Address	Noise Limits	Noise Rating Level		[MS/D/N]	6-7am	Daytime			(dB LAeq)			R4	194A Horseshoe Bush Rd	43/50/40	46.7	51.7	R5	188 Horseshoe Bush Rd	43/50/40	50.1	54.2	R6	176 Horseshoe Bush Rd	43/50/40	49.7	54
ID	Address	Noise Limits			Noise Rating Level																									
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R6	176 Horseshoe Bush Rd	43/50/40	49.7	54																										

#	Comment	Response
5	Noise contour diagrams for all scenarios should be included in the MDA Report. The WMNZ property boundary lines should also be shown in the foreground.	Report has been updated as requested (see Appendix A). The updated noise contour figures for all scenarios are contained in Appendix H to the report.

Appendix A Draft Assessment of Noise Effects report



Project: Redvale Landfill Expansion

Prepared for: WM New Zealand Ltd
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Report No.: Rp 001 20241151

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Document Control

Status:	Rev:	Comments	Date:	Author:	Reviewer:
DRAFT	00	Draft issued for review	9 May 2025	M. Cottle	J. Bell-Booth
DRAFT	01	Incl. minor updates	29 July 2025	M. Cottle	-
DRAFT	02	Incl. planning review	15 October 2025	M. Cottle	J. Bell-Booth
DRAFT	03	Further updates	15 Jan 2026	M. Cottle	J. Bell-Booth
DRAFT	04	Further review and updates	10 Feb 2026	M. Cottle	-
DRAFT	05	Includes peer review updates	13 May 2026	M. Cottle	-
DRAFT	06	Further review	10 June 2026	M. Cottle	-
DRAFT	07	Minor edits	25 June 2026	M. Cottle	-

DRAFT FOR DISCUSSION

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1.0 REPORT BACKGROUND, SUMMARY AND CONCLUSIONS

1.1 Introduction

WM New Zealand (WMNZ) is Aotearoa's leading materials recovery, recycling, and waste management provider, with over 2,000 team members across 70 locations.

WMNZ takes a strategic view of waste needs for the country, carefully operating and planning recycling and landfill infrastructure, and other waste management initiatives, to help ensure New Zealand's waste is managed safely and sustainably.

WMNZ collects over 1 million tonnes of waste and recycles well over 200,000 tonnes every year across New Zealand. Auckland faces an upcoming waste infrastructure challenge. WMNZ's Redvale Landfill and Energy Park (landfill), which currently manages approximately 40% of Auckland's waste, is due to stop accepting waste in December 2028 under the existing resource consents held for the site. There has been a delay in obtaining resource consent for Auckland Regional Landfill (ARL) which is the intended replacement for Redvale and therefore, a transition plan is required to cover the period before ARL is ready to accept waste.

ARL, which is still progressing through the consenting process, is not expected to be operational until approximately 2036. This creates a critical infrastructure gap of around 8-years where Auckland needs reliable, sustainable solutions for managing its residual waste.

WMNZ proposes to expand the existing landfill operations, as described in section 2.2.3 (the project).

Accordingly, WMNZ has engaged Marshall Day Acoustics to understand the acoustical effects from a proposal to seek new consents for Redvale Landfill, north of Auckland.

This report sets out the findings of our noise impact assessment and has been prepared for inclusion in a substantive application under the Fast-track Approvals Act 2024.

We have performed attended measurements and long-term noise monitoring to quantify existing noise emissions from the site. The results inform our assessment of effects.

We have reviewed the noise conditions contained in the current consent (Environment Court decision NZEnvC043) as well as the permitted activity standards for activities operating in the Rural - Mixed Rural Zone (RMRZ) of the AUP:OP (which is the applicable zone for the Redvale Landfill). Our modelling predicts that the project will comply with the limits contained in the current consent conditions as well as the AUP:OP permitted activity standards.

A glossary of terminology is provided in Appendix A.

1.2 Report summary and conclusions

Our assessment confirms that operational noise from the project will comply with the Auckland Unitary Plan Operative in Part (AUP:OP) permitted activity standards at all receivers.

Noise modelling under four operational scenarios shows compliance with the relevant limits. Operational noise from landfilling activities of up to 49 dB L_{Aeq} is consistent in level and character with current daytime operations. Energy Park noise of up to 40 dB L_{Aeq} at night will not cause adverse effects at the closest dwellings.

For operational noise to remain compliant, the noise control elements of the Landfill Management Plan (LMP) must be implemented effectively — specifically, refuse and earth bunding positioned to screen noise from active cells. Where the landfill operates in accordance with the LMP, noise will be reasonable under s16 of the Resource Management Act 1991 (RMA).

Noise will be audible to receivers when outside; however, the level and character will remain largely unchanged from current operations. The proposed extension therefore represents no change in the level of effect already authorised under the existing consent.

Construction noise, managed under the LMP, will comply with the AUP:OP and NZS 6803:1999 Acoustics – Construction Noise.

A glossary of terminology is provided in Appendix A.

2.0 LANDFILL SITE, ACTIVITY DESCRIPTION AND IDENTIFIED RECEIVERS

2.1 Site description

The landfill is located on Landfill Access Road, Dairy Flat and is situated on rural zone land. The site is bounded on all sides by lifestyle blocks and land used for cattle grazing. The landfill and surrounding receiver environment are shown generally in Figure 1 (see page 9).

2.2 Site activity

The following key elements form the basis of current and proposed activities at the landfill.

- Landfilling and associated site preparation and remediation activities, and
- Capture of landfill gas, electricity generation, flaring and leachate evaporation

2.2.1 Landfilling activities

Typical activities include:

- the seasonal (October to April) excavation of new refuse “cells”, all subsequent liner zone preparation and leachate drain construction;
- the formation of noise control bunds using overburden placed on the outside edge of waste piles;
- day-to-day placement and compaction of refuse, winning cover (daily, intermediate and final), placement and compaction of final cover;
- ongoing and final surface drainage works; and
- gas well and header installation and all ancillary works associated with landfill tip face operation.

The landfill accepts waste between 6am and 6pm Monday to Saturday. Plant operations during this period include:

- Landfill compactors, wheeled loaders, excavators and bulldozers;
- Grader, tractor, water cart, articulated dump trucks, and refuse trucks.

2.2.2 Energy Park

The Energy Park operates 24/7. It typically forms a part of the background noise environment (L_{A90}) given its steady-state noise emission characteristic. It is less audible during the daytime than at night. Plant operating includes:

- Up to 14 Jenbacher J320 biogas generators rated at approximately 1MW_e each plus associated cooling systems;
- biogas blowers;¹ and
- three landfill gas flares that operate intermittently.

Several landfill gas blowers are used to pull the gas out of the landfill cells and transport it along a network of pipes. These activities are considered to be a part of operational works and include the piping of landfill gas to a bank of reciprocating engines connected to electrical generators (together called “generators”); the evaporation of landfill leachate using a BeneVap low temperature

¹ Biogas blowers extract biogas from landfill cells.

evaporator, and the intermittent combustion of unwanted landfill gases by way of enclosed flare also occur.

Currently, up to 13 generators operate at any one time based on the available supply of landfill gases. As the remaining landfill capacity decreases with gas production increases, the number of operating generators is expected to progressively rise, reaching up to 14 generators around 2036.² This will have a negligible effect on Energy Park noise emissions.

Sometime after 2036 (the proposed date after which waste will no longer be accepted at the landfill) the number of operational generators would gradually decrease, as landfill gas volume declines, by one generator approximately every two years until closure. It is estimated that a total of eight generators would be operational in 2056.

2.2.3 Landfill expansion

As part of the development of an additional 4.56 Mm³ of airspace to accept more waste the following works are proposed:

- **Class 1 landfill expansion:** placement of waste within the existing landfill footprint, involving the removal of final cover and steepening of the final cap slope from 1V:4H to 1V:3H, to accommodate the additional waste
- **Class 2 footprint extension:** The landfill is proposed to be extended to the south-west of the current landfill boundary, within the area currently occupied by the now decommissioned Managed Fill and Pond 6. The extension will comprise the excavation and lining of a new landfill cell, allowing the acceptance of waste that meets the proposed Class 2 waste acceptance criteria. It will be constructed in a manner similar to the already constructed cells within the current landfill
- **Relocation of ancillary activities:** the relocation of ancillary activities to allow for the placement of waste
- **Sediment Retention Ponds:** the removal and filling of Sediment Retention Pond 6 and the Office Pond while enlarging Pond 1 to capture and treat the stormwater from these catchments.

2.3 Construction vs. Operational Works

The LMP defines construction work as works including all earthworks, building erection, road construction, fencing, initial drainage works and permanent earth bunding. As all of these site establishment works have been completed, including the establishment of the Class 1 landfilling footprint, the remaining works considered to be construction are periodic new building construction, liner installation, final capping, and the periodic construction and capping of earth stockpiles. It is noted that the final section of engineered landfill liner, covering an area of approximately 10,000 m², commenced construction in the western section of the site this earthworks season (October 2025 – April 2026).

Referring to NZS 6803: 1999 “Acoustics - Construction Noise”³, in particular the definition of what activities constitute ‘construction work’; we consider that all remaining works including the formation of noise control bunds (by constructing and capping over linear mounds of refuse), form a part of *operating the landfill* therefore should be assessed against the relevant operational noise criteria.

² There is the possibility that refuse receipt rates will be lower than projected. The consequence of this is that the landfill would take longer to fill, thereby necessitating the use of fewer generators.

³ Section 3 “Definitions” – Construction Work

2.4 Identified potentially noise sensitive receivers

We have identified properties surrounding the landfill that may contain noise-sensitive receivers.⁴ All properties with dwellings located close to or inside the 35 dB site daytime noise contour have been included in this assessment. Refer to Figure 2 (see page 10) which shows the location of these receivers.

We have also tabulated the receivers, identifying the relevant zoning, presence of a dwelling and the relevant distances to the closest point of the landfill envelope and Energy Park (refer to Appendix C). If compliance with the noise standards is demonstrated at the identified receivers, then it can be inferred with confidence that the noise standards will be met for all other, more distant, receivers not included in the assessment.

⁴ AUP:OP Chapter J – Definitions defines activities sensitive to noise as: Any dwelling, visitor accommodation, boarding house, marae, papakāinga, integrated residential development, retirement village, supported residential care, care centres, lecture theatres in tertiary education facilities, classrooms in education facilities and healthcare facilities with an overnight stay facility.

Figure 1: Redvale Landfill and surrounding environment (~2025)

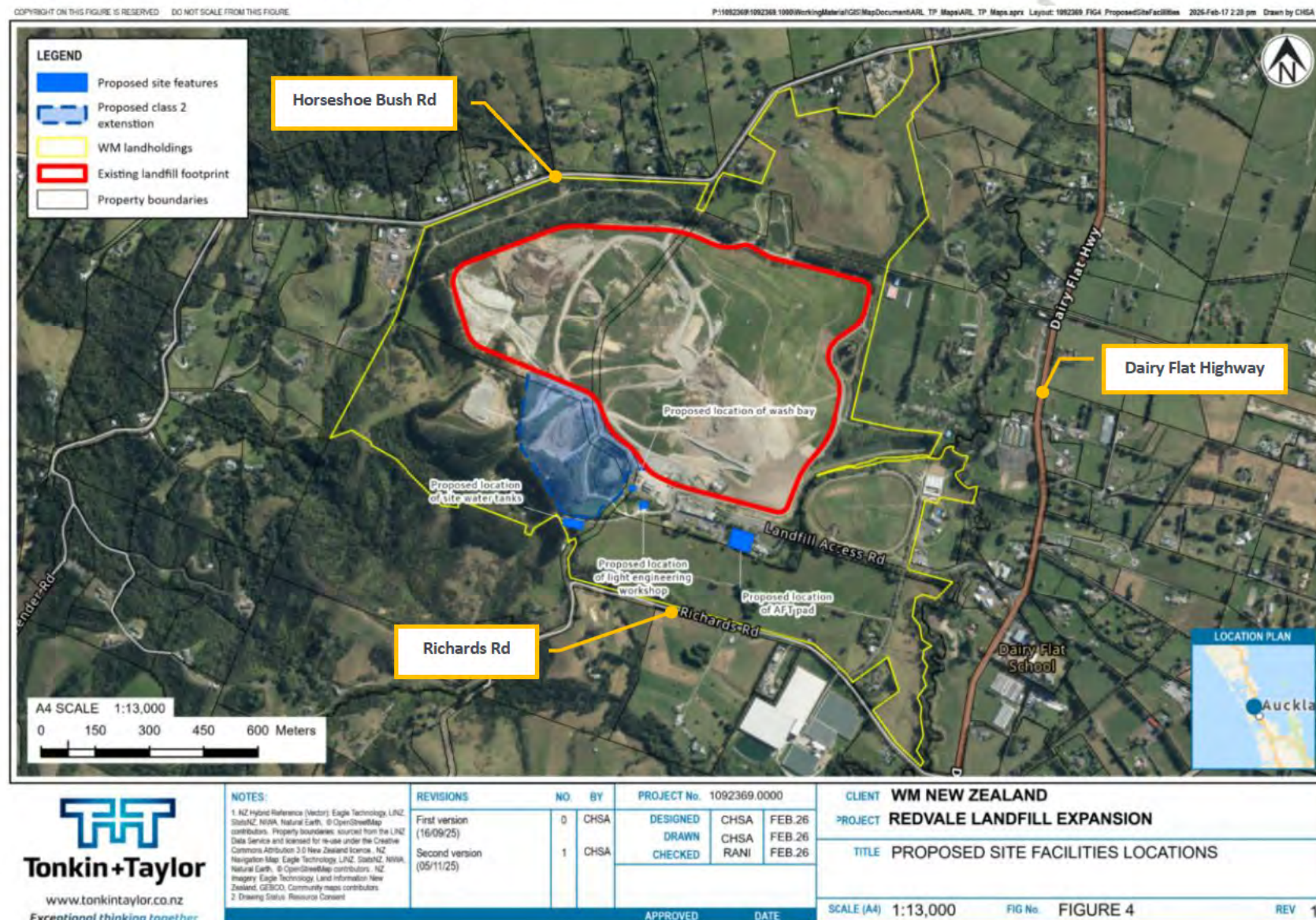
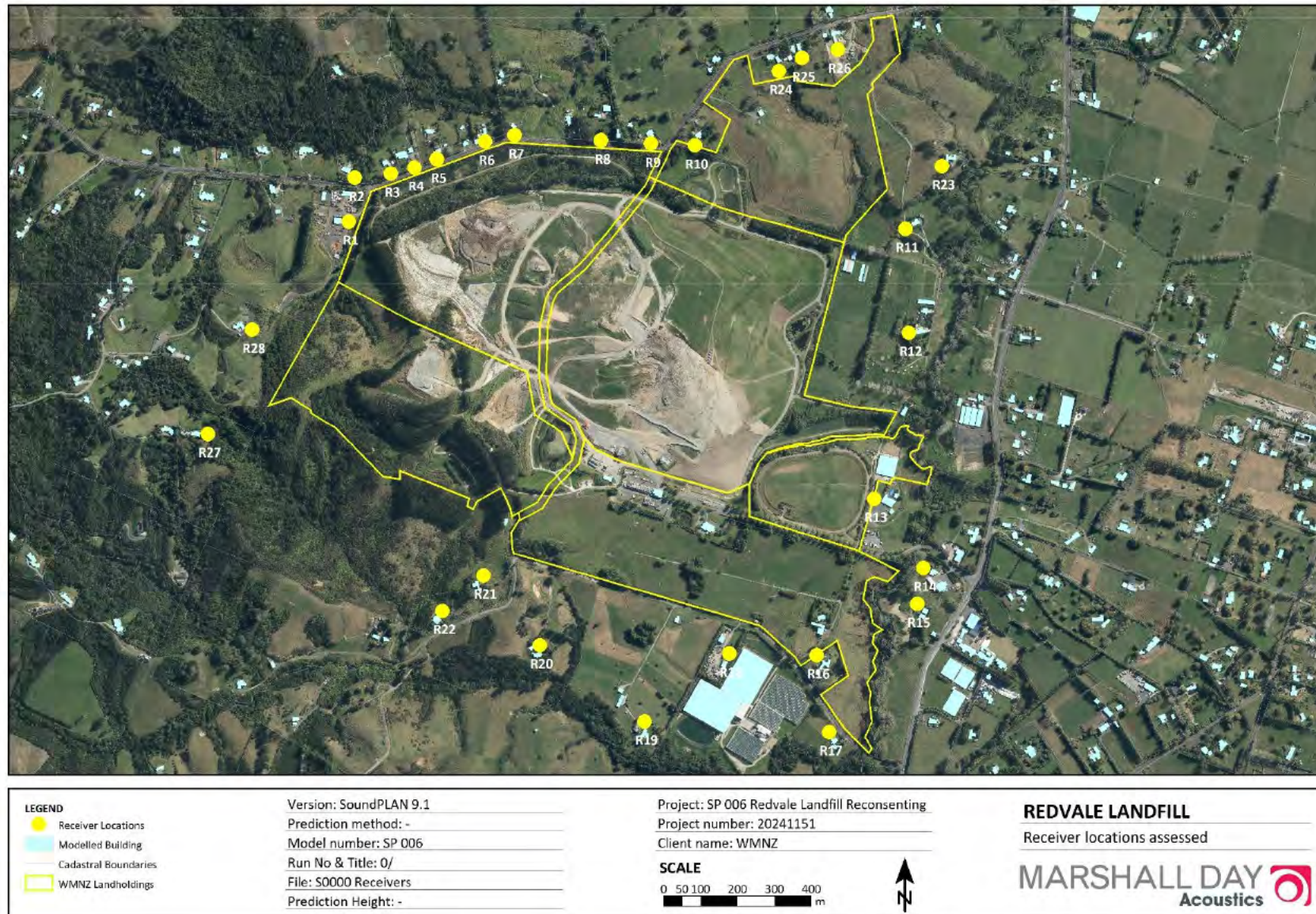


Figure 2: Assessed receiver locations



3.0 EXISTING NOISE ENVIRONMENT

The landfill is located next to Dairy Flat Highway (DFH). The highway has a weekday (two-way) average daily volume of about 8,109 vehicles per day (vpd), with a seven-day average of 7,388 vpd with at least 9% heavy vehicles⁵ moving past the site. Traffic noise forms a part of the existing noise environment.

The existing noise environment predominantly consists of traffic noise (as noted above), wildlife (birds, insects and farm animals), and site noise in the combined form of landfilling and Energy Park noise during the daytime, and solely Energy Park noise during the night-time. Together, these form the 'existing environment' against which noise from the expanded landfill has been assessed.

3.1 Attended night-time ambient noise measurements

We visited the site on 9 April 2025 and performed a series of attended measurements along Richards Road at the locations shown in Figure 3 (see page 12). Weather conditions during the survey consisted of clear skies with a south-southwest breeze (calm 0-0.2m/s) which represented a slight upwind monitoring condition.

We did not have access to the notional boundaries of the Richards Road dwellings. Therefore, we have used the measurement results obtained at positions DP1-DP3 to derive noise rating levels (L_R) at receiver notional boundary positions using the *derived point method*.

The results at positions DP1-DP3 were also assessed for tonality in accordance with Appendix B4 of NZS 6802:2008. No tonal components were found therefore we can infer from this that no sound containing special audible characteristics is likely to have occurred at the notional boundaries of the Richards Road dwellings.

Table 1 summarises the noise measurement results and derived noise rating levels.

Table 1: Measured existing noise levels and derived receiver results (night-time)

Measurement Position ¹ and receiver location	Measured Noise Levels (dB)				Noise Sources and Comments ³
	L_{Amax}	L_{Aeq}	L_{A10}	L_{A90}	
DP1 (for 115 Richards Road)	43	35	36	34	<u>Broadband noise from Energy Park</u> , birds, distant traffic, crickets, sheep
DP2 (for 87 Richards Road)	44	38	39	36	<u>"hum" from Energy Park</u> , birds, distant traffic, crickets, sheep
DP3 (for 63 Richards Road)	45	38	39	36	<u>"hum" from Energy Park</u> , birds, distant traffic, crickets, sheep
Derived receiver rating levels:		L_R			
115 Richards Road (R20)			33		-
87 Richards Road (R19)			32		-
63 Richards Road (R18)			28		-

Notes:

- (1) Refer to Figure 3 for the measurement positions (DP)
- (2) Adjustments of -8dB (R20) and -4dB (R18 & R19) have been made to results to account for upwind conditions
- (3) Eleven generators running during survey

⁵ July 2012 to September 2025 traffic count data available at "Traffic Counts" Auckland Transport www.at.govt.nz.

Figure 3: Attended measurement positions DP1 to DP3



3.2 Long-term noise logger results

We deployed two noise loggers on site between 28 February and 14 March 2025. The loggers were positioned at the locations shown overleaf in Figure 4.

The loggers automatically measured sound levels in 1-second intervals over the periods deployed. We derived 5-minute interval results through post-processing and averaging the data across the full period of each dataset. We removed any measurement intervals where the weather was outside the allowable meteorological window prescribed in NZS 6801:2008.

Logger NL1 (North) measured sound for 13 complete days. We excluded 49 datapoints due to weather or extraneous noise events.

Logger NL2 (South) measured sound for five days in total. We excluded 51 datapoints due to weather or extraneous noise events. Logging at this position was terminated prematurely due to livestock interfering with the logger installation.

The logged data is summarised in Table 2. Graphs showing the daily noise profile for each logger position can be found in Appendix D.

Table 2: Logger measurement results

Time	Ambient range (dB LAeq)	Ambient average (dB LAeq)	Background range (dB LA90)	Background average (dB LA90)
NL1 (North)				
7am – 10pm	41 – 69	57	34 – 68	55
10pm – 7am	29 – 60	49	25 – 58	45
NL2 (South)				
7am – 10pm	35 – 70	59	34 – 69	57
10pm – 7am	33 – 47	39	31 – 44	37

Figure 4: Noise logger positions NL1 and NL2



3.3 Historical noise complaints

Between 2022 and March 2026, WMNZ received 44 noise-related complaints. All were investigated by WMNZ staff, who took noise measurements at the complainant's property. Noise represents a small proportion of total complaints received.

Complaints were more frequent in the early part of the day, likely coinciding with landfill opening. A spike in 2025 is partly attributed to the introduction of bird-scaring devices rather than heavy equipment noise.

3.3.1 Overall findings

- Noise is a small share of the complaints profile, with a spike in 2025 partly due to the introduction of gas-powered bird scarers as a deterrent measure
- Peak complaint hour: 07:00 (10 complaints), then 08:00 (7) and 11:00 (7). Clear morning skew — start-up and early-shift activity

- 44 noise-related complaints represent 3.7% of total complaints.
- 64% of complaints come from five complainants.

3.3.2 Noise complaints by year

Table 3 summarises the noise complaints by year.

Table 3: Complaints by year

Year	Noise Complaints
2022	7
2023	1
2024	1
2025	34
2026 YTD	1
Total:	44

3.3.3 Sub-categorisation of noise complaints

Table 4 provides a breakdown of sub-categories for noise complaints including WMNZ comments.

Note: more than one sub-category is mentioned in some complaints.

Table 4: Noise complaints sub-categories

Source category	No.	Notes
Plant/machinery (track noise, dozers, scraping, general ops)	21	Dominant source — typical of active landfill working face
Bird scarers/gas guns/'fireworks'	7	Emerging issue from mid-2025; impulsive noise — high annoyance, animal-welfare concerns raised
Reverse beepers	5	Tonal/impulsive; flagged repeatedly by 158 & 184 Richards Rd
Truck/traffic	4	Often linked to early-morning start times
Generators	1	Temporary plant noise (176 HSB Rd, Aug-25)
Unspecified / generally noisy	12	No source identified in complaint text

Notes to table:

(1) Daytime is 7am to 10pm Monday to Saturday and 9am to 6pm on Sunday

In accordance with Standard E25.6.1(1) noise arising from activities must be measured and assessed in accordance with NZS 6801:2008 *"Acoustics – Measurement of environmental sound"* and NZS 6802:2008 *"Acoustics – Environmental noise"*.

4.1.3 AUP:OP construction noise performance standard

Standard E25.6.1 (3) of the AUP:OP states that noise from any construction work activity must be measured and assessed in accordance with the requirements of NZS 6803: 1999 *"Acoustics - Construction Noise"*.

Standard E25.6.27(1) sets noise limits for typical⁶ duration construction. As the anticipated length of the construction period would exceed 20 weeks, Standard E25.6.27 (4) is relevant. Subsequently, the construction noise limits set out in Table E25.6.27.1 would be decreased by 5 decibels.

In summary, the noise limits applying to typical construction hours (7:30am to 6:00pm) would be 70 dB L_{Aeq} and 85 dB L_{Amax} assessed at 1m from the façade of occupied buildings.

4.2 Noise Assessment Context – AUP:OP PA Standards and Existing Consent Conditions

Comparing the operational noise limits between AUP:OP standard E25.6.15 and Condition 48 of the existing consent NZEnvC043, we note the following key differences:

- The existing resource consent imposes limits 5 dB lower (stricter) than the AUP:OP permitted activity standard generally.
- The existing resource consent includes a specific 6am to 7am 'morning shoulder' limit of 43 dB L_{Aeq} Monday to Saturday, which is more restrictive than the AUP:OP daytime period.
- The existing resource consent limits landfilling operations to daytime hours of 6am to 6pm Monday to Saturday for non-maintenance work.
- The AUP:OP permitted activity daytime period is longer than the consented activity, spanning 7am to 10pm Monday to Saturday and 9am to 6pm on Sundays.

We note that the noise limits contained in existing consent NZEnvC043 are more generally stringent than the AUP:OP permitted activity standard in both the daytime and night-time periods as we note above. As the project is seeking new consents to operate, noise has been assessed against the relevant AUP:OP permitted activity standard, that being E25.6.15. This standard allows up to 55 / 45 dB L_{Aeq} day/night to be emitted, assessed at the notional boundary of dwellings. The AUP:OP considers these performance standards representative of acceptable acoustic amenity for the relevant receiver zones.

Providing further context, the RMNZ permits a range of activities that reflect the working character of the zone. The zone is not an acoustically sensitive environment in the manner of a national park or quiet rural retreat. The AUP:OP noise framework for this zone balances the reasonable acoustic amenity expectations of rural residents with the operational realities of activities that inherently generate noise, with the primary mechanism being containment and management of noise on site.

⁶ Typical duration construction is defined in Clause 7.2.1(b) of NZS 6803:1999 as "continuous construction lasting more than 14 days but less than 20 weeks"

5.0 OPERATIONAL NOISE IMPACT ASSESSMENT

Our assessment confirms that noise from the expanded landfill can be controlled to comply with the AUP:OP permitted activity standards at all existing sensitive receivers. For landfill noise to remain compliant at all times the LMP must be effectively implemented to ensure that refuse and earth bunding is in place at appropriate positions and times relative to the cells being filled to effectively screen noise. Operational noise of up to 49 dB L_{Aeq} from landfilling activities will be at a similar level and character to what currently occurs during the daytime. Energy Park noise will be controlled to no more than 40 dB L_{Aeq} (15-mins) at night-time at the closest existing dwellings. No change in the level of effect already authorised by the existing consent will occur from the proposed extension of operation of the landfill.

5.1 Operational noise modelling and results

The assessment considers the following scenarios at Redvale Landfill. Our modelling methodology is described in Section 5.3, together with a more detailed description of each scenario. The results are summarised in the following sections and shown visually as noise contours in Appendix H.

- Scenario 1: the existing environment and continued operations;
- Scenario 2: if the new consent is not granted, the situation from 2028 onwards;
- Scenario 3: if the new consent is granted, the situation in 2036 (if not earlier) where the landfill ceases accepting waste; and
- Scenario 4: the situation when the landfill is filled to capacity and capped with final cover (post-2036) – although still emitting some sound via the landfill gas generators and other associated sources (but not landfilling).

5.1.1 Scenario 1 existing and continued operations noise

The results in Table 6 are for the existing and continued operation of the landfill. They indicate that landfill noise complies with the relevant limits in Condition 48 of NZEnvC043 and the AUP:OP permitted activity standards at the identified receivers at all times.

Table 6: Calculated rating noise levels ("S1" existing and continued operations)

ID	Address	Noise Limits [MS/D/N]	Noise Rating Level (dB L _R)			Complies with the consent conditions and AUP:OP limits?
		(dB L _{Aeq})	6-7am	Daytime	Night-time	
R1	223 Horseshoe Bush Rd	43/50/40	39	45	23	☑
R2	212 Horseshoe Bush Rd	43/50/40	40	45	22	☑
R3	200 Horseshoe Bush Rd	43/50/40	42	47	22	☑
R4	194A Horseshoe Bush Rd	43/50/40	43	48	22	☑
R5	188 Horseshoe Bush Rd	43/50/40	43	49	23	☑
R6	176 Horseshoe Bush Rd	43/50/40	43	49	22	☑
R7	154 Horseshoe Bush Rd	43/50/40	41	47	22	☑
R8	146 Horseshoe Bush Rd	43/50/40	38	45	22	☑
R9	132 Horseshoe Bush Rd	43/50/40	37	45	25	☑
R10	115 Horseshoe Bush Rd	43/50/40	33	43	25	☑
R11	1319 Dairy Flat Highway	43/50/40	34	40	25	☑
R12	1317 Dairy Flat Highway	43/50/40	39	42	31	☑
R13	36 Landfill Access Rd	43/50/40	39	43	38	☑
R14	1215A Dairy Flat Highway	43/50/40	37	41	36	☑
R15	1215 Dairy Flat Highway	43/50/40	38	42	37	☑
R16	34 Richards Rd	43/50/40	41	44	40	☑
R17	19 Richards Rd	43/50/40	39	41	37	☑
R18	63 Richards Rd	43/50/40	38	42	35	☑
R19	87 Richards Rd	43/50/40	38	42	36	☑
R20	115 Richards Rd	43/50/40	36	39	34	☑
R21	126 Richards Rd	43/50/40	35	42	33	☑
R22	158 Richards Rd	43/50/40	32	39	28	☑
R23	1351 Dairy Flat Highway	43/50/40	34	39	25	☑
R24	85 Horseshoe Bush Rd	43/50/40	34	40	25	☑
R25	71 Horseshoe Bush Rd	43/50/40	33	40	25	☑
R26	67 Horseshoe Bush Rd	43/50/40	25	34	24	☑
R27	73 Tender Rd	43/50/40	35	38	33	☑
R28	1247 Dairy Flat Highway	43/50/40	28	35	21	☑

Notes:

(1) MS = morning shoulder (6am to 7am); D = Daytime (7am to 6pm); N = Night-time (8pm to 6am)

5.1.2 Scenario 2 post-2028 operations noise if consent not granted

For this scenario no landfilling noise will be emitted – only noise from the Energy Park. We predict a sound level range of 21–40 dB L_{Aeq} (15 mins) anytime of the day (refer to column 6 of Table 6 for receiver results).

The predicted levels comply with the AUP:OP Standard E25.6.15 (refer to ANE Section 4.2) at all assessed receiver locations in all periods.

5.1.3 Scenario 3 end of extended resource consent (2036) noise

This scenario models landfill activities in the western half of the site. The results in Table 7 indicate that landfill noise is predicted to comply with the AUP:OP Standard E25.6.15 at all times.

Table 7: Calculated rating noise levels ("S3" proposed operations as at 2036)

ID	Address	Noise Limits [D/N]	Noise Rating Level (dB L_R)			Complies?
		(dB L_{Aeq})	6-7am ²	Daytime	Night-time	
R1	223 Horseshoe Bush Rd	55/45	26	33	23	☑
R2	212 Horseshoe Bush Rd	55/45	26	33	23	☑
R3	200 Horseshoe Bush Rd	55/45	25	31	22	☑
R4	194A Horseshoe Bush Rd	55/45	25	33	23	☑
R5	188 Horseshoe Bush Rd	55/45	26	32	23	☑
R6	176 Horseshoe Bush Rd	55/45	26	33	22	☑
R7	154 Horseshoe Bush Rd	55/45	25	33	22	☑
R8	146 Horseshoe Bush Rd	55/45	26	33	22	☑
R9	132 Horseshoe Bush Rd	55/45	31	38	25	☑
R10	115 Horseshoe Bush Rd	55/45	30	38	25	☑
R11	1319 Dairy Flat Highway	55/45	30	36	26	☑
R12	1317 Dairy Flat Highway	55/45	33	38	32	☑
R13	36 Landfill Access Rd	55/45	38	41	38	☑
R14	1215A Dairy Flat Highway	55/45	38	41	37	☑
R15	1215 Dairy Flat Highway	55/45	38	41	37	☑
R16	34 Richards Rd	55/45	41	43	40	☑
R17	19 Richards Rd	55/45	39	41	38	☑
R18	63 Richards Rd	55/45	37	42	36	☑
R19	87 Richards Rd	55/45	37	42	36	☑
R20	115 Richards Rd	55/45	35	37	34	☑
R21	126 Richards Rd	55/45	41	48	33	☑

ID	Address	Noise Limits [D/N] (dB LAeq)	Noise Rating Level (dB LR)			Complies?
			6-7am ²	Daytime	Night-time	
R22	158 Richards Rd	55/45	38	45	29	☒
R23	1351 Dairy Flat Highway	55/45	29	36	26	☒
R24	85 Horseshoe Bush Rd	55/45	30	37	26	☒
R25	71 Horseshoe Bush Rd	55/45	30	37	25	☒
R26	67 Horseshoe Bush Rd	55/45	25	28	24	☒
R27	73 Tender Rd	55/45	38	43	33	☒
R28	1247 Dairy Flat Highway	55/45	23	28	22	☒

Notes:

- (1) Daytime is 7am to 10pm Monday to Saturday and 9am to 6pm on Sunday
 (2) The 6-7am period falls within the night-time prescribed timeframe of the AUP:OP

5.1.4 Scenario 4 post-2036 aftercare period noise

This scenario models only noise from the Energy Park, with the proposed 2036 final cap contours in place. The results in Table 8 indicate that Redvale is predicted to comply with AUP:OP Standard E25.6.15 at all times. With only the Energy Park operating, site noise emissions are consistent throughout the day.

Table 8: Calculated rating noise levels ("S4" post-2036 aftercare period)

ID.	Address	Noise Limits [D/N] (dB LAeq)	Noise Rating Level (dB LR)			Complies?
			6-7am ²	Daytime	Night-time	
R1	223 Horseshoe Bush Rd	55/45	21	21	21	☒
R2	212 Horseshoe Bush Rd	55/45	21	21	21	☒
R3	200 Horseshoe Bush Rd	55/45	21	21	21	☒
R4	194A Horseshoe Bush Rd	55/45	21	21	21	☒
R5	188 Horseshoe Bush Rd	55/45	21	21	21	☒
R6	176 Horseshoe Bush Rd	55/45	20	20	20	☒
R7	154 Horseshoe Bush Rd	55/45	20	20	20	☒
R8	146 Horseshoe Bush Rd	55/45	20	20	20	☒
R9	132 Horseshoe Bush Rd	55/45	23	23	23	☒
R10	115 Horseshoe Bush Rd	55/45	23	23	23	☒
R11	1319 Dairy Flat Highway	55/45	24	24	24	☒
R12	1317 Dairy Flat Highway	55/45	30	30	30	☒
R13	36 Landfill Access Rd	55/45	36	36	36	☒

ID.	Address	Noise Limits [D/N]	Noise Rating Level (dB L _R)			Complies?
		(dB L _{Aeq})	6-7am ²	Daytime	Night-time	
R14	1215A Dairy Flat Highway	55/45	35	35	35	☒
R15	1215 Dairy Flat Highway	55/45	35	35	35	☒
R16	34 Richards Rd	55/45	39	39	39	☒
R17	19 Richards Rd	55/45	36	36	36	☒
R18	63 Richards Rd	55/45	34	34	34	☒
R19	87 Richards Rd	55/45	34	34	34	☒
R20	115 Richards Rd	55/45	32	32	32	☒
R21	126 Richards Rd	55/45	31	31	31	☒
R22	158 Richards Rd	55/45	27	27	27	☒
R23	1351 Dairy Flat Highway	55/45	24	24	24	☒
R24	85 Horseshoe Bush Rd	55/45	24	24	24	☒
R25	71 Horseshoe Bush Rd	55/45	23	23	23	☒
R26	67 Horseshoe Bush Rd	55/45	22	22	22	☒
R27	73 Tender Rd	55/45	32	32	32	☒
R28	1247 Dairy Flat Highway	55/45	20	20	20	☒

5.2 Assessment of operational noise impacts

We have assessed operational noise impacts for each modelled scenario. The following sets out our findings.

Scenario 1: Existing and continued operations

The predicted sound levels range between:

- 25—43 dB L_{Aeq} (6-7am);
- 34—49 dB L_{Aeq} (Daytime); and
- 21—40 dB L_{Aeq} (15-mins) at night-time

which comply with the consented noise limits (refer to Section 4.1) at all existing sensitive receiver locations in all periods.

For all noise complaint investigations to date, the measured noise level was within consented limits at the time the measurement was taken, noting that compliance assessments by a suitably qualified expert in accordance with NZS 6801:2008 and NZS 6801:2008 were not undertaken to verify these complaints.

Scenario 2: post-2028 operations if consent not granted

For this scenario we predict sound level ranges of 21–40 dB L_{Aeq} (15 mins) any time of the day, which are less than the AUP:OP permitted activity standards (refer to Section 4.2) at all existing sensitive receiver locations in all periods.

We predict that Scenario 2 noise levels will be at or below the daytime ambient and background noise environment. At night, Energy Park noise will be within the range of existing ambient and background noise. Site noise during the daytime will be perceptibly lower than what currently occurs for all assessed receivers due to the cessation of landfill operations and equal to or more than half as loud for many receivers.

Scenario 3: end of extended resource consent (2036)

The predicted sound levels range between:

- 23–41 dB L_{Aeq} (6-7am)
- 28–48 dB L_{Aeq} (Daytime), and
- 22–40 dB L_{Aeq} (15-mins) at night-time

which are less than the AUP:OP permitted activity standards (refer to Section 4.2) at all receiver locations in all periods.

For Richards Road receivers, noise from landfill activities is predicted to be generally similar to the levels predicted in Scenario 1. For receivers on Horseshoe Bush Road there will be a perceptible reduction in noise, in some cases a more than halving of loudness (as landfilling would predominantly occur at greater setback distances to the south-west). No change in the level of effect already authorised by the existing consent will occur from the proposed extension of operation of the landfill.

Scenario 4: post-2036 aftercare period

The predicted sound levels range between 20–39 dB L_{Aeq} any time of the day and are less than AUP:OP Standard E25.6.15 (refer to Section 4.2) at all existing sensitive receiver locations in all periods.

Site noise during the daytime will be perceptibly lower than what currently occurs for all assessed receivers and equal to or more than half as loud for many receivers.

For most receivers on Richards Road and DFH, Energy Park noise at night will be perceived as being similar to what presently occurs. For all remaining receivers there will be a perceptible reduction in noise, in some cases a halving of loudness, for some Horseshoe Bush Road receivers.

5.3 Operation noise modelling methodology

We have calculated operation sound levels in accordance with the algorithms detailed in ISO 9613-2:1996⁷ and implemented in SoundPLAN® environmental noise modelling software (version 9.1). ISO 9613 considers a range of frequency dependent attenuation factors including atmospheric absorption, ground and barrier effects, directivity, as well as spherical spreading.

The ISO 9613-2 standard adopts the conservative approach of assuming that wind is always blowing from the noise source towards all receivers (downwind). The calculations also hold for average propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs on clear, calm nights.

The following subsections describe the scenarios we have modelled.

⁷ International Standard ISO 9613-2:1996 *Acoustics - Attenuation of sound during propagation outdoors – Part 2: General method of calculation*.

5.3.1 Scenario 1: Existing and continued operations

This scenario models landfill activities based on the 2024 surveyed landform using LiDAR,⁸ with the landfill at approximately 85% capacity by volume as of June 2025. This scenario models:

- Class 1 refuse receipt and placement at the southeastern end of the Phase 11 area (~RL 112 metres)
- Class 2 receipt and placement in Phase 22C and Phase 19B(2)⁹
- Refuse trucks enter the site from Landfill Access Road and travel up the north-south haul route located toward the centre of the site before splitting off left or right depending on the refuse class and cell being filled. The refuse is placed via excavator, bulldozer, and compactor.

Other landfill activities included in this scenario are:

- Placement of refuse into noise control bunds up to 4m in height
- Carting cover, i.e., the excavation and hauling of earth from other areas of the site and placing over fresh landfill
- Receipt and placement of managed fill
- Removal of overnight cover
- Operation of 13 landfill gas generators and ancillary equipment (as detailed in the project application's drawings).

We understand that WMNZ uses a standard operating procedure whereby refuse is 'built up' in blocks which create operating platforms. The natural development of the landfill is that the northern and eastern faces of each block are built up as fast as practicable, creating a refuse bund behind which the machinery operates. This results in shielding of receivers to the north from landfill activities for a significant proportion of time – estimated by WMNZ to be up to 90%. This shielding provides up to 4 decibels of additional sound reduction for receivers located to the north – which is considered a perceptible reduction in sound level.

We predict up to 54 dB L_{Aeq} at receiver R5 during refuse bund construction. This complies with AUP:OP Standard E25.6.15 in the daytime prescribed timeframe (0700 to 2200 hours). This activity is only undertaken between 0700 and 1800 hours.

This scenario has been assessed against the noise performance standards contained in the current resource consent NZEnvC043.

5.3.2 Scenario 2: Post-2028 operations if consent not granted

If WMNZ is not granted consent to extend landfill operations past 2028 it will no longer receive new waste albeit, Redvale Landfill will be undertaking post-closure operations (required under its consent) and the Energy Park will still be operating with up to 13 landfill gas generators running.

5.3.3 Scenario 3: 2036 (end date of extended resource consent)

This scenario models landfill activities in the western half of the site (the proposed expansion area) on the basis that an extension of time is granted. Class 1 and Class 2 refuse are placed in separate areas. The refuse is placed via excavator, bulldozer, and compactor. Other landfill activities are the

⁸ LiDAR: Light Detection and Ranging is a remote sensing method that uses pulsed laser light to measure time (and thus distance) and create highly accurate 3D maps of the terrain.

⁹ While this is currently Class 2, this may be Class 1 in future.

same as for Scenario 1. This includes the operation of 14 landfill gas generators and ancillary equipment including the BeneVap.

This scenario has been assessed against the permitted activity noise performance standards contained in the AUP:OP on the basis that WMNZ is seeking a new resource consent.

5.3.4 Scenario 4: Post-2036 (aftercare period)

This scenario models the remaining site activities with the proposed 2036 final cap contours in place. The landfill will be filled to its new capacity and capped albeit, still producing landfill gas. Therefore, eight landfill gas generators and ancillary sources will be operational.

This scenario has been assessed against the permitted activity noise performance standards contained in the AUP:OP on the basis that WMNZ is seeking a new resource consent.

Our modelling uses the sound power levels listed in Appendix G.

6.0 CONSTRUCTION NOISE ASSESSMENT

Engineered landfill liner commenced construction in the western section of the site this earthworks season (October 2025 – April 2026). We consider this is the only significant activity fitting the definition of “construction” as per report Section 2.3. Based on past noise surveys of construction activities (in which compliance was readily demonstrated) and considering the less stringent limits that apply to temporary construction activities, we consider that these works and all other similar works can be designed and managed using the LMP to readily comply with the relevant noise limits in NZS 6803:1999.

No adverse construction noise effects are anticipated on this basis.

7.0 REPORT CONCLUSIONS

Where the landfill continues to operate compliantly and in accordance with the noise control elements in the LMP, we conclude that **operational noise will be reasonable** with respect to s16 of the Resource Management Act 1991.

APPENDIX A GLOSSARY OF TERMINOLOGY

A-weighting	A set of frequency-dependent sound level adjustments that are used to better represent how humans hear sounds. Humans are less sensitive to low and very high frequency sounds. Sound levels using an “A” frequency weighting are expressed as dB A. Alternative ways of expressing A-weighted decibels are dBA or dB(A).
Background sound	The sound that is continuously present in a room or outdoor location. Often expressed as the A-weighted sound level exceeded for 90 % of a given time period i.e., L_{A90}.
Construction work	Means any work in connection with the construction, erection, installation, carrying out, repair, maintenance, cleaning, painting, renewal, removal, alteration, dismantling, or demolition of a structure (Source: Section 3 ‘Definitions’ NZS 6803: 1999. Includes any work in connection with any excavation, site preparation, or preparatory work, carried out for the purpose of any construction work.
dB	Decibel. The unit of sound level.
L_{A10}	The A-weighted sound level exceeded for 10% of the measurement period, measured in dB. Commonly referred to as the average maximum noise level.
L_{Aeq}	The equivalent continuous A-weighted sound level. Commonly referred to as the average sound level and is measured in dB.
L_{A90}	See ‘background sound’
L_{AFmax}	The A-weighted maximum sound level. The highest sound level which occurs during the measurement period. Usually measured with a fast time-weighting i.e. L_{AFmax}
L_w	Sound Power Level. The calculated level of total sound power radiated by a sound source. Usually A-weighted i.e. L_{WA}.
Notional boundary	A line 20 metres from any side of a dwelling, or the legal boundary where this is closer to the dwelling.
NZS 6801:2008	New Zealand Standard NZS 6801:2008 “Acoustics – Measurement of environmental sound”
NZS 6802:2008	New Zealand Standard NZS 6802:2008 “Acoustics - Environmental Noise”
NZS 6803:1999	New Zealand Standard NZS 6803: 1999 “Acoustics - Construction Noise”
Rating level	A derived level used for comparison with a noise limit. Considers any and all corrections described in NZS 6801 and NZS 6802, e.g. duration, special audible character, residual sound etc.
Specific sound	A component of total sound that can be identified as associated with a specific source. Specific sound is the ‘sound of interest’ in an assessment.
Special audible characteristics	Distinctive characteristics of a sound that make it more likely to cause annoyance or disturbance. A penalty of up to 5 decibels can be applied when assessing sounds with SAC Examples are tonality – a hum or a whine) and impulsiveness – bangs or thumps.
Total sound (Ambient sound)	The totally encompassing sound in a given situation at a given time, from all sources near and far, including the Specific Sound.

Figure 7: Proposed final cap contours



APPENDIX C RECEIVER TABLE

Table 9: Assessed receivers

ID	Address	Zoning ¹ / Usage	Min. distance to ² : (m)	
			Landfill envelope	Energy Park
R1	223 Horseshoe Bush Road	Rural / Dwelling	199	1,013
R2	212 Horseshoe Bush Road	Rural / Dwelling	199	1,086
R3	200 Horseshoe Bush Road	Rural / Dwelling	157	1,031
R4	194A Horseshoe Bush Road	Rural / Dwelling	152	1,006
R5	188 Horseshoe Bush Road	Rural / Dwelling	154	991
R6	176 Horseshoe Bush Road	Rural / Dwelling	151	975
R7	154 Horseshoe Bush Road	Rural / Dwelling	152	962
R8	146 Horseshoe Bush Road	Rural / Dwelling	150	900
R9	132 Horseshoe Bush Road	Rural / Dwelling	162	890
R10	115 Horseshoe Bush Road	Rural / Dwelling	190	901
R11	1319 Dairy Flat Highway	Rural / Dwelling	235	988
R12	1317 Dairy Flat Highway	Rural / Dwelling	270	817
R13	36 Landfill Access Road	Rural / Country Club	344	601
R14	1215A Dairy Flat Highway	Rural / Dwelling	558	763
R15	1215 Dairy Flat Highway	Rural / Dwelling	588	778
R16	34 Richards Road	Rural / Dwelling	506	618
R17	19 Richards Road	Rural / Dwelling	708	795
R18	63 Richards Road	Rural / Dwelling	446	469
R19	87 Richards Road	Rural / Dwelling	660	598
R20	115 Richards Road	Rural / Dwelling	436	485
R21	126 Richards Road	Rural / Dwelling	260	461
R22	158 Richards Road	Rural / Dwelling	391	606
R23	1351 Dairy Flat Highway	Rural / Dwelling	421	1,178
R24	85 Horseshoe Bush Road	Rural / Dwelling	449	1,156
R25	71 Horseshoe Bush Road	Rural / Dwelling	500	1,212
R26	67 Horseshoe Bush Road	Rural / Vacant	547	1,272
R27	73 Tender Road	Rural / Dwelling	656	1,137
R28	1247 Dairy Flat Highway	Rural / Dwelling	439	1,085

Notes to table:

- (1) "Rural" meaning *Mixed Rural Zone* in the AUP:OP
- (2) This distance is measured from dwelling notional boundary to relevant site feature

APPENDIX D AMBIENT NOISE LOGGING MEASUREMENT RESULTS

Figure 8: Logger NL1 data summary

Refined Dataset (With Acceptable Completeness)	Data completeness:	LAmax (dB)				LA10 (dB)*				LAeq (dB)				LA90 (dB)*			
		L _{24hr}	LD	LE	LN	L _{24hr}	LD	LE	LN	L _{24hr}	LD	LE	LN	L _{24hr}	LD	LE	LN
28 Feb '25 (Fri)	38%	---	---	---	49 - 68	---	---	---	45 - 56	---	---	---	44 - 57	---	---	---	40 - 55
01 Mar '25 (Sat)	84%	43 - 75	58 - 75	---	43 - 69	39 - 70	53 - 70	---	39 - 58	38 - 69	50 - 69	---	38 - 56	35 - 68	45 - 68	---	35 - 55
02 Mar '25 (Sun)	99%	41 - 75	56 - 75	---	41 - 67	39 - 70	44 - 70	---	39 - 58	37 - 69	42 - 69	---	37 - 57	35 - 68	36 - 68	---	35 - 54
03 Mar '25 (Mon)	100%	42 - 72	58 - 72	---	42 - 65	37 - 71	53 - 71	---	37 - 61	36 - 69	50 - 69	---	36 - 60	33 - 67	43 - 67	---	33 - 58
04 Mar '25 (Tue)	86%	42 - 74	56 - 74	---	42 - 63	40 - 64	42 - 64	---	40 - 57	40 - 61	41 - 61	---	40 - 56	38 - 59	38 - 59	---	38 - 52
05 Mar '25 (Wed)	80%	40 - 81	56 - 81	---	40 - 64	36 - 68	53 - 68	---	36 - 53	34 - 66	51 - 66	---	34 - 49	30 - 64	39 - 64	---	30 - 44
06 Mar '25 (Thu)	98%	39 - 73	55 - 73	---	39 - 69	31 - 61	46 - 61	---	31 - 53	29 - 57	43 - 57	---	29 - 50	26 - 52	38 - 52	---	26 - 45
07 Mar '25 (Fri)	99%	39 - 77	58 - 77	---	39 - 67	33 - 61	49 - 61	---	33 - 54	31 - 58	47 - 58	---	31 - 50	28 - 55	40 - 55	---	28 - 39
08 Mar '25 (Sat)	97%	47 - 70	55 - 70	---	47 - 68	37 - 60	51 - 60	---	37 - 58	36 - 60	48 - 60	---	36 - 55	31 - 59	41 - 59	---	31 - 48
09 Mar '25 (Sun)	94%	39 - 71	56 - 71	---	39 - 65	35 - 58	47 - 58	---	35 - 56	34 - 55	45 - 55	---	34 - 54	31 - 52	34 - 52	---	31 - 52
10 Mar '25 (Mon)	38%	36 - 70	---	---	36 - 63	32 - 59	---	---	32 - 54	31 - 57	---	---	31 - 51	29 - 54	---	---	29 - 46
11 Mar '25 (Tue)	100%	39 - 72	56 - 72	---	39 - 66	34 - 59	47 - 59	---	34 - 53	32 - 57	42 - 57	---	32 - 49	30 - 55	34 - 55	---	30 - 41
12 Mar '25 (Wed)	80%	54 - 72	57 - 72	---	54 - 63	46 - 60	52 - 60	---	46 - 59	41 - 59	18 - 59	---	41 - 58	31 - 57	41 - 57	---	21 - 56
13 Mar '25 (Thu)	91%	39 - 71	57 - 71	---	39 - 62	30 - 59	52 - 59	---	30 - 56	29 - 58	49 - 58	---	29 - 53	25 - 57	42 - 57	---	25 - 48
14 Mar '25 (Fri)	0%	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
OVERALL RANGE	79%	36 - 81	55 - 81	---	36 - 69	30 - 71	42 - 71	---	30 - 61	29 - 69	41 - 69	---	29 - 60	25 - 68	34 - 68	---	25 - 58

Figure 9: Logger NL1 histogram

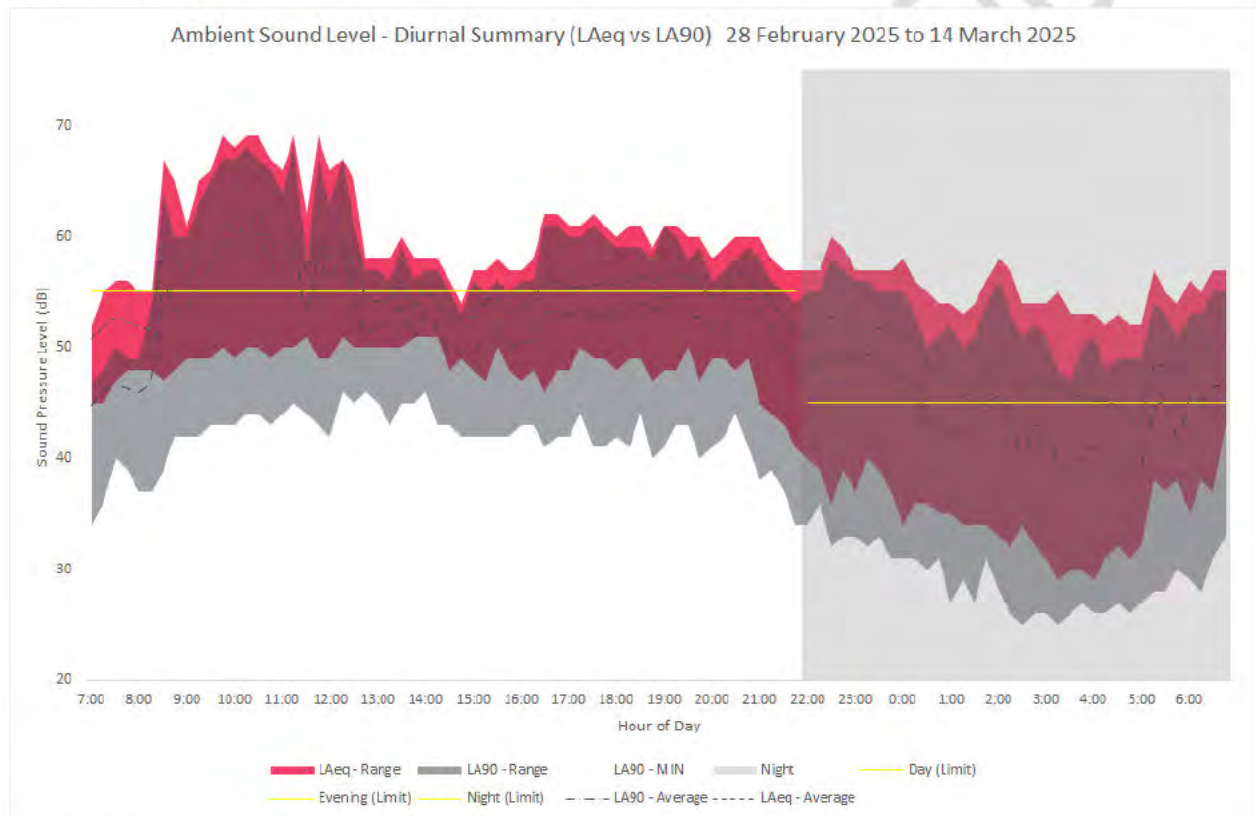
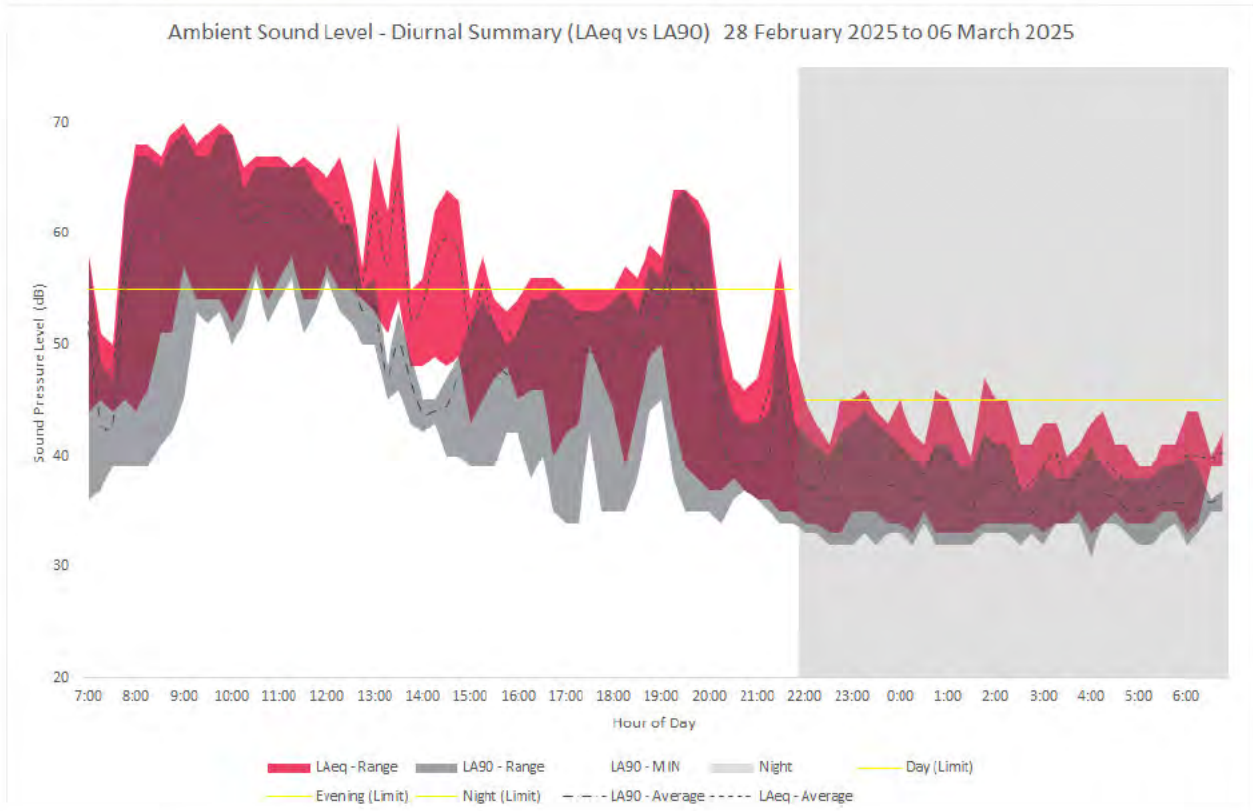


Figure 10: Logger NL2 data summary

Refined Dataset (Excludes Weather Events)	Data completeness:	LAmax (dB)				LA10 (dB)*				LAeq (dB)				LA90 (dB)*			
		L _{24hr}	LD	LE	LN	L _{24hr}	LD	LE	LN	L _{24hr}	LD	LE	LN	L _{24hr}	LD	LE	LN
		24hour	7-22	0-0	22-7	24hour	7-22	0-0	22-7	24hour	7-22	0-0	22-7	24hour	7-22	0-0	22-7
28 Feb '25 (Fri)	50%	39-77	53-77	---	39-61	38-68	48-68	---	38-48	37-67	46-67	---	37-46	36-66	43-66	---	36-44
01 Mar '25 (Sat)	84%	36-73	39-73	---	36-61	34-71	38-71	---	34-40	33-70	37-70	---	33-40	32-69	36-69	---	32-36
02 Mar '25 (Sun)	98%	37-96	40-96	---	37-60	35-69	37-69	---	35-41	34-70	36-70	---	34-40	34-64	36-64	---	34-37
03 Mar '25 (Mon)	100%	35-71	37-71	---	35-62	33-62	35-62	---	33-43	33-62	35-62	---	33-41	31-61	34-61	---	31-37
04 Mar '25 (Tue)	86%	39-94	52-94	---	39-60	35-61	39-61	---	35-50	34-67	39-67	---	34-47	32-57	34-57	---	32-42
05 Mar '25 (Wed)	80%	40-77	46-77	---	40-61	37-64	43-64	---	37-50	35-63	40-63	---	35-46	32-62	37-62	---	32-41
06 Mar '25 (Thu)	20%	61-75	61-75	---	---	46-66	46-66	---	---	45-65	45-65	---	---	37-63	37-63	---	---
OVERALL RANGE	83%	35-96	37-96	-	35-62	33-71	35-71	-	33-50	33-70	35-70	-	33-47	31-69	34-69	-	31-44

Figure 11: Logger NL2 histogram



APPENDIX E ENVIRONMENT COURT DECISION NZENVCO43 RELEVANT NOISE CONDITIONS

47. The hours of operation for the landfill shall be 6.00am to 6.00pm Monday to Saturday. Operation of the landfill includes all tipping operations and site preparation works that involve the use of landfill machinery, including machinery used to remove temporary cover. These hours may be extended to no later than 9.00 pm for equipment maintenance works only.

48. Any noise emitted from activities authorised by this consent shall comply with the following noise limits at the notional boundary of any dwelling existing as at the date of granting consent (excluding any houses on land owned by the consent holder):

Time period	Time period Noise limit
0600 to 0700 hours Monday to Saturday	43 dB L _{Aeq}
0700 to 2000 hours Monday to Saturday	50 dB L _{Aeq}
At all other times	40 dB L _{Aeq}
At all other times	75 dB L _{max}

49. Noise levels shall be measured and assessed in accordance with New Zealand Standards NZS 6801:2008 "Acoustics - Measurement of Environmental Sound" and NZS 6802:2008 "Acoustics - Environmental Noise". Construction noise shall be measured and assessed in accordance with NZS 6803: 1999 "Acoustics - Construction Noise".
50. Prior to the commencement of operation of any new plant on site (e.g. generators, leachate evaporators, blowers and flares), the potential noise levels at the notional boundary of the nearest affected dwellings shall be calculated based on the simultaneous operation of the new and existing plant that would reasonably be expected to operate together. Any noise mitigation measures that may be required to maintain compliance at all times shall be identified and applied prior to the operation of the new plant. Once the new plant is operational, the noise emissions shall be measured to confirm compliance or otherwise with the relevant noise limits. If non-compliance with those noise limits is identified, the operation of the new plant shall be suspended until further noise mitigation measures are implemented. Once compliant noise emissions are confirmed the process shall be documented and submitted to the satisfaction of Auckland Council.
51. The consent holder shall update the Noise Management Plan (NMP), being a section of the LMP, to include the requirements below. The objective of the NMP shall be to outline the methods and measures by which the consent holder will demonstrate the adoption of the best practicable option (BPO), as defined in the RMA, and ensure compliance with consent noise limits. Any material changes shall be to the satisfaction of Auckland Council.
- The applicable noise limits for all operational noise;
 - Any restrictions on heavy machinery or plant (excluding generators, flares and ancillary equipment) that may be required to meet the night time noise controls in Condition 48;
 - Any noise mitigation measures required by the conditions of consent or to achieve the BPO;
 - The methodology for control of the low frequency combustion noise from gas flares;
 - Guidance on minimising noise effects on neighbours when using starter pistols and guns as bird and vermin control;
 - Any other noise mitigation measures available (and relevant timings) to reduce noise levels for the

surrounding receivers as far as practicable, for example;

- i) using the quietest machinery and methods practicable;
 - ii) Keeping all machinery maintained in good condition e.g. all tracked plant will be greased to reduce squeaking;
 - iii) Regular checks on machinery and plant to ensure that it is not generating unnecessary noise, and rectifying if necessary;
 - iv) When selecting any new machinery or plant, the degree of noise generation between models will be considered as an important factor;
 - v) Fitting exhaust silencers where practicable;
 - vi) When machinery or plant is not required to be running, it should be switched off and not left idling;
 - vii) Noisy plant and machinery shall be strategically positioned on the site to reduce the effects on neighbours where practicable;
 - viii) All plant and equipment owned or operated by the consent holder shall use broadband reversing alarms in place of traditional pure tone beepers and the consent holder should use its best endeavours to encourage contractors and customers etc to adopt the same alarms;
 - ix) The consent holder should use its best endeavours to ensure that its employees, contractors and customers exercise care when closing tail gates of waste disposal trucks, so that they are not slammed or allowed to fall closed causing unnecessary noise;
 - x) Horns should not be used unless in the case of an emergency;
 - xi) When generators are to be decommissioned, generator noise will be an important factor in the selection of generators to be decommissioned first;
 - xii) All staff should be familiar with the NMP to ensure awareness of the impacts of noise and the above methods that can be used to minimise noise emissions.
- (g) The process for installing new generators with respect to noise control to ensure that noise limits are complied with at all times once operational. This shall include consideration of the recommendations contained in the document Supplementary Evidence of Evidence of Matthew Cottle on behalf of WMNZ dated 5 September 2014.
- (h) The appropriate contact person and phone numbers, including out of hours contact details, for any noise complaints.
- (i) The process for dealing with any noise complaints received, including keeping a register of complaints, any noise monitoring undertaken and the mitigation measures, if any, put in place. The register will be made available to Auckland Council on request.
- (j) Outline the process for carrying out annual noise monitoring, The Plan should set out but not be limited to the following:
- xiii) The relevant measurement and assessment locations;
 - xiv) The relevant noise limits;
 - xv) The relevant operating conditions under which measurements are to be taken; and
 - xvi) The process for reporting the results of the compliance assessment to Council.
- (k) The consent holder shall construct, with reference to the document Supplementary Statement of Evidence of Matthew Cottle on behalf of WMNZ dated 05 September 2014:
- i) Acoustic screening for the blowers, implemented within 3 months of grant of consent;
 - ii) Low-noise cooling fan blades; implemented within 3 months of grant of consent;

- iii) A 4.5m barrier to mitigate the noise breaking out from the existing generator enclosures; and implemented within 3 months of grant of consent;
- iv) A 6m high barrier to mitigate the noise breaking out from all new generator enclosures, or housing all new generators within their container enclosures inside a purpose-built building, as required and in accordance with the NMP.

The above timeframes may be adjusted with the written approval of Council's Team Leader Northern Monitoring, Orewa.

52. When requested by Auckland Council, the consent holder shall forward to the satisfaction of Auckland Council commissioning and / or monitoring reports demonstrating that the use complies with the noise conditions of these consents. In the event that there is non-compliance with Condition 48, the activity shall be modified (or ceased) forthwith, until such time as compliance can be demonstrated.

Vibration

53. The consent holder shall ensure that appropriate methodology is adopted to reduce, as far as practicable, low frequency noise emissions arising from the process of starting up any gas flare(s) on site. As part of the NMP for the landfill, the consent holder shall keep a detailed register for the gas flares including details of any complaints received; reaction to any reasonable complaints; any noise issues identified; and details of any noise reduction measures that have been investigated as part of an ongoing commitment to proactively minimise the low frequency noise emissions. The register shall be made available to Auckland Council for inspection upon their reasonable request.

APPENDIX F AUP:OP PERFORMANCE STANDARDS

Operation noise

E25.6.15. Rural – Mixed Rural Zone, Rural – Rural Production Zone, Rural – Rural Coastal Zone or Future Urban Zone interface

- (1) The noise (rating) level and maximum noise level from any activity in the Rural – Mixed Rural Zone, Rural – Rural Production Zone, Rural – Rural Coastal Zone or Future Urban Zone measured within the boundary of any site in a residential zone must not exceed the levels in Table E25.6.15.1 Noise levels at the Rural – Mixed Rural Zone, Rural – Rural Production Zone, Rural – Rural Coastal Zone or Future Urban Zone interface below:

Table E25.6.15.1 Noise levels at the Rural – Mixed Rural Zone, Rural – Rural Production Zone, Rural – Rural Coastal Zone or Future Urban Zone interface

Time	Noise level
Monday to Saturday	55dB L_{Aeq}
7am-10pm	
Sunday 9am-6pm	
All other times	45dB L_{Aeq} 75dB L_{A1Proc}

- (2) Standard E25.6.15(1) above does not apply to:

- (a) animal noise on farms unless they are confined within a building or enclosure on a permanent or semi-permanent basis; or
- (b) the use of mobile agricultural horticultural or forestry vehicles or machinery, or other mobile or portable agricultural, horticultural or forestry equipment; or

Note 1

The operator of such vehicles or machinery is required by the Resource Management Act 1991 to adopt the best practicable option to ensure that noise emissions do not exceed a reasonable level, which will depend on the time they are used, how loud they are, how long it is used for and how often it is used near dwellings.

- (c) the use of post-harvest facilities including vehicle access ways and milking sheds set back at least 100m from any residential zone.

Operation vibration

- (2) Permanently installed stationary vibrating, reciprocating and rotating machinery and all piping, ducting and other equipment attached to such machinery must be installed and maintained so that any resulting vibration does not exceed the limits of Table E25.6.30.2 Vibration levels for stationary machinery when measured in any occupied room of any building on another site or in any occupied unit under different ownership from the source of the vibration. Vibration must be measured in accordance with ISO 2631-2:2003 Mechanical vibration and shock – Evaluation of human exposure to whole-body vibration – Part 2: Vibration in buildings (1Hz to 80Hz):

Table E25.6.30.2 Vibration levels for stationary machinery

Affected occupied building or area	Time of day	Maximum vibration level in root mean square velocity (mm/s) between 8 and 80Hz
Noise sensitive spaces	7am-10pm	0.20
Bedrooms and sleeping areas only within activities sensitive to noise	10pm-7am	0.14

Construction noise

E25.6.27. Construction noise levels in all zones except the Business – City Centre Zone and the Business – Metropolitan Centre Zone

- (1) Noise from construction activities in all zones except the Business – City Centre Zone and the Business – Metropolitan Centre Zone must not exceed the levels in Table E25.6.27.1 Construction noise levels for activities sensitive to noise in all zones except the Business – City Centre Zone and the Business – Metropolitan Centre Zone when measured 1m from the façade of any building that contains an activity sensitive to noise that is occupied during the works.

Table E25.6.27.1 Construction noise levels for activities sensitive to noise in all zones except the Business – City Centre Zone and the Business – Metropolitan Centre Zone

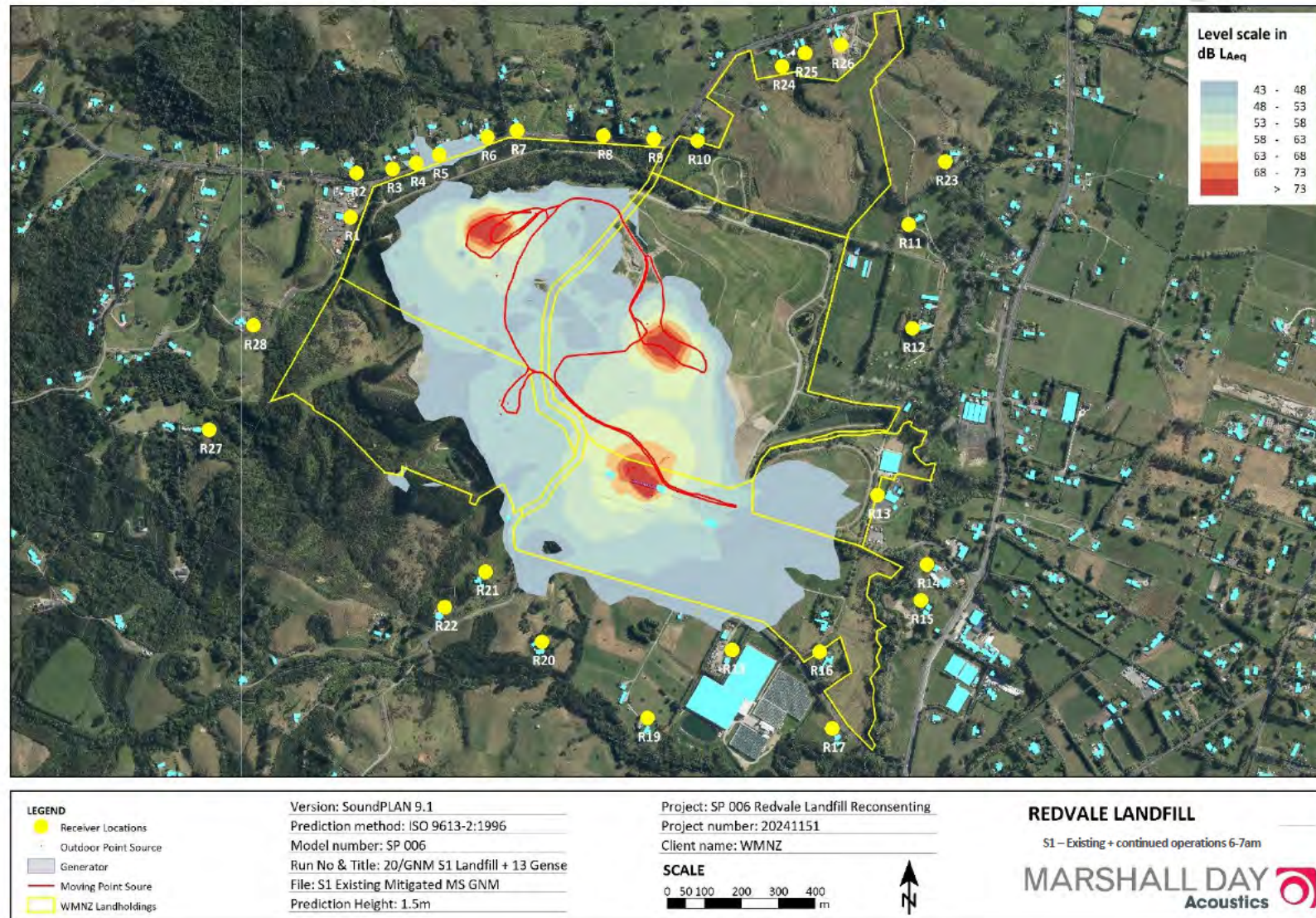
Time of week	Time Period	Maximum noise level (dBA)	
		L _{eq}	L _{max}
Weekdays	6:30am – 7:30am	60	75
	7:30am – 6:00pm	75	90
	6:00pm – 8:00pm	70	85
	8:00pm – 6:30am	45	75
Saturdays	6:30am – 7:30am	45	75
	7:30am – 6:00pm	75	90
	6:00pm – 8:00pm	45	75
	8:00pm – 6:30am	45	75
Sundays and public holidays	6:30am – 7:30am	45	75
	7:30am – 6:00pm	55	85
	6:00pm – 8:00pm	45	75
	8:00pm – 6:30am	45	75

APPENDIX G SOUND POWER LEVEL DATA USED IN MODELLING

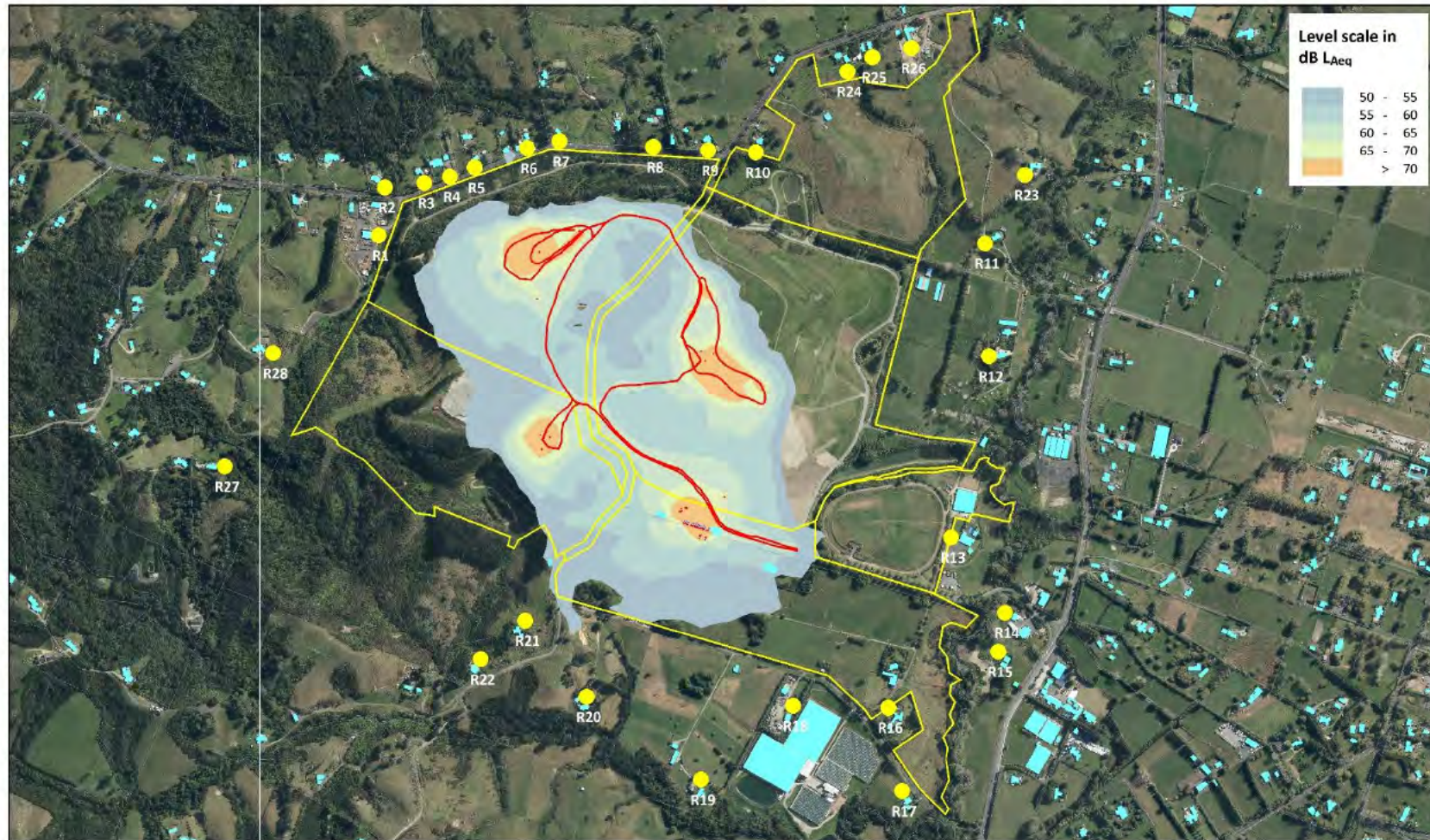
Table 10: Modelled source sound power levels

	Octave Band Centre Frequency (Hz)							
Source	63	125	250	500	1000	2000	4000	dBA
<u>Landfilling sources:</u>								
Excavator	103	112	106	102	98	96	92	105
Articulated dump truck	110	108	110	107	103	100	96	109
Refuse trucks	112	105	103	100	96	94	88	102
Bulldozer	101	110	99	99	106	104	97	110
Compactor	106	115	108	103	105	102	95	109
Water truck	105	101	97	93	93	89	84	97
Water pump	94	93	91	91	91	90	82	96
<u>Energy Park:</u>								
Genset cooling fans	91	95	90	88	87	83	77	91
Genset exhaust	98	99	94	89	85	82	78	92
Genset louvre	95	98	83	77	73	69	64	85
Genset container breakout	98	108	99	91	93	83	80	98
Genset fuel pump	95	100	91	86	84	85	84	92
Blower – large	90	87	92	106	97	97	94	105
Centrifugal fan	110	108	100	99	95	92	87	101
BeneVap leachate evaporator	104	100	94	94	91	85	84	96

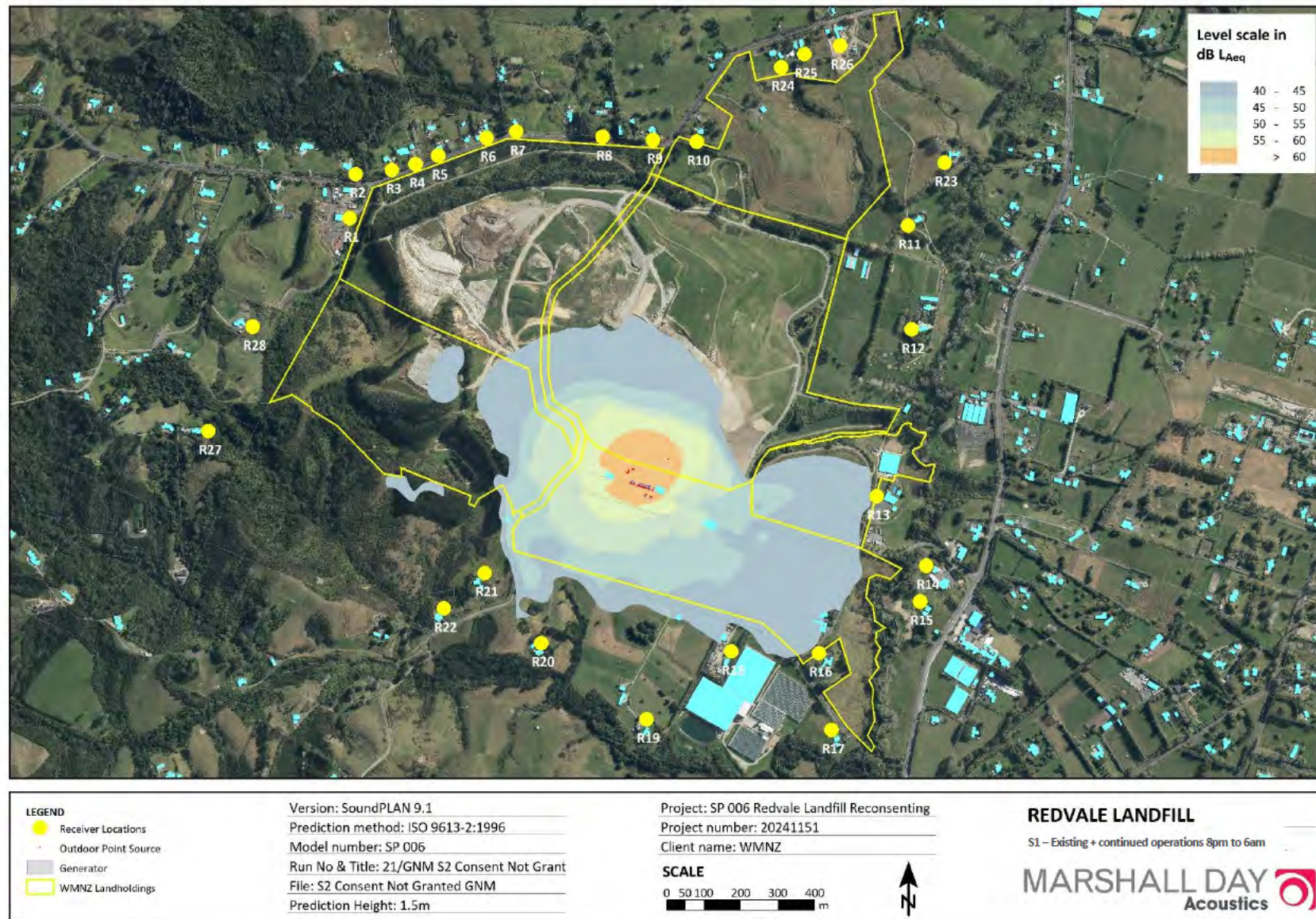
APPENDIX H CALCULATED NOISE CONTOURS

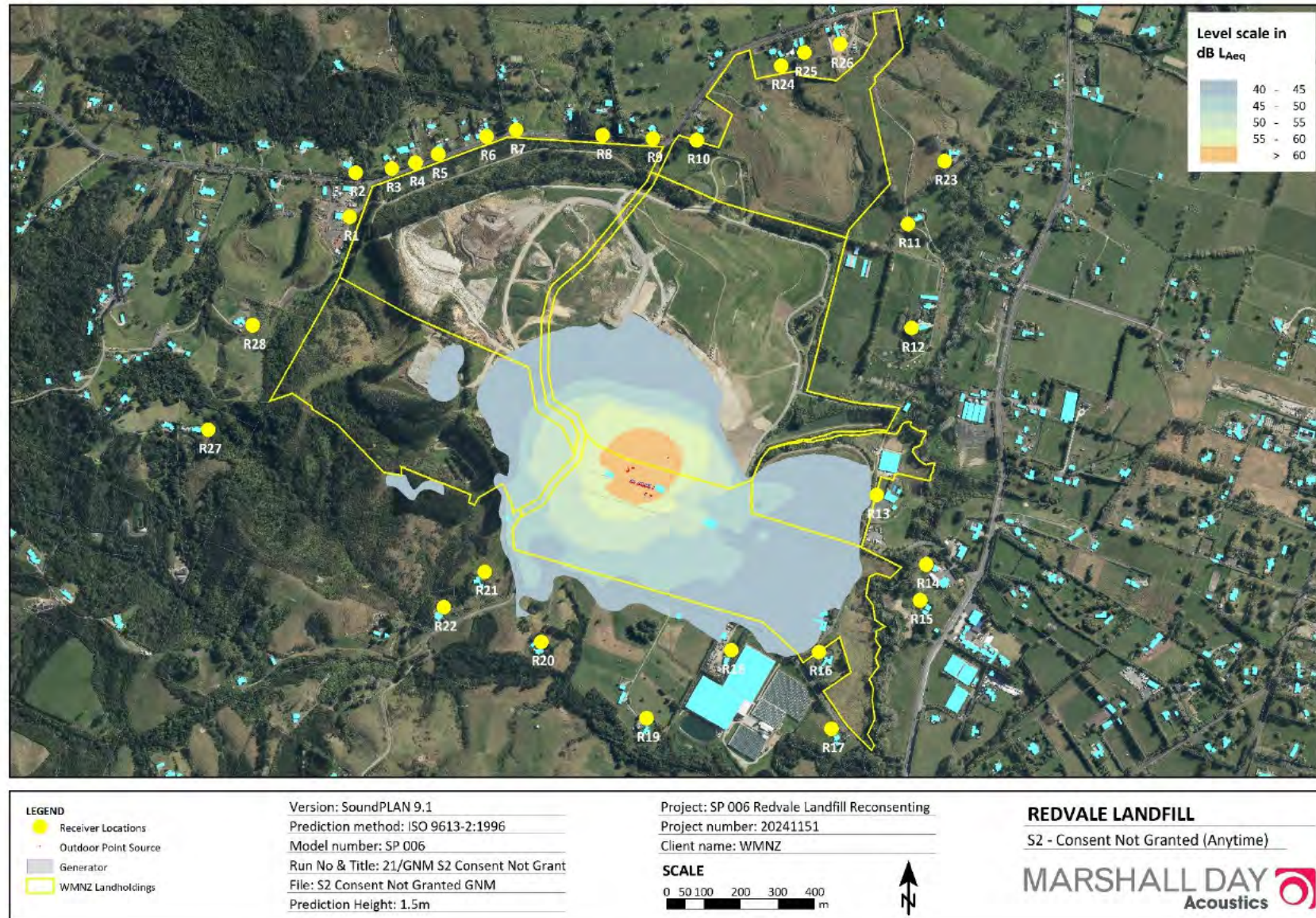


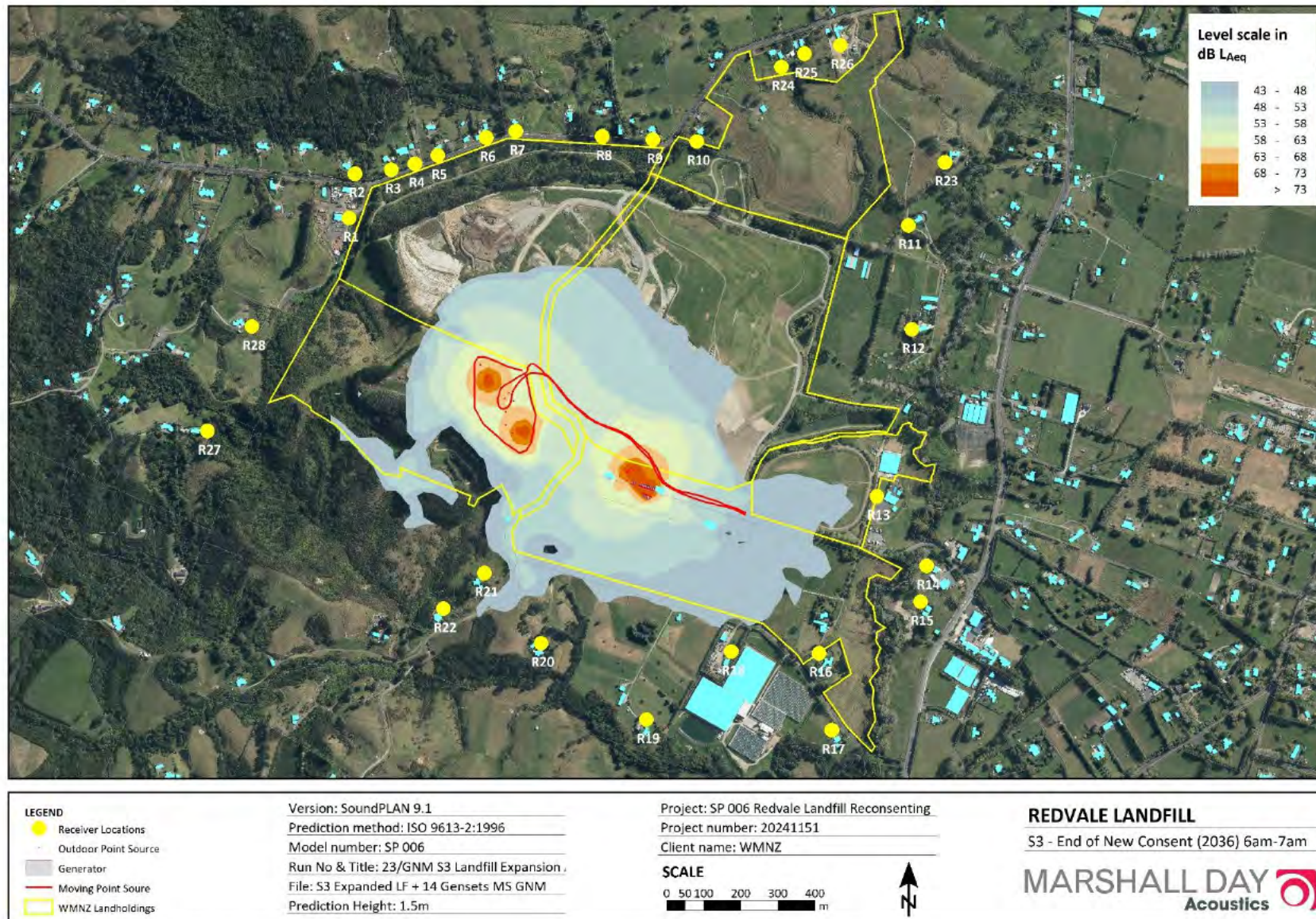
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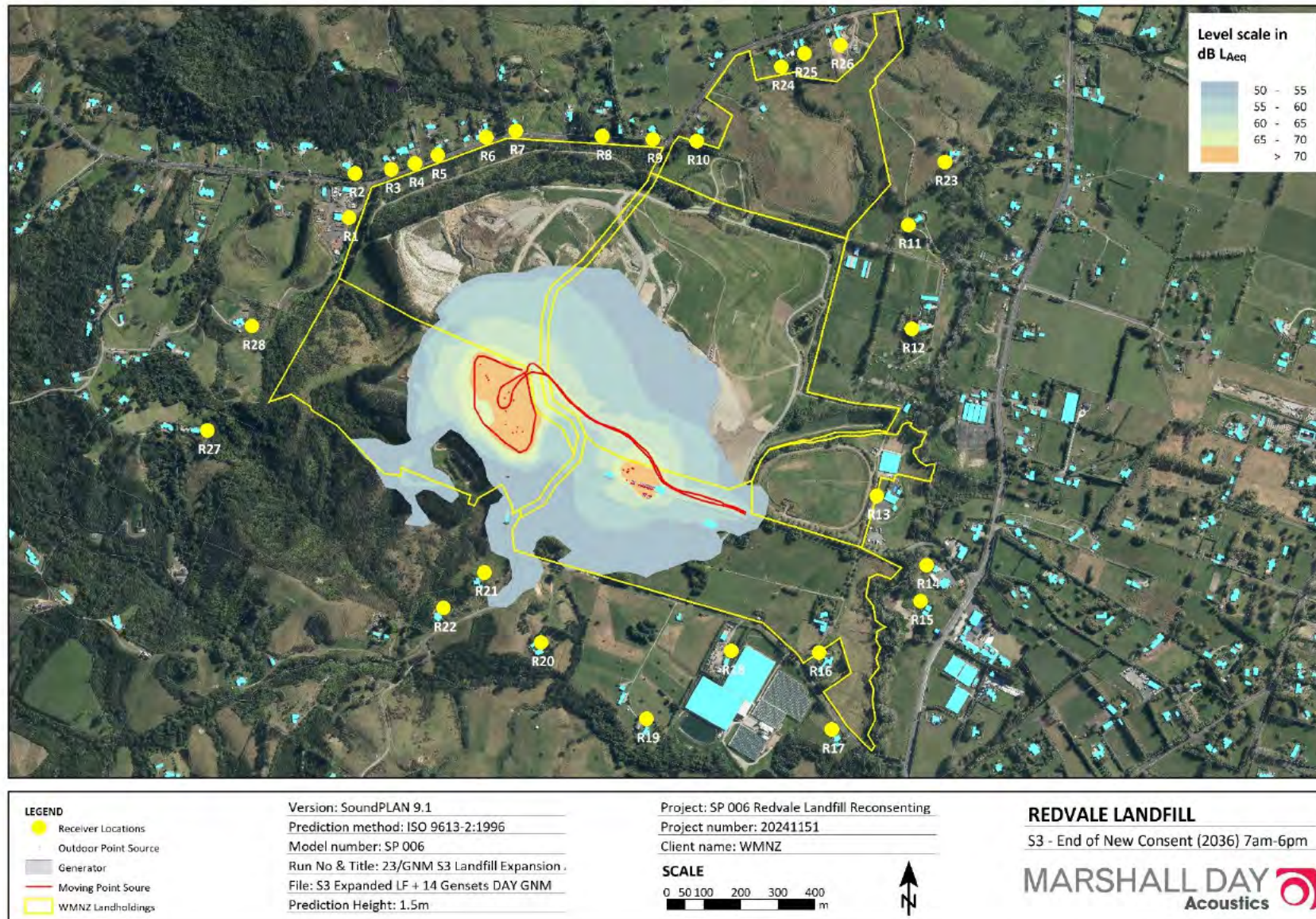


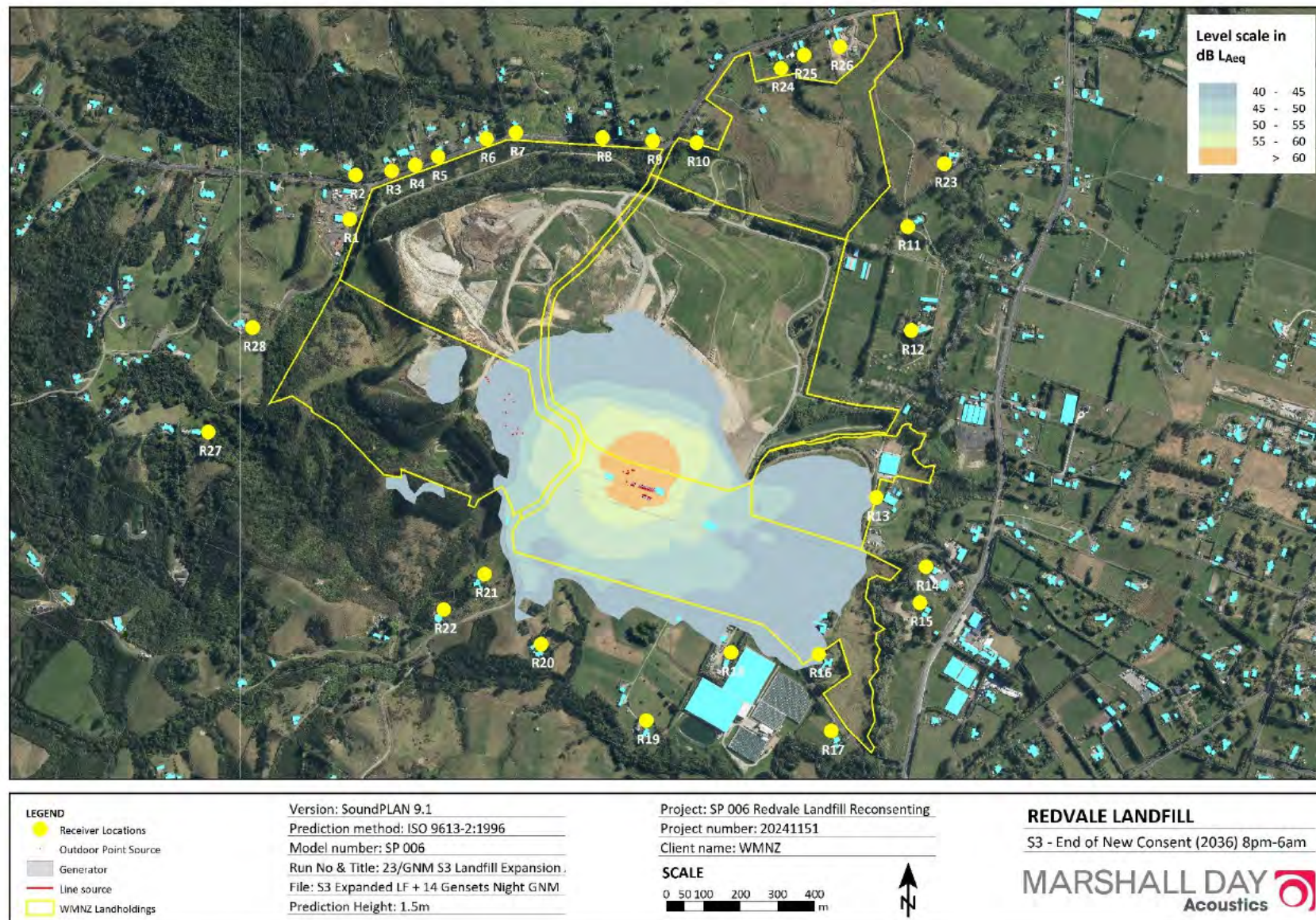
LEGEND Receiver Locations Outdoor Point Source Generator Moving Point Source WMNZ Landholdings	Version: SoundPLAN 9.1 Prediction method: ISO 9613-2:1996 Model number: SP 006 Run No & Title: 20/GNM S1 Landfill + 13 Gense File: S1 Existing Mitigated DAY GNM Prediction Height: 1.5m	Project: SP 006 Redvale Landfill Reconsenting Project number: 20241151 Client name: WMNZ SCALE 0 50 100 200 300 400 m 	REDVALE LANDFILL S1 - Existing + continued operations 7am to 6pm MARSHALL DAY Acoustics
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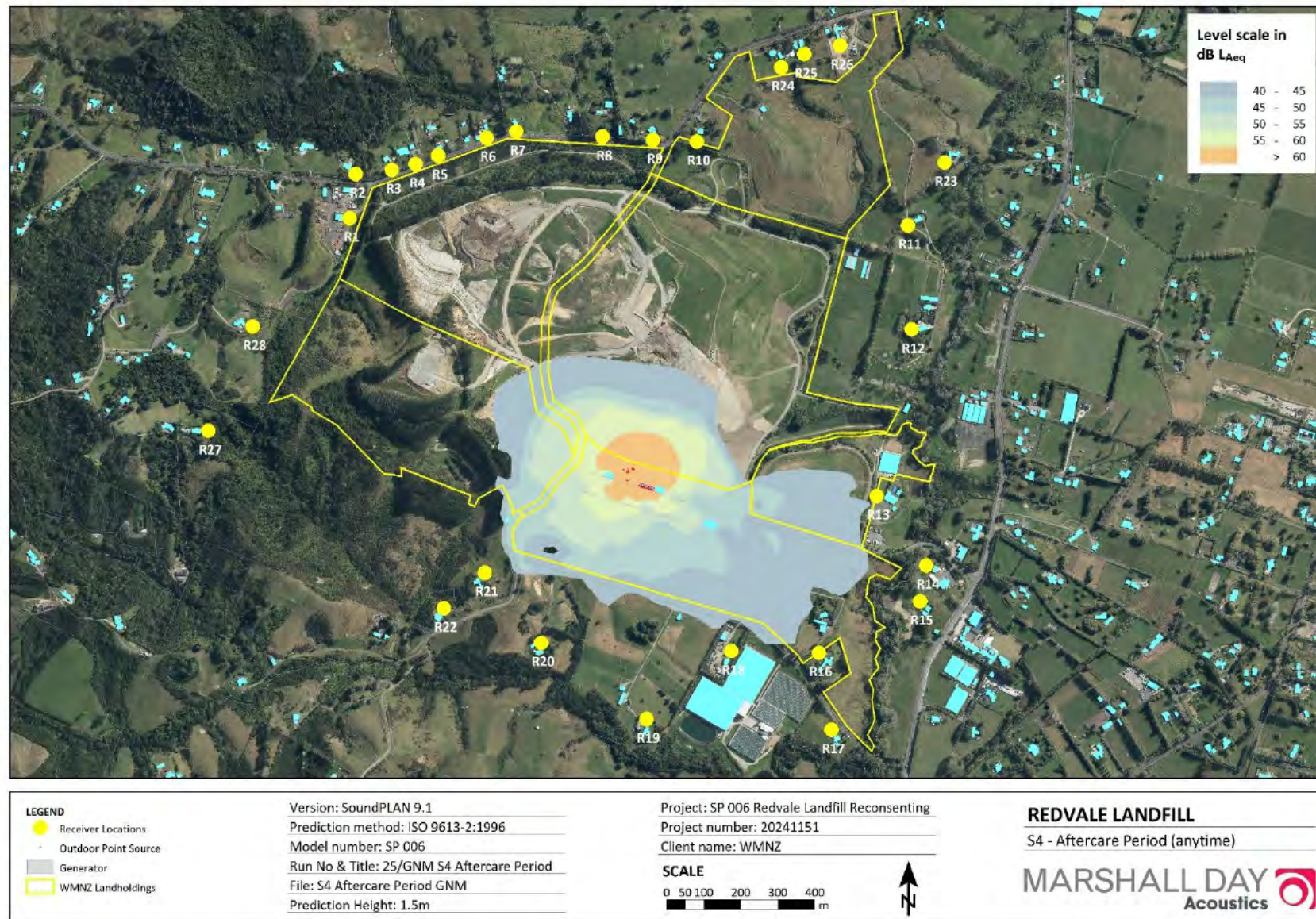








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Appendix C Landscape and Visual

C1 Landscape and Visual – Redvale Landfill Expansion

Table C1: Response (Tom Lines – Boffa Miskell) to Auckland Council (Peter Kensington) comments on the Draft Landscape Effects Assessment report

#	Comment	Response
1	The title of the assessment document includes the abbreviation “ARL-TP” – I suggest this should be written in full as “Auckland Regional Landfill - Transition Project”.	The project is now referred to as ‘Redvale Landfill Expansion’. This has been updated throughout the report (Appendix A).
2	Are there any particular limitations on the maximum slope of the finished landform contours and have the findings of the landscape assessment assisted to inform the design of this aspect of the proposal? This is in the context of the statement on Page 12 which states “While the resulting landform will exhibit greater uniformity when considered in isolation, the site sits within a broader landscape of ridges to the north, south and west of similar elevation, rather than as a distinct hill”. I suggest there is an opportunity to ensure that the final landform will be of as natural an appearance as possible – noting that this may not be reflected in the current design of the proposal.	Although the expansion is influenced by a range of engineering requirements (largely maximum slope) that define its form, the overall landform remains strongly influenced by the shape and scale of the existing landfill. The engineered works will integrate with these established contours and the expanded area will read as a coherent extension of the current landform rather than an isolated or abrupt addition. Once landfill operations are complete, the final landform will be progressively softened and naturalised through the establishment of vegetation. This planting will help to visually blend the engineered slopes into the surrounding landscape, reduce the apparent height and more uniform mass of the landform, and be more integrated over time.
3	Section 1.1 of the assessment document references earlier assessments, but does not list these – should these be listed?	These are now included as a bibliography for completeness.
4	It would be helpful to include road names (e.g. Richards Road and Jean Mackay Place) on the Viewpoint Location Plan; and it would also be helpful to include a closer scaled version of Figure 8 to illustrate the visibility comparison within 2.0km from the site (being an area of focus of the assessment).	This has been included and an additional map has been prepared.
5	Are there any Māori cultural landscape values considerations of relevance – as informed perhaps by the Whetū report?	The draft Cultural Values Assessment has now been received and reviewed. Cultural landscape values have been acknowledged in section 4.1.1.
6	Page 21 notes that night-time lighting effects are still to be assessed – I agree this is an important consideration that will need to be covered.	Night-time lighting effects are now considered in section 6.3 of the report (Appendix A).

#	Comment	Response
7	Additional mitigation planting is recommended in the assessment, but there is no drawing which illustrates where this is to occur. I recommend that there needs to be an updated 'Structure Planting Plan' (or similar), in association with an updated 'Landscape Mitigation and Rehabilitation Plan' (noting that there is a 25 October 2022 version of this document prepared by SLR), with the design of this planting scheme possibly prepared collaboratively with ecological input.	A Landscape Mitigation Plan which incorporates the planting commitments outlined in the LA4 Structure Planting Plan, in addition to this assessment's specific recommendations, is provided in Appendix 2 of the report.

Appendix A Draft Landscape Effects Assessment Report

Boffa Miskell



Redvale Landfill Expansion

Landscape Effects Assessment
Prepared for WM New Zealand

3 July 2026



Document Quality Assurance

This document may be cited as: Boffa Miskell Limited 2026. <i>Redvale Landfill Expansion: Landscape Effects Assessment</i>. Report prepared by Boffa Miskell Limited for WM New Zealand.				
For any information regarding this report please contact: Tom Lines Landscape Planner Senior Principal [REDACTED]				
Revision /version:	Issue date:	Prepared by:	Description:	Reviewed by:
Draft / Final V1	10/03/2026	Tom Lines Landscape Planner / Senior Principal	Revised after client review	John Goodwin Landscape Architect / Consulting Partner
Final V2	04/06/2026	Tom Lines Landscape Planner / Senior Principal	Update following Legal and Auckland Council Comments	John Goodwin Landscape Architect / Consulting Partner
Final V2	03/07/2026	Tom Lines Landscape Planner / Senior Principal	Final update following Legal and Auckland Council Comments	John Goodwin Landscape Architect / Consulting Partner
Approved for issue: Tom Lines Landscape Planner Senior Principal [04/06/2026]				
Release and Reliance This report has been prepared by Boffa Miskell Limited on the instructions of our Client, in accordance with the agreed scope of work. If it is intended to support an application under the Fast-track Approvals Act 2024, it may be relied upon by the Expert Panel and relevant administering agencies for the purposes of assessing the application. While Boffa Miskell Limited has exercised due care in preparing this report, it does not accept liability for any use of the report beyond its intended purpose. Where information has been supplied by the Client or obtained from external sources, it has been assumed to be accurate unless otherwise stated.				

File name & Project number: [BM240110_LVA_Draft_20260406.docx]

Template revision: 20230505 0000

Cover photograph: The site, © Tom Lines, 2024

Executive Summary

This Landscape Effects Assessment has been prepared for WM New Zealand to evaluate the actual and potential landscape and visual effects at a proposed extension to the operational life of the Redvale Landfill, located at Dairy Flat, north of Auckland. The proposal seeks to extend the operation of Redvale Landfill to 2036 through the development of additional landfill airspace within and adjacent to the existing facility, ensuring continuity of critical residual waste disposal capacity for the Auckland region.

The assessment has been undertaken in accordance with *Te Tangi a te Manu: Aotearoa New Zealand Landscape Assessment Guidelines* and is informed by detailed site inspections, visibility modelling, visual simulations, and a comprehensive review of the surrounding landscape context and viewing audiences. It considers the proposal in relation to the baseline environment at 2028, when the landfilling operation are otherwise required to cease under the existing consent conditions. The proposed extension will not increase the maximum consented height of the landfill but will involve a slightly expanded footprint, steeper slopes, and a longer duration of visible landfill activity. These changes will result in a continuation and, in some locations, a modest increase of landscape and visual effects compared with those experienced when landfilling operations cease in 2028. The assessment finds that the surrounding landscape has a demonstrated capacity to absorb such change, given its mixed rural character, modified land use history, enclosing topography to the west, and extensive existing vegetation which mitigates landscape and visual effects.

Landscape effects are assessed as no more than low adverse, with the expanded landform remaining coherent with the existing landfill and surrounding rolling hill country character. Visual effects vary by location and viewing audience. Visual effects during operation are predicted to be moderate from a limited number of residential properties—most notably those in the mid distance along Jean MacKay Place. For most other residential areas, road users, visitors, and workers, visual effects during operation are assessed as low to low-moderate, reducing to very low following completion, grassing, and establishment of rehabilitation planting.

Night-time lighting effects are assessed as very low to low, reflecting the limited lighting requirements and long-established landfill practices and designed to minimise light spill, glare, and sky glow.

With the implementation of existing consented mitigation measures, together with additional mitigation measures such as targeted planting recommendations outlined in this report, the proposal is considered capable of continuing to achieve a well-integrated landscape outcome. Overall, the assessment concludes that the adverse landscape and visual effects associated with the operation of the landfill will be temporary in nature given the limited duration of the proposed extension and will progressively diminish over time following closure, to a low level for landscape effects and very low level for visual effects as rehabilitation planting matures. Ultimately,

landscape effects are anticipated to reduce to a low level, while visual effects are expected to reduce to a very low level

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Appendices

Appendix 1: Assessment Method

Appendix 2: Graphic Supplement

1.0 Introduction

Boffa Miskell Limited (BML) has been engaged by WM New Zealand (WMNZ) to provide a technical assessment to understand the landscape effects of a proposal to extend the use of Redvale Landfill, north of Auckland (the Project). This report forms part of a suite of technical reports prepared for WMNZ for inclusion in a substantive application for resource consent under the Fast-Track Approvals Act 2024.

This report assesses the actual and potential landscape and visual effects of the Project and is intended to support the Assessment of Environmental Effects (AEE).

Redvale Landfill is currently scheduled to cease accepting waste in December 2028, and due to delays in securing resource consents for the establishment and operation of the replacement Auckland Regional Landfill (ARL), a transition plan is required. The proposal seeks to extend the operation of Redvale Landfill to 2036 through the development of additional landfill airspace within and adjacent to the existing facility, ensuring continuity of critical residual waste disposal capacity for the Auckland region.

The expansion of the existing landfill area will involve the recontouring of the fill profile. Although the final maximum height of the landform will not change from that previously consented, the footprint of the proposed landfill extension¹ will be larger, the slope angle of much of the landform will be steeper and the duration of potential effects while the landfill is in operation will extend by a period of approximately 10 years. As such this landscape assessment is required to accompany the Substantive Application for the Fast-Track Approvals Act 2024.

In undertaking this assessment, the author and peer reviewer have visited the location of the Project to understand its existing landscape attributes, values and character as well as the physical and visual relationship the Site and Project have with the surrounding built and natural environment. Additionally, the visual catchment and viewing audiences of the wider area have been identified and considered.

1.1 Assessment Approach

This assessment has been undertaken by a registered landscape architect and is consistent with the methodology (high-level system of concepts, principles, and approaches) of 'Te Tangi a te Manu: Aotearoa New Zealand Landscape Assessment Guidelines,' Tuia Pito Ora New Zealand Institute of Landscape Architects, July 2022. A Method Statement is attached as **Appendix 1** to this report.

This landscape effects assessment has considered the Project in the context of the existing environment, the zoning and use of the land surrounding the Site and the relevant planning framework.

The author of this report has reviewed the current plans provided by WMNZ and carried out a desk survey of the baseline landscape and visibility context, prior to visiting the site. This included a review of the current landscape classifications and assessments relevant to the local

¹ Specifically, the Class 2 waste is proposed to be extended beyond the existing landfill footprint, with Class 1 waste remaining within the existing footprint

area. Field survey work was carried out on the 8th of November and the 17th of December 2024 with records made in the form of field notes and photographs.

This report considers direct comparisons with the earlier Landscape and Visual Assessments undertaken by Boffa Miskell Limited listed in the Bibliography, updating the predicted effects in the context of changes to the landscape within or surrounding the site, and the extent of visibility.

1.2 Assessment Area

This site, as shown in **Figure 1, Appendix 2**, is located in the rural lifestyle community of Dairy Flat within the Auckland Region, approximately 5km south-west of Silverdale, 8km north-west of Auckland's urban fringe and approximately 2.6 km west of State Highway 1. It comprises an area of approximately 170ha of which 59ha is permitted for waste.

1.3 Assessment Scope

In summary this assessment covers:

- **Background**
A summary of the background of Redvale Landfill.
- **The Statutory Framework**
A brief outline of the relevant statutory context of the Project
- **Baseline Description**
A baseline description of the receiving environment together with an outline of the likely visibility and viewing audiences of the Project.
- **Description of The Project**
An overview of the phasing strategy to contextualise the current landfill phase and the proposed operation predicted to take place after 2028, with specific regard to any changes in landscape character and predicted visual effects.
- **Assessment of Landscape and Visual Effects**
An updated assessment of the landscape and visual effects; this will assess the effects of the continued operation of the landfill on what is predicted to be the current environment in 2028.
- **Recommendations**
A description of the informed recommendations for mitigating any additional landscape and visual effects over and above the mitigation measures already required for the currently operating landfill. A mitigation plan which is an evolution of the original LA4 Structure Planting Plan is provided in **Appendix 2**.
- **Conclusion**
Concluding comments summarising landscape and visual effects of the Project.

2.0 Background

The Redvale Landfill opened in August 1993 as a sanitary landfill, with consent issued for a 30-year period. The site originally contained a lime quarry which, after 25 years of operation closed in 2005. The Landfill accepts: non-hazardous residential, commercial and industrial solid waste from a catchment area containing over 1.5 million people.

The existing conditions² of consent for the landfill outline the development requirements with regard for landscape and visual mitigation. They provide context for the planting undertaken on site to date, much of which was undertaken in line with the original mitigation planting plan³ which has evolved alongside the various consents associated with the site.

3.0 Statutory Context

The relevant statutory provisions are set out in the accompanying Assessment of Environmental Effects report prepared by Tonkin and Taylor ('the AEE'). In relation to this assessment, the site is zoned Rural – Mixed Rural, which seeks to maintain rural character and amenity while accommodating a mix of rural production, non-residential and lifestyle activities. The surrounding area includes land identified as Future Urban Zone, where some limited activities may be undertaken, but which is generally not intended for urban activities until the site is rezoned for urban purposes. There are no Outstanding Natural Landscapes or Outstanding Natural Features within or adjacent to the site. While a Significant Ecological Area associated with Rangitopuni Stream is located nearby, it lies outside the project footprint.

4.0 Baseline Description

This section outlines the existing environment and the likely condition of the existing environment at the time of the cessation of waste placement for 2028. This forms a basis for which the Project has been assessed against.

4.1 Landscape Characteristics, Attributes and Values

4.1.1 Consideration of Cultural Landscape Values

Mana whenua have associations to the area and we understand those that have a particular interest in the Project include Te Kawerau ā Maki and Ngāti Whātua (includes Ngāti Whātua o Kaipara and Ngāti Whātua Ōrākei). A cultural values assessment has been prepared as part of

² General Conditions for resource consents and permit numbers LAN61338 (NRSI 42575), REG61341 (NRSI 42369), REG61342 (NRSI 42570), REG61343 (NRSI 42572), REG61544 (NRSI 42574)

³ Map 3, Redvale Sanitary Landfill, Visual Evidence, Maps 1-6, Mary Buckland, 1991

the application by James Whetu of Whetū Consulting Group. The report outlines key cultural and environmental values and interests of Mana Whenua and their spiritual, historical, and traditional associations with the project area. Te Kawerau ā Maki hold a statutory acknowledgement over the Rangitōpuni Stream and tributaries, which adjoin the landfill and sit within the landfill catchment, confirming the presence of cultural heritage values requiring recognition, protection, and engagement.

It is also recognised that multiple other Mana Whenua have overlapping rohe and connections—particularly through the downstream link to the Waitematā Harbour—and advocate a collaborative and holistic engagement approach to understand cultural relationships, manage adverse effects, and respond appropriately to shared values across the wider cultural landscape.

WMNZ has been undertaking engagement with mana whenua, and their cultural values and associations with this Site will be considered.

4.1.2 The Surrounding Context

The site is located on the western slopes of a broad valley which extends east, from the site, towards an elevated ridgeline containing East Coast Road and Top Road, see **Figure 1, Appendix 2**.

The undulating nature of the landscape becomes more prominent to the west of the site, where the land gains elevation forming an enclosing ridgeline around the site to the west and north. The land here is characteristic of elevated hill country, with prominent forested ridgelines and native vegetation apparent around the smaller streams and gullies. The combination of a low density scattered settlement pattern together with the enclosing topography and vegetation along the ridgelines and gullies contributes to a more intimate and smaller scale landscape to that found east of the site.

The gently rolling landscape to the east of the site opens out to form a landscape dominated by small scale pastoral land use. Here the landscape is characterised by paddocks defined by fence lines and exotic shelterbelts; specimen trees also punctuate the landscape. The Rangitōpuni Stream runs to the south-east of the site and is enclosed by dense often exotic deciduous vegetation.

The settlement pattern also changes to the east with an increased density of rural residential lots. Such residential lots occupy a significant portion of the landscape and form linear communities along the surrounding roads including Dairy Flat Road, Postman Road and further afield, East Coast Road which sits beyond State Highway 1. The density of properties increases around the settlement of Dairy Flat and includes small scale industrial and commercial land use.

The land use across the wider area is predominately agricultural, with some industrial elements contributed by the intensive agricultural/ horticultural land uses (greenhouses) to the south and east of the site. Large buildings and hangers associated with the North Shore Aerodrome (“NSA”) also exist, alongside the aeropark subdivision located further to the north. The lack of vegetation around the airfield also creates a distinctly open landscape.

By 2028, the wider landscape is may reflect the anticipated outcomes of the Mixed Rural Zone and Future Urban Zones, although these are unknown at this time and have not been taken into account in this assessment.

There are however some known projects (including Notices of Requirement and Plan Changes) which may alter the context of the broad environment (refer Appendix 2, Figure 3). Private Plan

Change 103 is Fully Operative as of 8 May 2026 which rezones about 107 ha at Silverdale West for light industry use. This area is however at least 2.7km from the site with limited visibility. Auckland Transport's Designations 1497 and 1489 are also both operative and provide for upgrades to Dairy Flat Highway from Silverdale to Albany, including new walking, cycling, and safety improvements. Viewing audiences along Dairy Flat Highway are already considered as part of the assessment.

By 2028, the surrounding environment will also include a staged development of a surf park at 1350 Dairy Flat Highway, Silverdale, Auckland (Surf Park). Only the first stage of this development has received resource consent which comprises (Stage 1); the construction and operation of a surfing lagoon, restaurant(s), market space, 70 visitor accommodation units consisting of a lodge and eco-cabins; a solar farm; a standard data centre; and associated infrastructure, earthworks and landscaping. This stage of the Surf Park is indicated for completion in late 2027.

4.1.3 The Site

The total Redvale site is approximately 170 ha and is dominated by the existing approximately 59 ha landfill footprint. The balance of the land is utilised for planting, sedimentation ponds, tracks, buildings and structures associated with the landfill. The site bounds Horseshoe Bush Road to the north-west, with Richards Road located approximately 180m to the south. The site is accessed via Landfill Access Road, which connects to Dairy Flat Highway; approximately 300m to the east.

The current vegetation on site is largely a reflection of the Structure Planting Plan and Landscape Mitigation and Restoration Plan (Appendix 4). This planting plan has formed a structural basis for vegetation retention and planting on site.

By 2028, planting would have been undertaken across much of the site with some further planting occurring within 2 years of completing refuse filling.⁴ If the Project were confirmed however, some of the planting requiring a lead in time would not be established as these areas of planting would be subsequently removed. Some limited planting has occurred on the consented landfill footprint, located on the lower portion of the northern slope adjacent to the perimeter road⁵. Some other areas of planting have been undertaken beyond the consented landfill footprint which will require removal to facilitate the expansion. This includes native colonising species, interplanted naïve climax species⁶ and native riparian species around the Pond 6 batters⁷,

The south-eastern site limits are defined by contextual planting around the buildings and facilities associated with the landfill. This includes a dense screen of semi-mature native planting around the office building and a tall screen of Leyland Cypress around the landfill gas

⁴ Planting phasing in the Landscape Mitigation and Restoration Plan includes planting dates such as; "within 2 years after the fill placement at the Managed Fill site has ceased", "within 2 years of completing refuse filling to the designed level in the area", "3 years before refuse placement ceases", "5 years before refuse placement is ceased", and "Native Colonising species: 5 years before refuse placement is ceased. Climax species: 5 years after planting the native species."

⁵ Specifically, the northern portion of Area 33, Refer Appendix 4 Landscape Structure Plan.

⁶ Planting Areas 4 and 9, Landscape Structure Plan, Appendix 4

⁷ Refer Planting Area 5, Appendix 4

treatment/energy facility. Avenue planting along Landfill Access Road provides a formal, park like entrance to the facility.

A large area of mature remnant tree planting, predominately Pine, is located further west along the southern boundary; this has been infilled with more recent pine planting. The planting here connects to a Pine plantation⁸ located to the west of the site.

The western boundary runs along a narrow lane which connects to Horseshoe Bush Road through a wooden fenced / gated entrance. The unnamed lane is lined by a mix of mature native and exotic vegetation which screen the adjacent activities associated with the Baker Tree Services property.

The Northern part of the site is dominated by a shelterbelt of Pine running along the ridgeline, with a dense area of native planting behind, extending north towards Horseshoe Bush Road. A narrow track runs between the native planting allowing access to a sequence of sedimentation ponds.

Further east the planting gives way to an area of low lying native riparian planting which frames a further three sedimentation ponds, the largest being 0.27 ha. This area lies adjacent to the completed eastern slopes of the Landfill, which have been capped and sown with grass.

The grassed completed eastern slopes border the eastern site boundary, here the slopes give way to tall visual screen planting, comprising a mix of mature exotic and native planting. Directly adjacent to the south-eastern boundary is a former trotting club track and the buildings / facilities associated with the Dairy Flat Country Club.

The surface of the landfill comprises areas of disturbed ground, (the extent of which changes on a daily basis) in addition to a series of metalled vehicular tracks, areas of scrub vegetation and a number of grassy banks associated with the filled areas. An approximately 4m high fence, designed to collect and contain litter, is located around the eastern edge of the fill area. There are also a number of pipes associated with the gas extraction and energy operation located across the surface of the capped banks and the active landfill surface.

To the end of December 2025 approximately 85% of the landfill's final volume has been filled and 42% of the final cap has been completed and occupied in grass banks.

Topography

The topography of the site is largely governed by the present operational phase of the landfill; this will continue to be the case until 2028. The landfill has been designed to provide topographic diversity, reflecting the surrounding topography⁹.

The site is enclosed by higher elevated land to the west and north, with the highest point, RL130m, located atop stockpile four, adjacent to the site, see **Figure 3**. The landform around the southern and eastern parts of the site is generally flat; however, the eastern slope of the completed landform forms a noticeable elevation change.

As at 2025, the northern and eastern slopes are largely complete, and form natural appearing slopes to the north and east of the site (**Refer Appendix 2 Viewpoint photos**); they will be completed in line with the final approved contours, as set out in **Figure 5, Appendix 2**. The south and western parts of the site are distinguishable by the sequence of working platforms and steep sided slopes associated with the airspaces of the filling operation.

⁸ Pinus radiata, planted on top of stockpile 4 site.

⁹ Visual Impact Assessment, Proposed Refuse Landfill Redvale Quarry, LA4 Ltd, September 1989

Land use

The site contains a number of buildings located along the southern boundary, these comprise the site management office, the landfill gas treatment/energy facility and various smaller auxiliary structures associated with the running of the landfill and its vehicles. There are no further buildings planned for the site before the current 2028 closure. Around the perimeter of the site lies a network of vehicular paths providing access to the landfill, sedimentation ponds and the boundary planting.

4.2 Visibility

The visibility of the landfill is defined by its visual catchment; this is the area from which the whole or part of the site is visible. The visual catchment is largely defined by the existing topography and above ground screening elements such as buildings, vegetation, and fencing.

A Zone of Theoretical Visibility ("ZTV") analysis has been undertaken to identify the areas from which the final completed contours of the landfill, as of December 2028, is theoretically visible (**Figure 6, Appendix 2**). A ZTV has also been undertaken which represents the proposed final landfill landform of this Project, (**Figure 7, Appendix 2**). A comparison between the two finished landforms has also been prepared to depict the additional areas of visibility associated with the Project to extend the life of the landfill (refer **Appendix 2, Figure 8**).

This analysis is based on the selection of 230 observable points for the consented landfill and 262 points for the Project. The output maps then show the area from which the proposed landform could potentially be seen and the relative number of points visible.

Visibility of 2028 Consented Landfill Landform

The visibility in 2028 will be similar to those observed at present where views of the site are screened to the west and partly to the north by the existing landform ridge which follows the alignment of Horseshoe Bush Road to the north. Views are generally limited to private land, with the majority of visual catchment projected across open farmland.

Although the landfill is within relatively close distance to high use areas such as Dairy Flat Highway, the site is well screened by intervening vegetation and only glimpses or partial views are afforded by passing traffic and from a limited number of properties. Further to the east, although the land rises up above the broad valley which surrounds Dairy Flat Highway and the Rangitopuni Stream, views of the site from these locations are also largely screened by existing vegetation or are very distant.

There are a number of properties within close proximity of the site which have the potential to view part of the landfill.

Based on the above analysis it is considered that the potential for visual effects would be within a localised radius of approximately 2 kilometres from the landfill landform and this was verified through on-site survey and photography.

Proposed Landfill Visibility (The Project)

Should the landfill operation continue past 2028 then its visibility would remain largely restricted by the topography and above ground elements, to the same viewing area/audience as the existing and future existing (2028) baseline scenarios. This is due to the maximum RL of the top of the landfill remaining the same. While there may be a marginal increase in the visual catchment due to the larger footprint, these areas are limited and are located alongside areas where views are currently attained.

4.3 Viewing Audience

The general viewing audience is likely to remain consistent with the current situation until completion of the landfill, with the exception of stage 1 of the Surf Park due for completion in late 2027. In summary the viewing audiences can be described as:

Residents

- Residential properties in the immediate context less than 2km away from the landfill, include properties along Horseshoe Bush Road, Richards Road, Austin Road, Kahikatea Flat Road (eastern portion), Turley Road, Selman Road, Dairy Flat Highway, Postman Road, Blackbridge Road and Jean MacKay Place.
- Residents beyond 2km from the landfill include Aeropark Drive subdivision, Wilks Road West, Bawden Road, Oregon Park, Bobs Way, Top Road, East Coast Road, Kennedy Road, Green Road, Sunnyside Road, Potter Road and Three Oaks Drive.

Road Users

The location of road users broadly corresponds with the location of identified residential viewing audiences. These include:

- Road users in the immediate context less than 2km away from the landfill. This includes those along Horseshoe Bush Road, Richards Road, Austin Road, Kahikatea Flat Road (eastern portion), Turley Road, Selman Road, Dairy Flat Highway, Postman Road, Blackbridge Road and Jean MacKay Place.
- Road users beyond 2km from the landfill include Wilks Road West, Bawden Road, Oregon Park, Bobs Way, Top Road, East Coast Road, Kennedy Road, Green Road, Sunnyside Road, Potter Road and Three Oaks Drive.

It is recognised that a number of these roads are no exit roads and therefore tend to exclusively service associated residential properties rather than provide for a thoroughfare for broader members of the public. Moreover, generally, these views are only glimpse views, and the landfill operation would generally not be noticeable due to the transient nature of the viewing audiences and existing vegetative cover.

Farm Workers

- Workers in the surrounding farmland and facilities such as the large greenhouse facility off Richards Road are likely to have views of the landfill; however, the views are anticipated to be filtered through existing vegetation.

Visitors

- Visitors and workers include those at the shops and facilities located on the corner of Kahikatea Flat Road and Dairy Flat Highway as well as visitors to the NSA. For the visitors to the Dairy Flat Country Club, the landfill is a prominent feature in the view on approach along the Landfill Access Road.
- Visitors and works of the Surf Park located at 1350 Dairy Flat Highway. If the surf park is completed at the end of 2027, visitors and workers would have been viewing the operating landfill for approximately 1 year when the cessation of waste placement takes place at the end of 2028.

Air

- Pilots and passengers using the North Shore Aerodrome will have clear views over the landfill on approach to landing and after take-off, although this is a public viewing audience, it is a relatively limited and transitional audience.

4.3.1 Selection of Viewpoint Photographs and Visual Simulations

Taking the above into consideration, a range of viewpoints have been selected to represent identified viewing audiences and were chosen based on:

- being publicly accessible; having a reasonably high potential number of viewers or being of particular importance to the viewer(s) affected;
- providing a representative range of viewing distances (i.e. short, medium and long distance views) and elevations;
- representing a range of viewing experiences (i.e. static views and points along sequential routes);
- representing views with different extents of the landfill visible (i.e. an entire landfill face, or just the tops of the landfill).

Table 1: Representative Viewing Audience Viewpoint Photographs

VP No.	Location	Direction of View	Viewpoint Distance to Applicant Landholding and project element (Approx.)	Reason for Selection	Visual Simulation undertaken? (Y/N)
VS1	Horseshoe Bush Road	South-west	290m to Landholding 815m to Landfill	Representative of road users and residents in vicinity.	Yes
VP2	Richards Road (1 of 2)	North	1m to Landholding 315m to Landfill	Representative of road users and residents in vicinity.	No
VP3	Richards Road (2 of 2)	North	800m to Landholding 960m to Landfill	Representative of road users and residents in vicinity.	No
VP4	Austin Road	South-east	1870m to Landholding 1945m to Landfill	Representative of road users and residents in vicinity.	No
VP5	Turley Road	South	1525m to Landholding 1700m to Landfill	Representative of road users and residents in vicinity including	No

				Kahikatea Flat Road and Selman Road.	
VS6	Postman Road	West	1585m to Landholding 1615m to Landfill	Representative of road users and residents in vicinity as well as visitors to NSA.	Yes
VS7	Jean Mackay Place	North	1200m to Landholding 1900m to Landfill	Representative of road users and residents in vicinity.	Yes
VP8	Green Road	North	2380m to Landholding 3160m to Landfill	Representative of road users and residents in vicinity.	No
VP9	Kennedy Road	North	3300m to Landholding 4045m to Landfill	Representative of road users and residents in vicinity.	No
VS10	Potter Road	North	3360m to Landholding 4125m to Landfill	Representative of road users and residents in vicinity.	Yes
VS11	Top Road	West	3260m to Landholding 3645m to Landfill	Representative of road users and residents in vicinity.	Yes
VS12	East Coast Road	West	2980m to Landholding 3175m to Landfill	Representative of road users and residents in vicinity.	Yes

5.0 The Project

Redvale Landfill is one of only two landfill sites in the Auckland region that can receive >350,000 tonnes of waste annually to service the approximately 1.5 million tonnes of waste that the Auckland Region produces each year. Redvale Landfill is currently scheduled to cease accepting waste in December 2028 and due to a delay in obtaining the resource consents required for the establishment and operation of the replacement Auckland Regional Landfill (ARL), WMNZ considers a transition plan is required. To address this potential gap in critical landfill infrastructure for residual waste disposal in the Auckland region, WMNZ is proposing to extend the operation of Redvale to the end of 2036 and develop 4.56 Mm³ of additional airspace at the existing facility. This includes 3.13 Mm³ in additional Class 1 Landfill expansion on top of the existing Class 1 refuse placement area and 1.43 Mm³ of Class 2 Landfill extension. The proposed works include the following:

- **Class 1 landfill expansion:** placement of waste within the existing landfill footprint, involving the removal of final cover and steepening of the final cap slope to accommodate additional waste.
- **Class 2 footprint extension:** extension of the existing landfill to the southwest to accommodate disposal of waste meeting Class 2 landfill waste acceptance criteria (WAC).
- **Relocation of ancillary activities:** the relocation of ancillary activities to allow for the placement of waste.
- **Sediment Retention Ponds:** The removal and filling in of Sediment Retention Pond 6 and the Office Pond while enlarging Pond 1 to capture and treat the stormwater from these catchments.

A full description of the proposal is included in the AEE prepared for the project. In relation to proposed landscape and visual mitigation measures, recommendations forming part of this assessment are outlined in **Section 7.0** of this report. A mitigation plan illustrating these recommendations alongside the existing planting commitments as per the approved LA4 Structure Planting Plan is provided in **Appendix 2**.

5.1 Landfill Phasing

The landfill has been designed to be constructed in phases. An indicative phasing plan has been developed as shown in the AEE. The current phasing layout identifies that the proposed landfill expansion will be constructed across three areas of waste types. These areas will be constructed in a phased approach which is identified on the phasing plan.

Putrescible and non-putrescible wastes will be disposed of in different areas within the Class 1 footprint due to the requirement to maintain a 500 m separation between putrescible waste and sensitive receivers. Class 2 waste will be disposed of within the extension area to the southwest of the existing landfill footprint and within an area in the northern portion of the landfill.

6.0 Assessment of Landscape and Visual Effects

The effects covered in this assessment include those that can occur in relation to changes to landscape attributes and values, character and visual amenity (i.e. viewing audiences and their outlook). The effects described in this assessment are considered with mitigation measures implemented. This includes mitigation measures (planting) as per the current conditions of consent in addition to the recommendations outlined in **Section 7.0** of this report.

Landscape and visual effects can result from change in the components, character or quality of the landscape values. Usually these are the result of landform or vegetation modification or the

introduction of new structures, facilities or activities. All these impacts are assessed to determine their effects on landscape character and quality, amenity and on public and private views. In this report, the assessment of potential effects is based on a combination of the landscape's sensitivity and visibility, and the nature and scale of the Project in relation to the existing characteristics of the site.

In relation to this Project and our methodology (**Appendix 1**), it is considered that the degree to which landscape and visual effects are generated by a development depends on a number of factors. These include:

- The degree to which the Project contrasts, or is consistent, with the qualities of the surrounding landscape.
- The proportion of the Project that is visible, determined by the observer's position relative to the objects viewed.
- The distance and foreground context within which the Project is viewed.
- The area or extent of visual catchment from which the Project is visible.
- The number of viewers, their location and situation (static or moving) in relation to the view.
- The backdrop and context within which the Project is viewed.
- The predictable and likely known future character of the locality.
- The anticipated outcomes sought in the statutory provisions, including zoning.
- The quality of the resultant landscape, its aesthetic values and contribution to the wider landscape character to the area.

Change in a landscape does not, of itself, necessarily constitute an adverse landscape or visual effect. Landscape is dynamic and is constantly changing over time in both subtle and more dramatic transformational ways, these changes are both natural and human induced. What is important in managing landscape change is that substantial and / or inappropriate adverse effects are avoided or sufficiently mitigated to ameliorate the effects of the change in land use.

6.1 Effects on Landscape Characteristics, Attributes and Values

Effects of the Current Operation (until 2028)

The key characteristics, attributes and values of the Site are broadly captured within the natural and physical environment, perceptual and associative dimensions. Landfilling activities within the site are an authorised activity until the end of 2028 and therefore effects are anticipated and form part of the baseline condition.

The rural landscape surrounding the site is characterized by a diverse range of activities, including the landfill, which has become a recognizable feature from certain viewpoints due to its operational processes and patterns. This landfilling activity will continue to form part of the receiving environment until the end of 2028.

The overall values of the local landscape are influenced by the landfill's activities, with earthworks, excavation, and waste filling which influences the landscape's sense of intactness. However, these 'industrial' processes align with the site's history of quarrying and are consistent with the findings of the 1984 and 1995 landscape assessments, which identified the area's low sensitivity to change due to its varied land uses.

Effects of the Project

The project represents a continuation of existing landfill activities and will extend their duration beyond the currently anticipated completion date, while slightly modifying the approved landform through an expanded footprint and steeper slopes, without exceeding the consented maximum height. To enable this expansion, some areas of recently planted native vegetation on the lower slopes and remnant exotic trees will be removed¹⁰; however, planting of the landfill landform is already provided for under the existing consent and will be reinstated following completion of the proposed landform. While the resulting landform will exhibit greater uniformity when considered in isolation, the site sits within a broader landscape of ridges to the north, south and west of similar elevation, and will be perceived in the context of these rather than as a distinct hill. Although the expansion is influenced by a range of engineering requirements (largely maximum slope) that define its form, the overall landform remains strongly influenced by the shape and scale of the existing landfill. The engineered works will integrate with these established contours and the expanded area will read as a coherent extension of the current landform rather than an isolated or abrupt addition. Once landfill operations are complete, the final landform will be progressively softened and naturalised through the establishment of vegetation. This planting will help to visually blend the engineered slopes into the surrounding landscape, reduce the apparent height and more uniform mass of the landform, and be more integrated over time.

On this basis, the effects on local landscape character and quality are assessed as no more than **low** adverse.

6.2 Visual Effects

Visual effects are effects on landscape values as experienced in views. The nature of a view depends on how it is perceived and the extent to which it is valued or not. It includes how the landscape in the view is understood, interpreted and what is associated with it.

The below assessment utilises the viewing audiences identified in **Section 5.3** of this report to describe the type of viewing audiences, the composition of their view and the nature and degree of visual effect in relation to the Project.

The following assessment refers to the **Appendix 2** viewpoint photographs visual simulations.

6.2.1 Viewing Audiences within approximately 2 km

Horseshoe Bush Road

Refer Appendix 2: VS1A to VS1G (Horseshoe Bush Road)

¹⁰ Specifically, the northern portion of Area 33, Planting Areas 4 and 9, and Planting Area 5, Appendix 4 Landscape Structure Plan.

Visibility towards the site along Horseshoe Bush Road, in addition to residential properties alongside it, is variable. A substantial amount of established mitigation planting along the northern boundary of the site already successfully helps to screen the landfill from most sections of the road and adjoining properties. The eastern end of Horseshoe Bush Road, in addition to properties in this area, are afforded views towards the landfill and will continue to do so from 2028 onwards. From these north-east locations, the landfill can be seen across open fields, rising above the screening planting in the north-east corner of the site, and visible against the skyline. The grassy northern slopes help to visually integrate the landfill mass into the surrounding landscape.

From immediate north locations, views from the road are now completely contained by the native planting undertaken along the northern site boundary.

In relation to residents along the north-eastern portion of Horseshoe Bush Road, No's 12, 24, 39 and 85 would have views of the landfill site, primarily of the north and eastern slopes. Road users of Horseshoe Bush Road are also present in this area, where transitory views towards the site are obtained.

These viewing audiences will experience an extended duration of landfilling, particularly on the mid to upper portion of the north-eastern slopes. By 2028 (and as indicated at present), the landfill landform is observed as a grassy hill. The change observed for these viewing audiences will be of the grassy landform being re-earth worked, with grass removed in stages, refuse deposited together with daily cover, in addition to the staged capping, grassing and future establishment of planting. Landfill machinery would be seen again in these views and whilst not completely reintroduced as new elements (as the site remains as a working landfill), the intensity of activities will increase together with the duration.

Whilst views are proximate, the landfill landform is oblique to road users and often slightly offset from the front of residential views. The landform forms part of these views (together with views of fields, tree stands, boundary vegetation), with the north-eastern section being visible. As the landfill operations become visible in their view, effects will be up to **Low-Moderate** adverse, reducing to **Very Low** following grassing and establishment of vegetation on the landform.

Richards Road

Refer Appendix 2: VP2 and VP3 (Richards Road 1/2 and 2/2)

Richards Road runs broadly perpendicular to the west of Dairy Flat Highway along low lying land, before returning south and increasing in elevation as it meets the hillsides to the south of the site. Through the low-lying section of the road, roadside vegetation, within the site (primarily *Cupressus Owensii*), filter views towards the landfill landform. Breaks in some of this vegetation, or vegetation being of a limited height in comparison to the elevated landfill landform does however allow for occasional views. By 2028, as the trees are planted in a single row and some trees appear lesser developed, the density of the foliage may be such that filtered views of the landfill are still possible. It is recommended that further planting in this area is undertaken in line with recommendations outlined in **Section 7.0**. As the road diverts south and climbs in elevation as well as negotiating Rangitopuni Stream, sections of the road corridor do allow for views towards the landfill.

For road users however, the extent of visibility towards the landfill from the length of Richards Road will remain comparable to the expected visibility by 2028 and any such effects for these transient viewing audiences would be no more than **Very Low** as a result of a greater duration of landfill operations within the site.

In relation to residents, those at No. 34 are located in close proximity to the landfill site's southern boundary. This property appears well screened from the landfill by the mature planting

which surrounds the property and it is expected that the landfill would continue to be screened by a similar extent beyond 2028. Residents at 19 and 63 Richards Road are expected to experience a similar degree of visibility towards the site as at present. It is expected that this will include partial views of the upper portion of the landform and lower portions filtered by vegetation with the properties and along the near field boundary of the site. Residents at 87 Richards Road will continue to be more exposed to the landfill landform, with a slight increase in landfill visibility within the property as dwellings are orientated towards the southern boundary.

Views for residents in more elevated portions of Richards Road are expected to remain comparable to that already anticipated up until 2028, with some slight increase in visibility within the property of 264 and 224 in fields in the balance of the landholdings.

With the above in mind, it is anticipated that adverse effects during the continued operation of the landfill would be **Low-Moderate** adverse, reducing to **Very Low** following completion of the landfill, including grassing and planting on the slopes.

Austin Road

Refer Appendix 2: VP4 Austin Road

Viewing audiences along Austin Road are located north-west of the site. The road connects between Horseshoe Bush Road and Kahikatea Flat Road and climbs in elevation to approximately 150msl. This high point, together with one or two other locations allow for elevated views towards the site. Residential properties sit on large lifestyle blocks along the road alignment, either alongside the road or further down the adjoining slopes. Properties on the southern side of the road, in the most elevated locations along the road length are afforded views.

The visibility of the site for these road users and residents is consistent with the visibility anticipated under the current consent. The northern mid to upper flanks of the landfill landform are visible in the distance for these viewing audiences. At present some of these northern flanks are seen as exposed earth areas. Distant litter trap fences can be seen on the top of the landform in addition to machinery. By 2028 the slopes would be established in grass and would be seen as part of the sequence of rolling topography which form part of their overall view.

The project would include the opening up of the completed grassed areas where the slopes would be reworked, refuse deposited in stages.. This would extend the duration of visible activity although it is expected that the duration of visible activity will change as the sections of the landfill are reworked before being capped and grassed as new stages are opened up. It is anticipated that the change to the overall form of the landfill will not be particularly discernible from these northern locations. Overall, it is considered adverse effects could be up to **Low** during the landfill operations (which are similar to that currently observed), reducing to **Very Low** following completion and establishment of planting.

Kahikatea Flat Road, Turley Road and Selman Road

Refer Appendix 2: VP5 Turley Road

Located north of the site, Kahikatea Flat Road partly sits on a ridge between approximately 50msl to 100msl before dropping away as it traverses the topography to the west. Turley Road and Selman Roads both originate from Kahikatea Flat Road and are no exit roads which run roughly perpendicular to Kahikatea Flat Road. Elevation on these roads ranges between RL65m and RL120m for Turley Road and RL95m to RL125m for Selman Road. Together, these roads support large lifestyle blocks and farms across pasture covered fields loosely boarded by tree stands, shelterbelts and some partially vegetated gullies. Residential viewing audiences tend to be focused near to the roads and those south of the road often have the opportunity to

afford elevated views in the direction of the site although vegetation and at times intervening landform (e.g. from the western portion of Turley Road) influence the extent of their views. For road users, roadside vegetation along with established planting within properties also filter views across the landscape and views to the south towards the site are transient and brief.

For those that obtain views, a sequence of broad ridges is visible. Vegetation interspersed across these hills and ridges reduces the readability of the gradients of the underlying topography. Overall, the site, represented by the pasture covered landfill landform, is difficult to discern from these distances with the uppermost portion of the landfill landform set behind, and filtered by vegetation to the north.

Visible change for these viewing audiences, beyond 2028 will be limited overall. For those with fixed views from the most elevated portions, distant activity on the mid to upper portions of the landfill may be visible, however this would take place progressively over time. Further, such change will make up a small portion of the wider panoramic views that tend to be attained. The landform of the landfill will change to what is currently observed, with the steepening of slopes. The height of the landform will remain the same however and continue to relate with the elevation of the hillsides to the south-west. The profile of the landfill will typically be restricted to the eastern edge, which would appear steeper once it is completed. Vegetation established on these slopes in line with the anticipated approach to mitigation on the landfill, will help to visually soften the appearance of uniform slopes.

With the above considered, it is anticipated that effects will be **Low** adverse during times of landfill activity (particularly observing areas of earthworks, refuse and machinery), in the northern and north-western portions of the landform. These effects will reduce to **Very Low** adverse following the establishment of grass on the slopes in addition to vegetation.

Dairy Flat Highway

Dairy Flat Highway lays east of the site and runs in a broad north to south direction to the east of the site before reorientating to a northwest/south-east orientation to the south-east of the site. Once a State Highway (SH17), it was designated as Urban Route 31 in 2012 as there was no need to maintain both SH1 and SH17 as most long-distance traffic was utilising State Highway 1 (SH1). Dairy Flat Highway remains, however, an important connection across Dairy Flat. Auckland Transport has two designated projects planned for upgrading Dairy Flat Highway.¹¹ However, the exact timeline for these upgrades is currently uncertain, though they are expected to be completed within the next 30 years.

For road users along Dairy Flat Highway, the landfill is not easily identifiable within views, with the mature trees in the immediate context of the road corridor, and around the landfill itself providing a good degree of screening; any views of the landfill are therefore filtered, with the uppermost portion at times, partially visible. Residents accessed from Dairy Flat Highway are in low lying positions and views from properties along the Dairy Flat Highway, adjacent to the landfill, are well contained by the vegetation around Rangitopuni Stream, and private amenity planting. In winter there may be filtered views towards the eastern slopes given a number of tree stands and shelterbelts contain deciduous species. Visibility towards the landfill is attained in some of the more open areas between Dairy Flat Highway and Postman Road which are primarily characterised by open fields and occasional dwellings.

The Project will result in a slight increase in the extent of visibility when compared to the visibility of the landfill in 2028. It is expected that this is due to the steepening of slopes, as the landfill height will remain unchanged. This increase in visibility however would be limited and broadly

¹¹ Designations 1497 and 1489.

occurs around areas where the landfill landform already characterises views. With the visibility of the landfill typically focused on the mid to upper slopes in already filtered views overall, the extent of change within the views while landfilling activities is being undertaken is expected to be limited and in this sense, the duration of time that activity will be visible will be restricted to the stage(s) and area(s) which are visible. With the steepening of slopes the landform will appear as a more engineered solution than observed at present however this would only be noticeable where the profile of the landform is observed. Further, planting along the eastern slopes, in a naturalised pattern will in time assist in visually softening the appearance of the steeper slopes. With the above considered, residents and road users are anticipated to experience up to **Low** adverse effects as part of the continued landfill operation on the site, entailing the steepening of slopes through new earth worked and refuse quadrants. Following grassing and establishment of vegetation, effects will reduce to **Very Low** adverse.

Postman Road

Refer Appendix 2: VS6A to VS6G (Postman Road)

Postman Road is located east of the landfill and for much of the alignment runs broadly parallel with Dairy Flat Highway, before returning and intersecting with Dairy Flat Highway at its southern end. Postman Road connects into Wilks Road to the north and Dairy Flat Highway to the south. Road users obtain oblique views towards the landfill, which are primarily focused on the northern section of the road corridor, in the immediate vicinity of the NSA. Views from residential properties tend to be limited to the western side of the road and focused just south of the NSA. Planting through the fields intersect with much of the views for other viewing audiences although it is accepted that for some, the upper most portion of the landfill may be discernible.

For those with views, the outlook contains open pastoral farmland with shelterbelt planting and vegetation around Rangitopuni Stream forming a continuous line of planting in the mid-ground and screening the lower eastern slopes of the landfill. The elevated landfill slopes are visible above the vegetation and form a foothill to the higher ground in the west.

By 2028, the landfill will be seen as a grassy landform prior to establishment of the proposed planting. Visual change beyond 2028 to completion will be similar to what is currently observed in relation to landfilling activities, including earthworks, refuse and earthwork machinery, albeit of an evolved shape featuring steeper slopes than seen at present. For road users, it is considered that effects would be no more than **Very Low**, particularly given the short duration they would observe the view as they travel along the road and the restricted section of the road that views are attained. Residential viewing audiences would have fixed views towards the site and for some, views may be 'focused' to the west, in the direction of the landfill. The opening up of grassed areas for accepting refuse will mean that effects associated with these activities will continue, albeit undertaken in sections rather than the entire landform being reworked at once. With this considered, adverse effects are anticipated to be up to **Low-Moderate** when sections are being reworked, reducing to **Very Low** once grassing and planting is established.

Blackbridge Road and Jean MacKay Place

Appendix 2: VS7A to VS7G Jean MacKay Place

Blackbridge Road runs perpendicular to Dairy Flat Highway and services Jean MacKay Place in addition to other local roads. Lots along this road are often boarded by vegetation (e.g. shelterbelts) which will impact on the extent of the landfill that is visible. For road users, roadside vegetation heavily filters and obscures views.

Jean MacKay Place, accessed from Blackbridge Road is located south of the landfill and is a reasonably short, no exit road servicing a collection of reasonably elevated rural lifestyle

properties at approximately 70m RL, a greater elevation than those along the northern side of Blackbridge Road. Many of these properties take advantage of the northern sloping aspects of their respective land parcels and obtain north facing views which include the existing landfill and the site.

The landfill landform clearly features in views for viewing audiences along Jean Mackay Place in particular, this is partly due to their elevation and absence of substantial vegetation in the foreground of their outlooks. Views from properties along Blackbridge are more influenced by boundary vegetation, although partial views will be attained. For those viewing audiences with views, these will include visible areas of earthworks and refuse in addition to activity through moving vehicles/ machinery. These viewing audiences essentially gain a broadside view of the landfill, with both the southern and southeastern sides for some, being visible.

By 2028, the remaining areas of the landfill will have been capped and regrassed, with the landfill reading as a landform broadly connecting to the elevated land to the west (left of the view), and contextually relating to more distant ridges to the north-east occupied by Selman and Wilks Road.

The Project will result in areas of established grass being opened up and areas undergoing earthworks, refuse deposited followed by daily cover and capping of each quadrant. Viewing audiences would observe these activities on the southern and south-eastern slopes which will be similar to those seen at present, thereby extending the duration of visible landfill activity on the site. The change in landform will also be noticeable, with the apparent 'flattening' of the ridge and steepening of slopes – which will both be visible through reading the profile of the landfill. The landform will however continue to appear as an extension of the rising topography to the west and relate to the elevated land to the north of the site. With the above in mind, for the extended duration of the landfill operation and change in landform, viewing audiences along Blackbridge Road will experience adverse effects of up to **Low-Moderate**. It is expected that those from Jean MacKay Place would experience adverse effects up to **Moderate** adverse due to the more uninterrupted and elevated views of the profile of the landfill operations. Effects are expected to reduce to **Very Low** following grassing and establishment of vegetation which will assist in visually integrating the landform overall.

Visitors and Workers of the Surf Park

Once completed in late 2027, visitors and workers of stage 1 of the Surf Park would experience generally west-facing views towards the landfill site that are comparable to those available from locations along Dairy Flat Highway. Views from within the Surf Park will be partially filtered to varying degrees by intervening land uses and vegetation (both within the Surf Park itself and to the west of Dairy Flat Highway); however, the outlook from the Surf Park will typically comprise an agricultural context, with shelterbelt planting and riparian vegetation associated with the Rangitopuni Stream forming a continuous vegetated corridor. This vegetation will screen the lower eastern slopes of the landfill. The upper landfill slopes remain visible above the vegetation and read as a foothill element set against the higher land to the west.

By 2028, the landfill is anticipated to present as a grass-covered landform prior to the implementation of the proposed planting programme. Thereafter, visual changes through to completion would be consistent with those associated with ongoing landfill operations, including earthworks, waste placement, and the intermittent presence of heavy machinery. Over time, the landfill landform would become more defined, with steeper slopes than those currently apparent.

Viewpoints within the Surf Park will be generally fixed and recreational in nature, with views typically oriented westward towards the landfill site. As grassed areas are progressively opened for waste disposal, associated visual effects would occur but would be confined to actively

managed areas rather than occurring across the full extent of the landform simultaneously. Having regard to this, the predicted overall adverse visual effects for Surf Park visitors and workers is assessed as **Low–Moderate** during periods of active landfill operations, reducing to **Very Low** once grass cover and proposed planting are established.

Visitors and Workers at shops, facilities and within greenhouses and farmland

This group includes a broad range of viewing audiences who are either visitors or workers of surrounding commercial enterprises or facilities. These include but are not limited to those at Dairy Flat Community Hall, Dairy Flat School as well as business such as Massimo's Italian Cheeses as well as Greenhouse facilities (e.g. 35 Richards Road) which all tend to be internal activities taking place in buildings. Workers on farms are also considered who may afford more open views from outdoor locations. These viewing audiences are likely to be more focused on the activities of these facilities rather than external factors beyond their respective boundaries.

Views from these facilities are variable but broadly either do not have views, or views are either heavily filtered or limited to the upper portions of the landfill.

These viewing audiences would collectively observe the reworking of the grassy landform, with grass being removed in stages, refuse being deposited alongside daily cover, and the gradual capping, grassing, and future planting of the area. Landfill machinery will once again be visible in these views. While these elements are not entirely new—since the site remains an active landfill—the intensity and duration of activities will increase as areas are reworked in quadrants. With the above in mind, it is considered that the adverse effects on these viewing audiences would be no more than **Low**, reducing to **Very Low** following grassing and planting.

6.2.2 Viewing Audiences beyond approximately 2km

Residents within NSA Aeropark subdivision

Residents in the Aeropark subdivision obtain similar west facing views towards the site as those attained from along Postman Road. Neighbouring residential properties within the subdivision may impact on these views to some degree, however views from properties would include open pastoral farmland with shelterbelt planting and vegetation around Rangitopuni Stream forming a continuous line of planting in the mid-ground and screening the lower eastern slopes of the landfill. The elevated landfill slopes are visible above the vegetation and form a foothill to the higher ground in the west.

By 2028, the landfill will appear as a grass-covered landform before the planned planting begins. After this, visual changes leading to project completion will resemble current landfill operations, including earthworks, waste disposal, and the use of heavy machinery. However, the landform will develop a more defined shape with steeper slopes than those presently visible. Viewers will generally have a fixed perspective of the site, with some focusing more towards the west where the landfill is situated. As sections of grassed areas are gradually opened for waste disposal, the associated visual effects will persist but will be confined to managed sections rather than affecting the entire landscape at once. Considering this phased approach, the adverse visual effect is expected to be **Low–Moderate** during active site work, decreasing to **Very Low** once grass cover and planting are in place.

Wilks Road West

Residents and road users along Wilks Road West are north of the site and obtain elevated views in the direction of the landfill. This road serves a mix of large lifestyle properties and

farms, spread across open pastureland and loosely framed by tree stands and shelterbelts. Residential viewpoints are primarily concentrated near the road, with those to the south often obtaining elevated perspectives toward the site.

For those with panoramic views, a series of broad ridges can be seen. Vegetation scattered across these hills and ridges softens the contours of the underlying terrain, making its natural slopes less distinct. The landfill itself, covered in pasture, broadly blends into the wider landscape from a distance.

Beyond 2028, noticeable changes for viewers will be limited given the distance of the observer. While those with elevated, fixed viewpoints may have the opportunity to see landfilling activity on the mid-to-upper sections of the landfill, this will occur gradually and in localized areas rather than through large-scale exposure of land for refuse disposal. Additionally, any such changes will make up a small fraction of the broader panoramic views available from these vantage points.

The landfill's form will evolve, with steeper slopes becoming more prominent. However, its overall height will remain consistent, continuing to align with the elevation of nearby south-western hills. The most visible transformation will occur along the eastern edge, which will take on a steeper profile once completed. To mitigate visual impacts, vegetation will be established on these slopes, softening their uniform appearance.

Considering these factors, the visual effects during active landfill operations—particularly in the northern and northwestern areas—are expected to be **Low** adverse, mainly due to earthworks, machinery, and exposed refuse. Once grass and vegetation have been re-established, these effects will diminish further, reducing to a **Very Low** adverse over time.

Kennedy Road, Green Road, Sunnyside Road, Potter Road, and Three Oaks Drive

Refer Appendix 2: VP8 Green Road, VP9 Kennedy Road VS10A to VS10G Potter Road

More distant viewing audiences to the south include those on north facing slopes Kennedy and Green Road (with the roads broadly on a north to south axis), Sunnyside and Potters Road (with the roads on an east to west axis) as well as portions of Three Oaks Drive.

Roadside vegetation along verges and within properties often restricts views towards the landfill however at times, clear views are attained with the landfill featuring in the centre of the view from Kennedy and Green Roads and more oblique views from along Sunnyside Road, Potter Road and Three Oaks Drive.

From within residential properties, elevated views towards the landfill are attained and for both viewing audiences, the view has a relatively high scenic value of views across a rural landscape featuring large swathes of vegetation extending out towards the horizon. The landfill is seen in the context of the rolling topography and observed alongside other ridges of similar elevation and grade. At present, much of the slopes have been established in grass, although landfill activities remain evident through areas involving earthworks and lighter hues of areas of exposed refuse. By 2028 the landfill will have been fully grassed prior to planting and feature as rounded landform in a rural context. Whilst the lack of vegetation on landfill will be noticeable in comparison to the dense vegetation cover across the balance of the view this is easily lost in the context of the wider view and the forested backdrop.

Visual change beyond 2028 to completion will be similar to what is currently observed in relation to landfilling activities, including earthworks, refuse and earthwork machinery, albeit of an evolved shape featuring steeper slopes that seen at present. The project will increase the

duration of visibility of the operational southern and western aspects of the landfill; however considering the distance, the complexity of the view and the limited viewing audience any adverse effect on visual amenity is considered to be **Low** reducing to **Very Low** once the landfill has been regressed and established in vegetation.

Bawden Road, Oregon Park, Bobs Way, Top Road and East Coast Road

Refer Appendix 2: VS11A to VS11G Top Road, VS12A to VS12G East Coast Road

These viewing audiences are located east of the project site and typically obtain elevated views towards the west. No exit roads such as Oregon Park, Bobs Way and Top Road are considered to primarily service local residents (rather than commercial businesses or as a through road). Bawden ties into East Coast Road (to the east) and Dairy Flat Road (to the west). East Coast Road remains as a well-used arterial corridor servicing residents and business, which run alongside SH1.

Residential viewing audiences tend to be focused along Oregon Park, Bobs Way, Top Road, Bawden Road and East Coast Road. The development pattern along these roads is typically large lot development with dwellings often orientated with northern or western aspects, toward the site. Much of this land is zoned as Future Urban and therefore in time, there is an expectation that viewing audiences will increase. In the meantime, however any change is expected to be limited in relation to the current condition.

For those who attain an outlook, the view is an open panorama across the Dairy Flat landscape. For those along Bawden Road, Oregon Park, Bobs Way and Top Road the view includes gently undulating pastoral farmland intersected by shelterbelt planting and small wood lots. The distant horizon contains scattered trees and dense forested knolls, leading towards Riverhead Forest in the south. Electricity pylons and transmission lines run across the view in the foreground of Top Road views, adding an urban element and State Highway 1 forms a prominent man-made element in the view to the north.

From East Coast Road the current view is an open panorama across a large part of Dairy Flat and the hills beyond. The elevated position of the viewing audience together with the open nature of the airfield allow for distant, uninterrupted views of the upper eastern landfill slopes; the exposed clay of the worked landfill contrasts against the finished green eastern banks. Views of the landfill are seen in the context of the disturbed ground east of the airfield and the numerous urban elements, including; SH1, communications masts, and a cluster of large hangers and buildings, including recent residential development associated with the NSA.

By 2028, the eastern face will have been fully grassed, and therefore current distant views of landfill activities would not feature in the view. The proposed staging of the project would mean that sections of the landfill would be worked on before being capped and regressed as the next area is opened up. Works in the lower portion of the site where the perimeter road is to be raised by approximately 2m would not be particularly discernible given the distance, scale of works and existing planting around the landform. Therefore, the key changes in the view would be the continuation of landfilling activities (as presently observed). The change in the shape of the landform is unlikely to be particularly discernible from these eastern locations, and it is considered that the overall form will continue to relate to and tie into the sequence of ridges to the north and south.

Overall, it is considered adverse effects would be up to **Low** for viewing audiences as a result of the increased duration of landfill activities until grassing and planting is established. By this time, these effects would reduce to **Very Low** adverse.

6.3 Night-Time Lighting Effects

Night-time lighting associated with the extended operation and proposed expansion of Redvale Landfill has the potential to give rise to visual amenity effects through three primary mechanisms:

- Light spill, where artificial light extends beyond the operational area into surrounding land uses;
- Glare, where luminaires are poorly oriented or directly visible to receptors, creating annoyance or visual discomfort; and
- Sky glow, where multiple or poorly controlled light sources contribute to a diffuse brightening of the night sky, reducing levels of natural darkness.

The landfill is proposed to operate between 6:00 am and 6:00 pm, Monday to Saturday, and as such artificial lighting will be required during hours of darkness outside daylight periods, particularly during winter months. The approach to lighting will continue to prioritise safety-critical operational needs only, with all lighting minimised in extent, duration, and intensity.

In practical terms, lighting is required only in the following locations to enable safe operation of the facility:

- the site entrance and internal access road;
- the office area and staff car park; and
- the active landfill working face.

Lighting associated with the site entrance and access road will remain unchanged and confined to the existing street lighting along the southern side of Landfill Access Road. Similarly, lighting within the office area and staff car park will remain minimal and consistent with current operations. These areas are centrally located within the landfill site, are relatively low-lying, and are visually contained by surrounding landform and vegetation, which collectively limits the outward visibility of light sources from nearby rural and residential properties.

Lighting at the landfill working face will be provided via portable lighting rigs and will continue to operate in a manner consistent with existing and historic landfill operations. These lights will be used only when and where required and will be fitted with directional, downward-facing luminaires focused directly onto the tipping area. This approach reduces the potential for light spill and glare by limiting direct views of the light source from surrounding properties. The constrained extent and temporary nature of this lighting, combined with its controlled orientation, means it will not contribute materially to sky glow or result in noticeable degradation of night-time darkness in the wider area.

From surrounding viewpoints, particularly during winter months, the presence of limited night-time lighting associated with landfill operations will not be out of context when considered against the site's established and long-standing use as an operational landfill.

Overall, the continued use of low-level lighting, downward-directed luminaires, shielding, and careful orientation of portable light sources will effectively avoid or minimise adverse effects related to light spill and glare, while also ensuring that contributions to sky glow remain negligible. While temporary lighting at the working face may be intermittently visible to some

surrounding residents, it will not be of sufficient brightness or duration to create glare, nor will it occur at a scale capable of altering the perceived darkness of the night sky.

On this basis, the potential effects of night-time lighting on visual amenity are assessed as very low in relation to light spill and sky glow, and no more than low in relation to glare.

6.4 Viewing Audience Assessment Summary

The table below provides a summary of the likely effects of the Project on the viewing audiences identified above. Where multiple viewing audiences are identified in one location (e.g. road users and residents), the greatest visual effect for the viewing audience group has been listed in Table 2.

Table 2: Summary Of Visual Effects During Site Operation And Closure

Viewing Audience Location	Level of Adverse Effect During Operation	Level of Adverse Effect Following Closure of Landfill and establishment of grassing and planting on landform
Horseshoe Bush Road	Low-Moderate	Very Low
Richards Road	Low-Moderate	Very Low
Austin Road	Low	Very Low
Kahikatea Flat Road, Turley Road and Selman Road	Low	Very Low
Dairy Flat Highway	Low	Very Low
Postman Road	Low-Moderate	Very Low
Blackbridge Road	Low-Moderate	Very Low
Jean MacKay Place	Moderate	Very Low
Surf Park	Low-Moderate	Very Low
Visitors and Workers within 2km	Low	Very Low
Aeropark Subdivision	Low-Moderate	Very Low
Wilks Road West	Low	Very Low
Kennedy Road, Green Road, Sunnyside Road, Potter Road and Three Oaks Drive	Low	Very Low
Bawden Road, Oregon Park, Bobs Way, Top	Low	Very Low

Road and East Coast Road		
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7.0 Recommendations

Based upon the above analysis there are a number of measures which will help to mitigate the effects associated with the extended visibility of the operating landfill. It is recommended these measures be included as additions to the Structure Planting plan which details mitigation planting to be carried out on site. The implemented Structure Planting Plan, in addition to the measures below, have been taken into account when considering the landscape and visual effects assessment. The updated mitigation plan incorporating the below planting recommendations is located in **Appendix 2**.

These measures are:

- Continue infill/replacement screen planting regime where plant failure/die back has been identified. Most notably these areas are around the boundary of the landholding along Richards Road; and supplementary planting to the north near Horseshoe Bush Road where existing planting is either over mature or showing signs of tree failure. Planting in these areas will strengthen the visual screening and integration of the landfill in years to come.
- Revise selected areas of planting on the landfill face—within the proposed expansion footprint—from exotic/native tree species to shallow-rooting native colonising species.
- Convert a limited area of exotic tree planting to native tree screen planting.
- Replace portions of existing vegetation (including exotic tree and pond plantings) with shallow-rooting native colonising species on the landfill face.

Low level lighting, downlights, light shields and directional lighting should also continue to be utilised to assist in managing light spill, glare and potential impacts on sky glow.

8.0 Conclusion

In summary, the above analysis demonstrates that the existing landfill operation is visually well integrated into the surrounding landscape, primarily through mitigation planting and the surrounding topography.

The proposal to extend the life of the landfill operation will lengthen the time when the landfill operation is visible and postpone the completion of the grassed and planted final landform.

With progressive grassing and naturalised planting, together with supplementary perimeter planting the adverse effects of the Project on the local landscape character and quality will be

low, with the only residual effect relating to the extended duration in which the landfill alters the perceived quality of the wider landscape from a limited number of viewpoints.

In relation to visual effects, moderate adverse effects during operation are expected to be from residential properties at Jean Mackay Place during the landfill operation. Moderate-Low effects are anticipated for residents along Horseshoe Bush Road, Richards Road, Postman Road, Blackbridge Road and the Aeropark Subdivision, as well as visitors to the Surf Park. Other viewing audiences during operation are anticipated to experience up to Low adverse effects. Once the landfill is completed and grassing and planting on the landform is undertaken, effects are considered to reduce to Very Low for all viewing audiences.

Ultimately the Project will continue to achieve a well-integrated outcome and in years to come, the rehabilitation planting will mature and assist in integrating the landfill structure into the local landscape context.

Bibliography

December 2011: Boffa Miskell (“BML”) was commissioned by Trans Pacific Industries limited (TPI) to undertake a technical review of a proposed Managed Fill site within their current landholding, which was granted consent in 2011. The managed fill site, which is approximately 5.9 ha is located adjacent and to the west of the existing refuse landfill, and will be incorporated into become part of the proposed 7.4 ha ‘Class 2’ extension of the refuse landfill.

June 2012: BML was commissioned by TPI to undertake an assessment of landscape and visual effects for a proposed Earthfill Landform to the north- east of the site. The earth fill was granted consent later in 2012.

November 2013: BML prepared an assessment of landscape and visual effects for TPI to extend the operating period of the refuse landfill from 2023 when the previous consent was due to expire. The finished landform height, contours and proposed end use remained the same.

March 2020: BML prepared a landscape and visual effects assessment of a Project to replace an existing Leachate Evaporator Unit (LEU) with a BeneVap BV3000 LEU.

March 2021: BML prepared a landscape and visual effects assessment of a proposed alternative location for a new BeneVap BV3000 LEU to replace.

April 2021: BML prepared an assessment of landscape and visual effects for an extension to the managed fill operation to align this with the approved extension to the refuse landfill until December 2028.

May 2021: BML prepared an assessment of landscape and visual effects associated with delaying the removal of a temporary stockpile to be used in the final capping of the refuse landfill to align with the December 2028 refuse landfill consent expiry date.

Appendix 1: Assessment Method

Landscape Effects Assessment Method

15 November 2023

This assessment method statement is consistent with the methodology (high-level system of concepts, principles, and approaches) of 'Te Tangi a te Manu: Aotearoa New Zealand Landscape Assessment Guidelines,' Tuia Pito Ora New Zealand Institute of Landscape Architects, July 2022. The assessment provides separate chapters to discuss landscape, visual and natural character effects where relevant, but is referred to throughout as a Landscape Effects Assessment in accordance with these Guidelines. Specifically, the assessment of effects has examined the following:

- *The existing landscape;*
- *The nature of effect;*
- *The level of effect; and*
- *The significance of effect.*

The Existing Landscape

The first step of assessment entails examining the existing landscape in which potential effects may occur. This aspect of the assessment describes and interprets the specific landscape character and values which may be impacted by the Project. The existing landscape is assessed at a scale(s) commensurate with the potential nature of effects. It includes an understanding of the visual catchment and viewing audience relating to the Project including key representative public views. This aspect of the assessment entails both desk-top review (including drawing upon area-based landscape assessments where available) and field work/site surveys to examine and describe the specific factors and interplay of relevant attributes or dimensions, as follows:

Physical –relevant natural and human features and processes;

Perceptual –direct human sensory experience and its broader interpretation; and

Associative – intangible meanings and associations that influence how places are perceived.

Engagement with tāngata whenua

As part of the analysis of the existing landscape, the assessment should seek to identify relevant mana whenua (where possible) and describe the nature and extent of engagement, together with any relevant sources informing an understanding of the existing landscape from a Te Ao Māori perspective.

Statutory and Non-Statutory Provisions

The relevant provisions facilitating change also influence the consequent nature and level of effects. Relevant provisions encompass objectives and policies drawn from a broader analysis of the statutory context and which may anticipate change and certain outcomes for identified landscape values.

The Nature of Effect

The nature of effect assesses the outcome of the Project within the landscape. The nature of effect is considered in terms of whether effects are positive (beneficial) or negative (adverse) in the context within which they occur. Neutral effects may also occur where landscape or visual change is benign.

It should be emphasised that a change in a landscape (or view of a landscape) does not, of itself, necessarily constitute an adverse landscape effect. Landscapes are dynamic and are constantly changing in both subtle and more dramatic transformational ways; these changes are both natural and human induced. What is important when assessing and managing landscape change is that adverse effects are avoided or sufficiently mitigated to ameliorate adverse effects. The aim is to maintain or enhance the environment through appropriate design outcomes, recognising that both the nature and level of effects may change over time.

The Level of Effect

Where the nature of effect is assessed as '**adverse**', the assessment quantifies the level (degree or magnitude) of adverse effect. The level of effect has not been quantified where the nature of effect is neutral or beneficial. Assessing the level of effect entails professional judgement based on expertise and experience provided with explanations and reasons. The identified level of adverse landscape and visual effects adopts a universal seven-point scale from **very low** to **very high** consistent with Te Tangi a te Manu Guidelines and reproduced below.



Landscape Effects

A landscape effect relates to the change on a landscape's character and its inherent values and in the context of what change can be anticipated in that landscape in relation to relevant zoning and policy. The level of effect is influenced by the size or spatial scale, geographical extent, duration and reversibility of landscape change on the characteristics and values within the specific context in which they occur.

Visual Effects

Visual effects are a subset of landscape effects. They are consequence of changes to landscape values as experienced in views. To assess where visual effects of the Project may occur requires an identification of the area from where the Project may be visible from, and the specific viewing audience(s) affected. Visual effects are assessed with respect to landscape character and values. This can be influenced by several factors such as distance, orientation of the view, duration, extent of view occupied, screening and backdrop, as well as the potential change that could be anticipated in the view as a result of zone / policy provisions of relevant statutory plans.

Zone of Theoretical Visibility

As an initial step in the visual analysis, a Zone of Theoretical Visibility (ZTV) mapping exercise was undertaken of the site in its context to determine the likely extent of visibility in the wider landscape. ZTV mapping represents the area that a development may theoretically be seen - that is, it may not actually be visible in reality due to localised screening from intervening vegetation, buildings or other structures. In addition, ZTV mapping does not convey the nature

or magnitude of visual impacts, for example whether visibility will result in positive or negative effects and whether these will be significant.

Following the ZTV analysis, field work is used to determine the actual extent of visibility of the site, including the selection of representative viewpoints from public areas. This stage is also used to identify the potential 'viewing audience' e.g. residential, visitors, recreation users, and other groups of viewers who can see the site. During fieldwork, photographs are taken to represent views from available viewing audiences.

The viewing audience comprises the individuals or groups of people occupying or using the properties, roads, footpaths and public open spaces that lie within the visual envelope or 'zone of theoretical visibility (ZTV)' of the site and Project. Where possible, computer modelling can assist to determine the theoretical extent of visibility together with field work to confirm this. Where appropriate, key representative viewpoints should be agreed with the relevant local authority.

The Significance of Effects

Decision makers assessing resource consent applications must evaluate if the effect on individuals or the environment is less than minor¹² or if an adverse effect on the environment is no more than minor¹³. For non-complying activities, consent can only be granted if the s104D 'gateway test' is satisfied, ensuring adverse effects are minor or align with planning objectives. In these situations, the assessment may be required to translate the level of effect in terms of RMA terminology.

This assessment has adopted the following scale applied to relevant RMA circumstances¹⁴ (refer to diagram below), acknowledging low and very low adverse effects generally equate to 'less than minor' and high / very high effects generally equate to significant¹⁵.



¹² RMA, Section 95E

¹³ RMA, Section 95E

¹⁴ Seven-point level of effect scale. Source: Te tangi a te Manu, Pg. 15

¹⁵ The term 'significant adverse effects' applies to specific RMA situations, including the consideration of alternatives for Notices of Requirement and AEEs, as well as assessing natural character effects under the NZ Coastal Policy Statement.

