

Applicant: Woodstock Quarries Limited
Record Number/s: CRC214073, CRC214074, CRC214075, CRC214076, CRC214077
Activity Description: Various activities associated with a new landfill proposal



This is the response to Request for Information 1 of 10 June 2021 from Environment Canterbury. The responses in this table correspond to the numbering in the column to the left. The reference to Attachments in this response matches the Attachments that accompany this response.

This part of the response relates to the information requested by Environment Canterbury officers. A second part to this response relates to an attachment with requests from Tonkin and Taylor.

Item	Requested Information	Response
1	GEOLOGY AND HYDROGEOLOGY	
1.1	<p>The technical review by Tonkin & Tylor Limited of the Geology Report provided with the application stated that the report forms a sound basis for providing inputs to the design of the landfill. However, there are several issues identified that require to be addressed.</p> <p>(a) Please provide responses to all question in Section 5 of the attached <i>CRC214073 Landfill Compliance Review Woodstock Quarries Limited</i> letter, dated 31 May 2021, and address all the issues identified, particularly in relation to the recommendation to reconsider or further justify the proposed cut slope profile.</p>	See separate responses table labelled "Woodstock Landfill- Responses to RFI 1- Tonkin and Taylor"
1.2	<p>The monitoring wells (MWs) do not appear to have been placed to intercept fault/shear zones. The highest groundwater conductivity (K) values would be expected in the faulted/fractured rock. Groundwater levels may also be most critical near these structures, i.e., if the faults/shears act as drains then the hydraulic gradient may increase significantly near these features. Further, it is understood that drilling of MWs was carried out without extracting a core, which would have been useful to characterise the fractures below the site (i.e., are they clean/infilled, open/tight, etc.?).</p>	<p>This matter is partly addressed in Attachment 2 Letter from Geology Consultant.</p> <p>Attachment 1 Hydrogeology Report 2 also addresses these matters.</p> <p>In summary, the technical reports have concluded that the underlying greywacke is of very low permeability and that no further investigation of the underlying rock is necessary.</p> <p>Other parts of this response address the matters of transport and fate of any contaminants that may result from the proposed landfill.</p>

Item	Requested Information	Response
	<p>(a) Please provide an investigation of fractures and joints of the exposed pit walls to get an understanding of the fracture characterisation for the site.</p> <p>(b) Please also consider whether or not further investigations are necessary to confirm conductivity of the underlying rock and whether there are fault/shear zones within the site of the proposed landfill.</p>	
1.3	<p>In the rising head test's Hvorslev calculation a R value of 2.5 cm (radius of screen) was used; however, it is believed that this should have been 5.5 cm (radius of drilled hole). This changes the K values slightly, although the conductivity values already show a very wide range.</p> <p>(a) Please confirm whether the calculated numbers are or have been used for any specific calculations.</p> <p>(b) If so, please provide revised calculations with the correct R value.</p>	<p>The conductivity values derived in Appendix 4 Hydrogeology Report have not been used for specific calculations.</p> <p>While some of the investigations in Appendix 4 Hydrogeology Report are relevant to this Application the Applicant has provided Appendix 4A Hydrogeology Report 2 (Attachment 1) to replace Appendix 4 Hydrogeology Report.</p>
1.4	<p>The K value calculated from the rising head test would be an average value over the screened length in the piezometer (which is about 2.5 m in most piezometers). As the site is underlain by fractured rock, the K values are expected to be low in the bulk rock and high in the fractures. Therefore, groundwater velocity estimates should take this into account as it would result in preferential flow paths through the fractures. The calculated value would represent an average of the high and low together, but the highest velocity would occur in the fractures.</p> <p>(a) Please confirm the screen length in the piezometers installed on the site.</p> <p>(b) Please confirm how representative the investigations carried out are in relation to the varying K values across the site and at the</p>	<p>While some of the investigations in Appendix 4 Hydrogeology Report are relevant to this Application the Applicant has provided Appendix 4A Hydrogeology Report 2 (Attachment 1) to replace Appendix 4 Hydrogeology Report.</p> <p>Letter from Geology Consultant (Attachment 2), and Appendix 4A Hydrogeology Report 2 (Attachment 1), have concluded that the underlying greywacke is of very low permeability and that no further investigation of the underlying rock is necessary.</p> <p>Attachment 1 Hydrogeology Report 2 has concluded that the preferential flow paths outside the proposed landfill are likely to be lateral and through relatively permeable material, rather than vertical through very low permeability material.</p>

Item	Requested Information	Response
	<p>depth of the final quarry pit that is proposed to be filled with landfill waste. This should include a description of the highest K values that can be expected at the site and depth and where these are likely to be experienced (i.e. will the landfill cells be located on top of areas with a high conductivity?).</p>	<p>Other parts of this response address the matters of transport and fate of any contaminants that may result from the proposed landfill.</p>
1.5	<p>The Geology Report notes “<i>minor rock types that may be found interbedded with, or faulted into, the greywacke include limestone, chert, and conglomerate, none of which have been observed on site</i>”. The geologist confirmed in the site visit that there is no limestone onsite.</p> <p>(a) Please confirm this in writing and whether this statement applies to all areas and depths to be quarried and filled.</p> <p>(b) Please confirm whether or not the argillite beds are calcareous as carbonates can dissolve in weak acids such as rainwater over long periods of time, or very quickly with stronger acids (i.e. potential leachate from the landfill).</p>	<p>This matter is addressed in Attachment 2 Letter from Geology Consultant</p>
1.6	<p>Overall, it is considered that the local groundwater system has not been characterised sufficiently. This is also evident from the Hydrogeology Report, which acknowledges in the limitations section that the assessment to date is “<i>limited to the location and depth of monitoring wells installed at the site</i>”, and the majority of these wells are installed above the planned quarry pit floor, in material that will be removed (i.e. monitoring wells MW5 to MW10 were installed in the rock that will be removed from the quarry pit and only MW11 reaches the rock that will remain in the pit base). Further, springs are a common feature in areas of high topographic relief with a high water table. Discharge from the groundwater system is likely to be springs (including the streambed) unless there is a deep fractured system that the water flows down towards.</p>	<p>Appendix 4A Hydrogeology Report 2 (Attachment 1) addresses all these matters and provides detailed characterisation of the system.</p> <p>Other parts of this response address the matters of transport and fate of any contaminants that may result from the proposed landfill.</p>

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	<p>(a) Please provide further information to characterise the groundwater system for the final pit shape.</p> <p>(b) Please provide baseline information of groundwater quantity, including information on whether groundwater from the quarry site feeds springs or nearby stream in the valleys below and how might it affect them, or whether groundwater would flow downslope and feed the gravel aquifers on the plains.</p> <p>(c) Please provide further information about any springs (in addition to the stream identified) in the area.</p> <p>(d) Please provide an investigation of baseline levels for spring flow volume/quality and streamflow volume/quality.</p> <p>The Hydrogeology Report notes future work including sampling and a water balance model. This would assist in the environmental impact assessment and operational flowrates to expect for the drainage system design.</p> <p>(e) In light of the above questions, please carry out further hydrogeological investigations to confirm the hydrogeological characterisation for the site and address the issues and risks identified below.</p>	
1.7	<p>We agree with the description given for the expected groundwater behaviour, i.e. the intact rock has a low conductivity, and groundwater flow is likely to be dominantly fracture flow or along bedding planes. However, to predict where potential contaminant may flow, it is recommended that structural mapping of faults/shear zones in the area (local to pit, not just regional). This would help with placement of monitoring wells (also see Question 5.9 below).</p>	<p>(a) Attachment 1 Hydrogeology Report 2 addresses these matters</p>

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	(a) Please provide a conceptual model of the groundwater system specific to this site, considering local structure, geology, recharge, and specifically discharge mechanisms.	
1.8	<p>Blasting is currently used as part of pit excavation. This is expected to increase fracturing and potentially increase permeability in the rock surrounding the pit.</p> <p>(a) Please confirm how fracturing and increase in permeability in surrounding rock will be monitored and managed throughout the quarrying operation and how the proposed landfill cell design will be informed by this information.</p>	<p>The Applicant advises that blasting is a relatively minor component of the excavation process with most excavation being undertaken by large excavators.</p> <p>(a) This matter is addressed in Attachment 2 Letter from Geology Consultant.</p> <p>This matter is also addressed in Attachment 8 Letter from Mining Consultant.</p> <p>Both consultants have concluded that the fracturing of the rock due to blasting will have minimal impact on the permeability of the surrounding rock.</p>
2	QUARRYING AND ANCILLARY ACTIVITIES	
	Authorisations for Current Quarry Operations	
2.1	<p>The quarrying operation is understood to have commenced in 2018, and includes the excavation, handling and processing of quarry rock. While it is understood that the current operation holds resource consent from the Waimakariri District Council, the Canterbury Land and Water Regional Plan (LWRP), the Waimakariri River Regional Plan (WRRP) and the Canterbury Air Regional plan (CAPR) are regional plans that contain rules that are relevant to those activities.</p> <p>(a) Please confirm whether regional resource consents are required for the existing quarrying operation.</p>	<p>(a) The Applicant's advisors have concluded that no additional consents are required as this Application covers both quarrying and landfilling activities.</p>
	Management of Water Accumulating in Excavations during Current and Proposed Quarrying Operations	

Item	Requested Information	Response
2.2	<p>It is evident from aerial images and from the conditions encountered during the site visit that water accumulates within the quarry pit. The source of water has not been described in the application (see above) and neither has the management thereof or the effects of management of the water. It is understood that water accumulated in excavations is pumped out as required and discharged within the wider site.</p> <p>(a) Please confirm the source of the accumulating water, i.e. is this fed from groundwater, rainfall, or a combination of both. Will there be an increase in inflows into excavations if artesian conditions are encountered in future quarry stages?</p> <p>(b) Please confirm where the water accumulating in the excavation would normally flow if the excavation was non-existent (i.e. will this feed springs or nearby streams, or flow downslope and contribute to the plains gravel aquifer recharge; etc.).</p> <p>(c) Please confirm whether water is removed from the excavations and if so by what means and at what frequency and rates and volumes.</p> <p>(d) If water has been removed previously, please confirm whether pumping rates were measured and perhaps compared to recent rainfall data. If not, please confirm if this will be instigated going forwards, including setting up a rain gauge, to provide more field data for input to the water balance model construction as suggested in the application (and addressed under Question 1.6 above).</p> <p>(e) Please confirm the fate of the removed water, i.e. whether this water is used in quarrying operations or discharged within the site. If the water is discharged, please confirm the location of the</p>	<p>This matter is discussed in Attachment 2 Letter from Geology Consultant.</p> <p>(a) The Applicant confirms that the water that accumulates in the existing quarry pit is almost entirely fed by rainfall. Occasionally small amounts of water are released from the rock during the excavation process, but this has observed to be tens of litres and of no more than a day's duration.</p> <p>(b) The water accumulating in the pit would normally mostly have flowed downslope, mostly into the Woodstock Stream and a small proportion would have flowed into the ephemeral stream to the east of the existing quarry.</p> <p>(c) The water that accumulates in the pit is pumped out slowly and discharges overland into the Woodstock Stream catchment. The frequency is entirely dependent on rainfall events. The water is pumped out at a rate of approximately 5 litres per second.</p> <p>(d) In the past pumping rates have not been measured. The Applicant confirms that in future pumping rates will be measured and has offered a Condition of Consent that a weather station will be established on the site and will include rainfall monitoring.</p> <p>(e) The water that accumulates in the pit is pumped out slowly and discharges overland, to the south of the existing pit primarily in the swales adjacent to the existing roads, into the Woodstock Stream catchment. Due to the slow pumping rate, and the energy dissipation in the rock lined swales, it has not been necessary to provide additional mitigation measures.</p> <p>(f) The Applicant understands that the current activity meets permitted activity rules. However, this Application includes an application for a water permit as the scale of the activity will be increasing and the diversion of water will not always be within existing flow paths.</p>

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	<p>discharge and describe the measures that are in place to avoid, remedy or mitigate adverse effects on the receiving environment as a result of the discharge.</p> <p>(f) Please confirm whether the diversion of groundwater into the open excavation, as well as the diversion of run-on water via perimeter clean water diversion system, meets any relevant permitted activity rules in a regional plan, or whether this activity requires a resource consent (water permit).</p> <p>(g) Please confirm whether the taking of accumulated water from the open excavation meets any relevant permitted activity rules in a regional plan, or whether this activity requires a resource consent (water permit).</p> <p>(h) Please confirm whether the discharge of water taken from the open excavation meets any relevant permitted activity rules in a regional plan, or whether this activity requires a resource consent (discharge permit).</p> <p>(i) If a resource consent is required for any of the above activities, please provide a full assessment of effects on the environment of each activity.</p>	<p>(g) The Applicant understands that the current activity meets permitted activity rules. However, this Application includes an application for a water permit as the scale of the activity will be increasing and there may be some taking of groundwater.</p> <p>(h) The Applicant understands that the current activity meets permitted activity rules. However, this Application includes an application for a water permit as the scale of the activity will be increasing and there will be a discharge of water away from existing natural flow paths</p> <p>(i) This Application includes a full assessment of the effects on the environment for the consents that are being applied for.</p>
2.3	<p>The quarry pit will excavate into the groundwater table, which would create a drawdown of the water table from surrounding soil profiles.</p> <p>(a) Based on the baseline information requested above, please provide an assessment of the potential drawdown effects created by the pit on any springs, stream flows or aquifer levels, as well as vegetation that may become deprived of groundwater within the rooting zone.</p>	<p>(a) Appendix 4A Hydrogeology Report 2 (Attachment 1) addresses these matters</p>

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2.4	<p>As addressed further below, the risk of leachate discharging into land below the liner and subsoil drainage system has not been adequately addressed. There is also a risk of clean water accumulating in the quarry excavations to become cross-contaminated by leachate escaping one of the completed landfill cells via, either through cracks and fissures in the quarry rock or via overland flow.</p> <p>(a) Please confirm if water accumulating in active quarry excavations will be tested prior to pumping it out and discharging it elsewhere on the site.</p>	<p>Section 4.4.1 of the Addendum to Appendix 5 Engineering Report (Attachment 3) provides clarification of the proposed liner system, including the proposed underdrainage system.</p> <p>As noted in the report above there will be a clear separation of quarry activity from the landfill activity with a bund between the two activities.</p> <p>(a) Water from the quarry activity will be directed to the perimeter drainage system and will be subject to the same monitoring and testing regime that any runoff from the landfill activity.</p>
	Dust Discharges from Proposed Quarry	
2.5	<p>The application is for expansion of the existing hard rock quarry that has been operating at the site for some time. Quarry operations usually handle (i.e. extraction, quarrying, mining, processing, screening, conveying, blasting, or crushing) and store bulk solid materials (rock, fines, etc.). The application has focused on the discharges of dust and particulates from the proposed landfilling activities; however, no assessments were provided against the rules in the Canterbury Air Regional Plan relevant to quarrying activities (also see questions in Section 7 below).</p> <p>(a) In addition to Question 1.1 above, please confirm compliance with Rules 7.35 (handling of bulk solid materials) and 7.36 (storing of bulk solid materials) of the CARP.</p> <p>(b) Please also confirm if blasting is carried out at the site and if so, please provide further details on frequency of that activity.</p>	<p>(a) The Applicant advises that the Woodstock Quarry operation is a relatively low volume, but higher than usual value operation. The average production rate is 400 tonnes per day, most of the product has a large particle size (greater than 20mm) and is made to order. The Applicant confirms that it meets the requirements of Rules 7.35 and 7.36 of the Canterbury Regional Air Plan. In addition, an updated management plan, Appendix 8 Draft Landfill Management Plan Issue 2 (Attachment 6), provides details of how dust discharges from the quarrying activities will be managed, and meets the requirements of Schedule 2 of the Canterbury Regional Air Plan .</p> <p>(b) The Applicant advises that blasting is a relatively minor component of the excavation process with most excavation being undertaken by large excavators. Based on the expected production of the quarry blasting is likely to occur approximately once a fortnight.</p>

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2.6	<p>The LMP addresses dust discharges from the proposed landfilling activities. However, no description of dust mitigation measures for the proposed quarrying activity has been provided.</p> <p>(a) Please provide further details on how dust discharges are managed during rock extraction and handling to ensure effects beyond the site boundary are not offensive or objectionable.</p> <p>(b) Please confirm whether rock crushing will occur within the quarry site and if so, what mitigation measures will be in place to ensure effects beyond the site boundary are not offensive or objectionable.</p>	<p>(a) An updated management plan, Appendix 10 Draft Landfill Management Plan Issue 2 (Attachment 6), provides details of how dust discharges from both the quarrying and the landfill activities will be managed.</p> <p>(b) The Applicant confirms that rock crushing will occur within the quarry site. An updated management plan, Appendix 10 Draft Landfill Management Plan Issue 2 (Attachment 6), provides details of how dust discharges from the quarrying activities will be managed , and meets the requirements of Schedule 2 of the Canterbury Regional Air Plan.</p>
3	LANDFILL DESIGN	
	Engineering Review	
3.1	<p>The technical review of the landfill engineering design by Tonkin & Tylor Limited has raised a number of questions in relation to the proposed lining system, leachate collection system, leachate management, final cap, stormwater management and landfill gas management.</p> <p>(a) Please provide responses to all question in Section 6 of the attached <i>CRC214073 Landfill Compliance Review Woodstock Quarries Limited</i> letter, dated 31 May 2021, and address all the issues identified.</p> <p>Please note that the attached questions may be similar or overlap with the other questions asked below, which were asked specifically by Environment Canterbury staff. Where questions are similar or overlap, please refer in your responses to the below questions to the responses provided for the external engineering design review.</p>	<p>See separate responses table labelled “Woodstock Landfill- Responses to RFI 1- Tonkin and Taylor”, which uses the same numbering as that provided in the Tonkin and Taylor RFI.</p>

Item	Requested Information	Response
	Drainage Water/Groundwater Management	
3.2	<p>A sub-liner drainage system is proposed to capture and transport groundwater away from the landfill to protect the liner from uplift and prevent intrusion of ground water into the landfill.</p> <p>(a) Please confirm the expected groundwater inflow volumes, considering both downward inflow from surrounding water bearing strata as well as the upward hydraulic gradient in some areas of the site (i.e. artesian flows entering the underdrainage system from below) and confirm that the sub-liner drainage system has been, or will be, sized to accommodate these inflows.</p>	<p>Section 4.4.1 of the Addendum to Appendix 5 Engineering Report (Attachment 3) provides clarification of the proposed liner system, both for the basegrade and the sidewalls, and the proposed underdrainage system.</p> <p>(a) The AEE notes that there will large areas under the liner that may have artesian water, but as noted in the Geology report it is likely that this artesian water will be due to the release of water within the rock structure as it is excavated. The quarry operator has observed that occasionally small amounts of water are released from the rock during the excavation process, but this has observed to be tens of litres and of no more than a day's duration.</p> <p>While the extent of the areas of artesian water may be large the expected quantity of groundwater is expected to be small, but an underdrainage system will be required to enable the construction of the liner system without the risk of groundwater lifting the liner system. The factor of safety for the underdrainage system will be in the order of ten or more.</p> <p>Once the landfill site becomes operational and waste is placed there is no risk of uplift of the liner. Once each cell becomes operational the amount of groundwater will diminish rapidly.</p>
3.3	<p>The application recognises there may be issue with artesian pressures beneath the liner, and water may accumulate in the pit. While the water inflow into the landfill pit is proposed to be addressed through the subsurface drainage system, there has been no consideration of contingency measures in the event that the system fails or becomes unreliable over time.</p> <p>(a) Please provide more details on the measures in place to ensure the sub-surface drainage system will operate effectively.</p>	<p>(a) As noted in response to Q3.2 above the main purpose of the underdrainage system is to enable the construction of the liner system without the risk of groundwater lifting the liner system. The factor of safety for the underdrainage system will be in the order of ten or more. Also as noted in response to Q2.2 above the Applicant confirms that the water that accumulates in the existing quarry pit is almost entirely fed by rainfall. Occasionally small amounts of water are released from the rock during the excavation process, but this has observed to be tens of litres and of no more than a day's duration.</p>

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	<p>(b) Please confirm any contingency measures to be put in place in the event that the sub-liner drainage system fails or becomes less effective over time (please also see Question 5.13 below on the risk).</p> <p>(c) Please provide an assessment of actual and potential effects as a result of significant groundwater inflow in the event that the sub-liner drainage system is no longer working effectively. This assessment should include a consideration of saturating the landfill toe bund and shaped wedge at the back wall, which could result in destabilisation of the entire contaminant containment system and the overlying landfill cells.</p>	<p>(b) The underdrainage system has been designed to be constructed in sections moving from east to west. Unlike most landfills that are constructed up a valley each section is independent of each other. Each section of the underdrainage system terminates in a manhole which will enable camera inspection, and water blasting (if required), as well as the ability to monitor flows and water quality. In addition, the base of the landfill falls from east to west so in the event of one section of underdrainage not performing as expected the groundwater could migrate to the next section to the west.</p> <p>(c) As noted in the response to Q3.2 above once the landfill site becomes operational and waste is placed the overlying weight of waste will significantly greater than any artesian pressures of the groundwater, and that any groundwater inflows will be minimal. Once each cell becomes operational the amount of groundwater will diminish rapidly. The risk of saturation of the toe bund where the underdrainage system passes under the toe bund will be controlled by the installation of a series of seepage collars. The risk of saturation of wedge at the back wall is very low as it will be protected by the liner system. Once waste is placed against the side of the wedge, and on top of the wedge, the wedge will be totally confined and even it became saturated it may deform slightly (like toothpaste in a tube) but not to the extent that the structural integrity of the landfill could be compromised.</p>
3.4	<p>The subsurface drainage system underlying the landfill cells will provide a secondary protection in event of liner breach.</p> <p>(a) Please provide further information around lining system settlement and failure including quantity of leachate that might theoretically be released in the event of a minor, moderate, major or catastrophic liner failure.</p>	<p>(a) Section 4.4.1 of the Addendum to Appendix 5 Engineering Report (Attachment 3) provides details of possible failures of the liner system. This assessment has concluded that the greatest risk of the release of leachate into the environment would be due to a localised rupture of the liner caused by the failure of a section of the toe bund. This failure would not result in any leachate being captured by the underdrainage system.</p>

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	<p>(b) Please confirm if the underdrainage system will be sufficient to capture all (or majority) of leachate if liner is compromised for all of the above scenarios.</p> <p>(c) Please confirm if a third level of protection has been considered such as filling and sealing existing cracks and fissures, specifically if the sub-liner drainage system may be sealed in future (see questions below).</p>	<p>(b) Section 4.4.1 of the Addendum to Appendix 5 Engineering Report (Attachment 3) provides details of leakage rates through the liner system based on extensive international research. These leakage rates are many magnitudes less than the capacity of the drainage system.</p> <p>(c) Firstly, it is not proposed to seal the underdrainage system as a matter of course, and it would only be sealed off at the terminating manhole when there is no flow in the underdrainage system. Sealing of the cracks and fissures of the base of the landfill with a polyurea membrane system has been considered. However, this would not be done routinely as Appendix 4A Hydrogeology Report 2 (Attachment 1) concluded that any flows under the landfill would be lateral, rather than vertical. However, it is possible that during the course of excavation localised area of highly fractured, or highly permeable, structures may be encountered. The geologist has recommended that these be sealed using an appropriate sealing system.</p>
3.5	<p>Groundwater discharged via the subsurface drainage system is proposed to be diverted into the leachate collection and storage system in the event that conductivity or pH levels exceed the trigger level.</p> <p>(a) Please confirm the basis for the proposed conductivity and pH trigger levels to indicate potential leachate contamination of the underdrainage system and confirm why no numeric trigger levels have been proposed.</p> <p>(b) Please provide justification to only monitor conductivity and pH and no other parameters described in the proposed conditions.</p> <p>(c) Please confirm how water will be diverted into the leachate collection and storage system. Will this occur automatically or is manual operation of the diversion system required?</p>	<p>(a) As noted in Appendix 10 Proposed Conditions of Consent Issue 2 (Attachment 7) it is proposed to analyse any groundwater from the underdrainage system for the first 6 months of operation of the landfill to establish trigger levels. This is necessary as there are inadequate quantities of groundwater that have not been mixed with rainwater to get any meaningful measures of the groundwater chemistry. In addition, only a small portion of the landfill footprint has been exposed by excavation. The establishment of trigger levels from the actual groundwater is considered to be much more meaningful.</p> <p>(b) The measurement of conductivity and pH is a practical and efficient method of continuous measurement of any groundwater flows, that is commonly used as an indicator of change in water chemistry. As the groundwater is likely to be free of non-soluble particles any change in water chemistry will be detected very quickly by the conductivity metering system. The continuous measurement of other potential contaminants, particularly metals is expensive</p>

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	<p>(d) Please confirm the fate of 1) leachate that reaches the subsurface drainage system in the event that the diversion system failure or 2) there being no capacity in the leachate collection and storage system.</p>	<p>and subject to errors. The Proposed Conditions of Consent set out a process for further analysis and reporting of potential leachate contamination should the Conductivity or pH trigger levels be exceeded.</p> <p>(c) The diversion of groundwater into the leachate collection and storage system would be a manual process following the process of further analysis and reporting of potential leachate contamination as detailed in Appendix 10 Proposed Conditions of Consent Issue 2 (Attachment 7)</p>
3.6	<p>The Engineering Report states that as subsoil drains provide a potential pathway for any leachate seepage through the lining system the drains will be progressively sealed when they are no longer required (e.g. when groundwater inflows cease). If groundwater inflows cease and subsoil drains are sealed, the secondary protection system ceases to function, and this may provide a pathway for leachate in the event of a future liner failure.</p> <p>(a) Please clarify what is meant with ceasing groundwater inflows into the landfill pit. Is this as a result of the hydraulic gradient reversing or as a result of the placed fill blocking the inflow, or both?</p> <p>(b) Please confirm the likelihood of groundwater inflows ceasing and provide examples of other landfills in a similar geological setting where a subsoil drainage system was required.</p> <p>(c) Please confirm how the subsoil drains would be sealed and whether this will be permanent.</p> <p>(d) Please confirm if progressively sealing the subsoil drainage system would increase the risk of a subsequent liner breach discharging into underlying cracks and fissures.</p>	<p>Section 4.4.1 of the Addendum to Appendix 5 Engineering Report (Attachment 3) provides clarification of the proposed liner system, including details of the underdrainage system.</p> <p>(a) As noted in the response to Q3.2 above once the landfill site becomes operational and waste is placed the overlying weight of waste will be significantly greater than any artesian pressures of the groundwater, and that any groundwater inflows will reduce and after a period will cease. Once each cell becomes operational the amount of groundwater will diminish rapidly. However, there is a small risk of encountering areas of higher permeability, or more extensive fracturing, than what has been observed to date, which would necessitate the installation of an under-drainage system. An underdrainage system becomes more important when a liner system that comprises a GCL as excessive hydration of the GCL will compromise the effectiveness of the GCL.</p> <p>(b) As noted in earlier sections the main purpose of the under-drainage system is to prevent uplift of the liner system during construction and prior to the placing of waste, and when the waste is placed on the liner system ingress of subsurface water will diminish. Section 5.5 of the WasteMINZ guideline also notes that an underdrainage system will be required for Class 1 and Class 2 landfills. The proposed Auckland Regional Landfill at Waybe Valley has also proposed an underdrainage system to intercept seeps and perched</p>

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		<p>groundwater that may be encountered during the construction phase. Similarly, the designers of the proposed Otago Regional Landfill at Smooth Hill have concluded that an underdrainage system is required.</p> <p>(c) In the event that the flows from the under-drainage system diminished to the point that they were barely detectable the underdrain system would be sealed at the terminating manhole. In the event that the operator decided to undertake investigations of the underdrainage system at a later date It would be possible to unseal the pipe adjacent to the manhole.</p> <p>(d) The sealing of the under-drainage system would only be undertaken if the landfill operator was confident that the flows were so minimal that they justified sealing. It is acknowledged that if the underdrainage system was prematurely sealed there is a small risk of leachate discharging into the underlying fractured rock formations. However, as noted in Appendix 4A Hydrogeology Report 2 (Attachment 1) the preferential flowpaths under the liner are likely to be lateral rather than vertical. In addition, the underdrainage system also serves as an important monitoring tool in detecting leaks through the liner system as the preferential flow path for any leachate would be through the underdrain system.</p>
	Stormwater Management	
3.7	<p>Run-on water is proposed to be managed via a perimeter clean water diversion system that is to designed to accommodate a 1% AEP rainfall event. Plans show cross-sections of the upgradient perimeter road and drains along the lower perimeter road along the toe bund. The AEE states further that flows will follow natural drainage paths in a downhill direction, and that the contour of the land surrounding the landfill is such that this system will largely reflect that which occurred on the site prior to quarrying. However, the Engineering Report states that an open channel</p>	<p>Section 4.7.2 of the Addendum to Appendix 5 Engineering Report (Attachment 3) provides clarification of the proposed stormwater system and clarifies the role of the perimeter drains. Responses to the specific questions are noted below.</p> <p>(a) Detail H on Drawing C3 of Appendix 2 Drawings (Attachment 8) clarifies that for most of the perimeter drainage network the water diversion drains will direct stormwater from above the landfill footprint into the existing natural terrain. In the lower sections the stormwater will be collected in a drain similar to that shown on Detail L on Drawing C4.</p>

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	<p>drain on the outside of the road will divert stormwater to the stormwater treatment ponds. Overall, it is unclear how the proposed system will operate and how a sloped vehicle track and drainage channels around the entire perimeter of the landfill site will divert water from up to and including a 1% AEP rainfall event away from the site and allow the water to follow natural drainage patterns without diverting the water downslope along the vehicle tracks. From the existing quarry roads, it was already evident that stormwater has been concentrated into certain areas and these areas have experienced beech tree dieback.</p> <p>(a) Please provide more detailed plans for the perimeter clean water diversion system, including further cross-sections at key locations where there is a stormwater catchment above the perimeter road (e.g. northern and north-western areas of the site).</p> <p>(b) Please confirm where run-on water will discharge to.</p> <p>(c) Please confirm secondary flow paths in the event that the 1% AEP rainfall event is exceeded. Would water drain towards the quarry/landfill footprint?</p> <p>(d) Please confirm if and how changes to rainfall intensities and peak rainfall depths over time as a result of climate change will be taken into account for sizing the perimeter clean water diversion system (it is noted that HIRDS v3 was references in the Engineering Report, but this has been superseded by HIRDS v4 and v4 is also used to estimate maximum precipitation events in the Hydrogeology Report).</p> <p>(e) Please confirm catchment size above the perimeter clean water diversion system.</p>	<p>(b) For most of the perimeter drainage network the run-on water will be stormwater directed from above the landfill footprint and discharge into the existing natural terrain. In the lower sections the stormwater will be collected in a drain shown on Detail L on Drawing C4, and pass through the sedimentation ponds.</p> <p>(c) As most of the perimeter drainage network directs stormwater away from the landfill footprint the secondary flow paths would be into the existing gullies to the east and west of the proposed landfill. It is possible that in some locations there will be localized overland flow path into the quarry / landfill footprint. Any flows into the active quarry area would be collected by the temporary drainage network and ultimately discharged into the lower primary perimeter drain.</p> <p>(d) The Applicant confirms that HIRDS v4 Scenario RCP8.5 will be used for the design of the drainage network.</p> <p>(e) As the centre of the landfill follows a ridge catchment areas directly above the landfill is approximately 0.5 hectares.</p> <p>(f) Observed subsurface flows into the current quarry operation would continue to flow into the landfill but as the landfill operation proceeds and the capping is installed in stages as shown on Drawing C1 the subsurface flows near the top of the cut faces would decrease, with water flows returning to a state similar to those before the current quarry operation commenced.</p> <p>(g) For most of the perimeter the run-on water will be directed from above the landfill footprint and discharge into the existing natural terrain as it does now. Only in the lower sections of the landfill will the surface water runoff be directed into a perimeter drain, and discharge to the environment after passing through the sedimentation ponds. Where water does discharge from drains scouring and erosion protection will be installed in accordance</p>

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	<p>(f) Please confirm whether subsurface flows (i.e. after rainfall has infiltrated) would still enter the quarry/landfill pit as it appears to do currently.</p> <p>(g) Please provide further details on the functionality of the perimeter clean water diversion system and how this system is to mimic natural drainage patterns. In doing so, please also confirm whether run-on water will be diverted to a specific location and provide a detailed assessment of effects on the environment for the location that the water will be discharged to. Please also confirm what measures will be in place to avoid scouring and erosion in the areas where water discharges from the drain.</p> <p>(h) Please confirm what measures will be put in place to avoid adverse effects on local flora as a result of concentrating potentially large volumes of water into areas that have historically not been saturated.</p> <p>(i) If a resource consent is needed for the diversion of run-on water in the perimeter clean water diversion system (see Question 2.2 (f)), please provide a full assessment of actual and potential adverse effects of diverting water and discharging it in different locations than where it would naturally flow. The assessment should include consideration of adverse effects on springs, stream flows or aquifer levels, as well as effects on nearby aquatic and terrestrial ecosystems.</p>	<p>with the Environment Canterbury Erosion & Sediment Control Toolbox For Canterbury.</p> <p>(h) As shown on Drawing C4 the outlet from the sedimentation pond will include a decant system that will result in most of the runoff collected by the perimeter drainage network being slowly discharged via a dissipater across a long section of the slope above the Woodstock Stream. This will also have the effect of attenuating the stormwater runoff, but also provide a more reliable flow in the Woodstock Stream. Section 3 of Appendix 6 Ecological Assessment showed there to be only limited effects from the dispersal of the non-attenuated flow from the current concentrated discharge point. The design of the outlet structure from the Sedimentation Ponds will require input from an ecologist to ensure that there is not excessive saturation of the soils on this slope.</p> <p>(i) This Application does include application for a Water Permit and an assessment of effects has been included in Appendix 4A Hydrogeology Report 2 (Attachment 1) and Appendix 6 Ecological Assessment.</p>
3.8	<p>Stormwater and water collected in the underdrainage system is proposed to be discharged to a two-stage sedimentation pond and then to land via a restricted outflow or overflow channel and energy dissipator (which includes scour protection works of concrete, rock or timber construction. The sedimentation pond is proposed to be designed to retain the flows</p>	<p>Section 4.7.2 of the Addendum to Appendix 5 Engineering Report (Attachment 3) provides clarification of the proposed stormwater system including the sedimentation ponds and the secondary flow paths.</p>

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	<p>from a 10% AEP storm event, with an overflow structure that will be able to safely pass a 1% AEP storm event to an extreme precipitation event containment pond shown on the site plans. The infiltration area is located on a steep slope and is currently densely vegetated. Further, given the existing landform at the discharge point, water may flow overland and discharge to the stream at the valley floor.</p> <p>(a) Please confirm the working volume of the proposed two pond system considering the entire contributing catchment (including run-on water diverted into the ponds via the perimeter road drains) and a worst case scenario runoff event (i.e. what is the pond volume required to accommodate runoff from the contributing catchment when soils are frozen or waterlogged during a 10% AEP rainfall event). Rainfall intensities and depths derived from HIRDS v4 and a relative concentration pathway of 8.5 should be used for this assessment.</p> <p>(b) Please confirm if the ponds will be constructed above or below the natural ground level and what the proposed “dam works” will include. Please note that damming of water may be subject to further approvals required, including resource consents and building consents.</p> <p>(c) Please confirm whether the two ponds will be lined and what the ‘sediment removal zone’ consists of at the base of the ponds.</p> <p>(d) Please confirm the critical duration storm event that these stormwater system components will be designed for.</p> <p>(e) Please also confirm how the discharge from the underdrainage system has been incorporated to the pond volume requirements,</p>	<p>In summary the ponds, and other sediment control structures, will be designed in accordance with Environment Canterbury Erosion & Sediment Control Toolbox For Canterbury.</p> <p>Where the Environment Canterbury Erosion & Sediment Control Toolbox For Canterbury does not cover a particular situation GD05 Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region will be utilised.</p> <p>(a) This is a matter for detailed design which will be subject to review by the Peer Review Panel prior to being submitted to Environment Canterbury. The preliminary design for the primary pond is that will have a capacity of approximately 2500 cubic metres of total storage. The first pond is designed to be a forebay to the main pond.</p> <p>(b) The preliminary design is that the ponds will be constructed below ground level.</p> <p>(c) It is not proposed that the ponds be lined due to low permeability rock on which they will be constructed.</p> <p>(d) This is a matter for detailed design which will be subject to review by the Peer Review Panel prior to the design being submitted to Environment Canterbury.</p> <p>(e) The expected discharge from the underdrainage system is likely to be less than 0.5 litres per second and will have minimal impact on the operation of the sediment ponds.</p> <p>(f) This is a matter for detailed design which will be subject to review by the Peer Review Panel prior to the design being submitted to Environment Canterbury. Based on the preliminary design a maximum flow rate of approximately 20 litres per second is likely.</p> <p>(g) The extreme precipitation event pond is shown on Drawing B1 of Appendix 2 Drawings Issue 2 (Attachment 8). The detailed design will be subject to review</p>

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	<p>i.e. what would the maximum flows from the underdrainage system be during the 10% AEP rainfall event.</p> <p>(f) Please confirm what the discharge rates will be from the restricted outflow.</p> <p>(g) Please provide further details on the size and location of the extreme precipitation event containment pond and how water will be diverted to the pond.</p> <p>(h) Please provide further details of the energy dissipation area and how scouring and erosion will be avoided as a result of the discharge. This should also include further information on the proposed scour protection works and any inspection and maintenance requirements.</p> <p>(i) Please provide a detailed description of the proposed discharge infiltration area and how this will operate in practice.</p> <p>(j) Please confirm the suitability of the proposed discharge infiltration area in light of the topography of the area. What are the risks associated with the attempt to discharge potentially large volumes of water into land on a steep slope? Would the discharge result in increased sediment runoff to surface water bodies at the valley floor?</p> <p>(k) Please confirm infiltration rates for discharge area to confirm whether water discharged from the ponds would infiltrate and not run overland to stream. Please also confirm whether a factor of safety has been used in the design of the infiltration area.</p> <p>(l) Please provide a detailed assessment of the proposed discharge on the local fauna. This assessment should include whether the</p>	<p>by the Peer Review Panel prior to being submitted to Environment Canterbury. The preliminary design for the extreme precipitation event pond is that will have a capacity of approximately 1000 cubic metres of total storage. This pond is primarily intended to attenuate the flow before it discharges into the Woodstock Stream.</p> <p>(h) This is a matter for detailed design which will be subject to review by the Peer Review Panel prior to the design being submitted to Environment Canterbury. Any scour protection measures will be designed in accordance with Environment Canterbury Erosion & Sediment Control Toolbox For Canterbury.</p> <p>(i) This is a matter for detailed design which will be subject to review by the Peer Review Panel prior to the design being submitted to Environment Canterbury.</p> <p>(j) Section 3 of Appendix 6 Ecological Assessment showed there to be only limited effects from the dispersal of the non-attenuated flow from the current concentrated discharge point, and no sign of increased sediment runoff.</p> <p>(k) This is a matter for detailed design which will be subject to review by the Peer Review Panel prior to the design being submitted to Environment Canterbury. Further testing of the infiltration capacity of the soils in this area will be required as part of the design process.</p> <p>(l) This is a matter for detailed design which will be subject to review by the Peer Review Panel prior to the design being submitted to Environment Canterbury. This will require input from an ecologist to ensure that there is not excessive saturation of the soils on this slope that may affect the vegetation.</p> <p>(m) This is a matter for detailed design which will be subject to review by the Peer Review Panel prior to the design being submitted to Environment Canterbury.</p> <p>(n) It is proposed that the sedimentation pond spillway be located on the southern side of the sedimentation pond and that the secondary flow path</p>

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	<p>vegetation in and below the discharge area is suitable for soils becoming saturated from the discharges.</p> <p>(m) Please provide an assessment of actual and potential effects of any overland flow discharging to the Woodstock Stream at the valley floor. This should include an assessment of likely discharge volumes that could emanate in the stream and how the additional volumes would affect the stream's capacity to convey.</p> <p>(n) Please provide further information on the secondary flow paths in events exceeding the 1% AEL (e.g. the 0.4% AEP rainfall event described in the Hydrogeology Report).</p> <p>(o) Please provide further details on the required inspections and maintenance of the entire stormwater disposal system.</p>	<p>be down the gully above the extreme precipitation event pond as shown on Drawing B1 of Appendix 2 Drawings Issue 2 (Attachment 8). The detailed design will be subject to review by the Peer Review Panel prior to being submitted to Environment Canterbury.</p> <p>The details of the inspection and maintenance of the stormwater system will be included in the Landfill Management Plan (LMP).</p>
3.9	<p>Stormwater monitoring is proposed in the draft LMP and proposed conditions at a location downstream of the existing vehicle crossing of Woodstock stream (Location SW01 shown on Drawing E2). No monitoring of groundwater quality is proposed, although the main receiving environment is described to be groundwater.</p> <p>(a) Please confirm why Location SW01 was chosen for surface water quality monitoring and how the location would be representative to determine whether or not the discharges to the stream some distance upstream would have resulted in adverse effects closer to the discharge point.</p> <p>(b) Please confirm if ongoing monitoring will also be carried out in the sediment ponds or at the pond outlets.</p>	<p>Further information on this matter is included in Appendix 4A Hydrogeology Report 2 (Attachment 1).</p> <p>(a) Location SW01 was chosen to be the primary surface water quality monitoring report and is proposed to be considered the point of compliance for the site. This location was chosen as it will monitor all the potential discharges from the site. The proposed conditions in Appendix 10 Proposed Conditions of Consent Issue 2 (Attachment 7) details the proposed monitoring regime and the actions required in the event of a trigger level being exceeded.</p> <p>(b) Continuous monitoring of pH and conductivity is proposed at the outlets to the sedimentation ponds.</p> <p>(c) The twice-yearly additional monitoring for a wide range of contaminants as detailed in the conditions of Appendix 10 Proposed Conditions of Consent Issue 2 (Attachment 7) is designed to detect contaminants at a time when they will least dilute. Due to large size of the catchment, most of which is in</p>

Item	Requested Information	Response
	<p>(c) Please confirm why monitoring is only to occur twice per year and during low flow conditions and why sampling has not been tied to rainfall events.</p> <p>(d) Please provide justification why no groundwater quality monitoring is proposed, although stormwater and water from underdrainage system are proposed to be discharged primarily onto and into land.</p>	<p>bush or farmland, testing after rainfall events is unlikely to yield any meaningful data.</p> <p>(d) The conditions of Appendix 10 Proposed Conditions of Consent Issue 2 (Attachment 7) detail an extensive groundwater quality monitoring programme from the underdrainage system.</p>
3.10	<p>The Erosion and Sediment Control Guideline 2007 (ESCG) are quoted in the proposed conditions and these guidelines are proposed to be used to design the sedimentation ponds. The ESCG has been superseded and also is a guideline designed for construction sites, not necessarily operational sites; however, it is acknowledged that many measures included in these guidelines would be appropriate to manage soil erosion and sediment discharges from the proposed quarry operation. Further, the proposed measures are largely dependent on the long-term maintenance of the sediment ponds so that they remain effective, including monitoring and maintenance procedures.</p> <p>(a) Please confirm why the ESCG was used for the design of the sediment ponds and whether there are more appropriate guidelines that can be used to design and size the sedimentation ponds, specifically in relation to the underdrainage system and operational stormwater discharges from landfill operations.</p> <p>(b) Please confirm how stormwater discharge will be managed across the entire quarry and landfill site in order to avoid creation of channels and water ruts and protect exposed soils from erosion, all of which could result in sediment discharges and slope stability issues.</p>	<p>(a) The Applicant confirms that the ponds, and other sediment control structures, will be designed in accordance with Environment Canterbury Erosion & Sediment Control Toolbox For Canterbury. Where the Environment Canterbury Erosion & Sediment Control Toolbox For Canterbury does not cover a particular situation GD05 Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region will be utilised.</p> <p>(b) The Applicant will prepare an Erosion and Sediment Control Plan (ESCP) in accordance with Environment Canterbury Erosion & Sediment Control Toolbox For Canterbury. Where the Environment Canterbury Erosion & Sediment Control Toolbox For Canterbury does not cover a particular situation GD05 Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region will be utilised.</p> <p>(c) The Applicant will prepare an Erosion and Sediment Control Plan (ESCP) for each stage of the project. This is a matter of detail which will be subject to review by the Peer Review Panel prior to the ESCP being submitted to Environment Canterbury. The development of stockpile areas for stripped overburden will very much depend on the type and quantity of material encountered during the excavation. The ESCP will be continually developed to reflect the situation at the time.</p>

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	<p>(c) Please provide further information on specific erosion and sediment control measures to be utilised for each stage of works, as well as for storing the stripped overburden material (including volumes), including how those measures will be maintained long term and any monitoring proposed. This should include a draft erosion and sediment control plan or a more detailed stormwater management for the existing and proposed activities at the site.</p>	
3.11	<p>The AEE states that any groundwater entering the area of the quarry/pit not utilised for landfill purposes will be discharged to the swale and stormwater ponds. Further, if groundwater in the underdrainage system is found to be contaminated by landfill leachate, the contaminated groundwater is proposed to be diverted to the leachate system and disposed of accordingly.</p> <p>(a) Please confirm what groundwater will be used for in the landfill operation and confirm whether the intended uses will be consumptive in nature.</p> <p>(b) Please confirm if and how a liner leak will be remediated to ensure that groundwater from the underdrainage system does not have to be diverted to the leachate system on a permanent basis.</p> <p>(c) If the groundwater use is consumptive for any of the above reasons, please provide an assessment of this activity against the relevant regional plan provisions. If a resource consent is required, please provide an assessment of actual and potential effects of the consumptive groundwater take.</p>	<p>(a) The amount of groundwater that is expected to be encountered during excavation is likely to be minimal and will be discharged to the perimeter drains, possibly after passing through a temporary sediment control structure located in the active quarry area.</p> <p>(b) If there is a liner leak, and this is discussed in detail elsewhere in this response, it is possible that a section of underdrainage system may need to be permanently diverted to the leachate system.</p> <p>(c) An Application for groundwater take has already been applied for as part of this Application and the assessment of effects is detailed in the AEE of the Application.</p>
	Liner System	

Item	Requested Information	Response
3.12	<p>The liner does not isolate the entire pit as the walls are not proposed to be lined and the walls will be lined with free draining material that would direct any leachate downwards. It is considered that this provides a potential area of contact of leachate and groundwater.</p> <ul style="list-style-type: none"> (a) Please provide justification for the proposed free-draining material to be used instead of lining the side walls, including examples where such a system has been implemented successfully. (b) Please provide an assessment of the potential contaminant flow paths through cracks and fissures in the side walls and on the benches. (c) Please confirm the risk of leachate and potentially additional rainfall water backing up in the funnel shaped free-draining material if base near the underlying bench or a lower bench is not as free-draining as required, and also where accumulated leachate and rainwater could escape to. (d) Please confirm whether leachate can migrate down the free-draining layer along the walls and reach the clay wedge, and then bypass the underlying liner if this is not adequately sealed to the rock face. 	<p>Section 4.4.1 of the Addendum to Appendix 5 Engineering Report (Attachment 3) provides clarification of the proposed liner system, including amendments to the materials to be used. This includes the use of a sprayed on polyurea membrane system on the sidewalls, and benches, of the landfill.</p> <ul style="list-style-type: none"> a) A free draining material is not being used instead of a liner but is important to provide a downwards preferential flowpath for any rainwater that lands on the active landfill area. b) The sprayed on polyurea membrane system on the sidewalls of the landfill will ensure that there is no contaminant flow paths through the sidewalls and benches, nor ingress of groundwater. c) There is a small risk of some backup of leachate and rainwater in isolated sections of the sidewalls and benches. However, the free draining material is continuous along the side walls and benches and leachate will be able to migrate laterally to an area of higher permeability and drain through the free draining material. In addition, C&D waste in Canterbury is generally very dry, is likely to be highly permeable so any localised build-up of leachate will be able to pass through the waste, or will be absorbed by the waste. d) It is not expected that leachate can migrate and reach the clay wedge. Section 4.4.1 of Addendum to Appendix 5 Engineering Report (Attachment 3) includes further details of the connection between the sprayed polyurea membrane and the liner system which sits above the clay wedge. The free draining material is continuous along the side walls and benches and leachate will be able to migrate laterally to an area of higher permeability and drain through the free draining material which connects to the horizontal leachate blanket. In addition, C&D waste in Canterbury is generally very dry, and be highly permeable so any localised build-up of leachate will be able to pass through the waste, or be absorbed by the waste.

Item	Requested Information	Response
3.13	<p>It appears from drawings provided with the application that the toe bund is only approximately 700 mm tall.</p> <p>(a) Please confirm and back up with calculations whether the liner sump is deep enough to manage all potential volumes of leachate and groundwater inflows from the side walls.</p>	<p>As shown on Detail L on Drawing C4 the toe bund is 2.5m high, and prior to the capping being installed an additional 0.5m of freeboard will be in place.</p> <p>(a) As noted in the response to 3.12 above it is not expected that there will an ingress of groundwater from the side walls as these are to be sealed with a sprayed polyurea membrane.</p> <p>It is calculated that the potential volume of leachate that could accumulate behind the toe bund for each cell is around 400 cubic metres in each basegrade cell. This is based on a 10% void ratio and the expected leachate generation rate. This is equivalent to around six months of leachate generation.</p> <p>Each cell will have its own leachate extraction pump equipped with a pressure transducer so any build up of leachate will be detected.</p> <p>In addition, a build-up of leachate in a particular cell is able to overflow into the adjacent cell, with a general flow of leachate from east to west.</p>
3.14	<p>The landfill is expected to start operation in cells while quarry works continue.</p> <p>(a) Please confirm what the effect of nearby quarry works and specifically blasting activities will be on the properties of rock mass beneath and adjacent to the operative and completed landfill cells, and the integrity of the liner.</p>	<p>(a) The letter from the Geology consultant (Attachment 2) and the letter from the Mining Consultant (Attachment 5) provides information on the potential effects of blasting on the rock mass beneath and adjacent to the landfill cells.</p>
	Leachate Management System	
3.15	<p>The application does not detail any contingency measures in place in the event that there is a failure of the pump-back system for the leachate.</p>	<p>Section 4.5 of the Addendum to Appendix 5 Engineering Report (Attachment 3) provides further details of the proposed leachate collection system, including a summary of the redundancy in the leachate collection system.</p>

Item	Requested Information	Response
	<p>(a) Please describe what contingency measures will be in place to address any issues with the pump-back system.</p> <p>(b) Please confirm the operational capacity available to store leachate until pump failures are repaired.</p> <p>(c) Please also confirm whether leachate will be pumped back into the landfill cells in perpetuity or if this will occur only for a limited time period.</p>	<p>(a) The leachate collection system has been designed to be built in stages from east to west, with each stage being independent of each other. As the basegrade slope from east to west there is the ability of leachate to flow from one cell to the other in a westerly direction if there is a build up of leachate in a basegrade cell. In addition, each cell will have its own leachate extraction pump equipped with a pressure transducer so any build-up of leachate will be detected.</p> <p>(b) As noted in Condition 3 of CRC214073 leachate storage of at least 5 days of leachate generation shall be provided on site. In addition, as noted in response 3.14 above, there is sufficient capacity within the landfill to store up to six months of leachate generation in each basegrade cell.</p> <p>(c) Leachate will only be pumped back into the landfill during the operational phases. Once the landfill closes any leachate extracted will need to be removed off site or treated on site (which would require a separate consent).</p>
3.16	<p>The side wall leachate filter/drainage system will also allow any groundwater draining from the cut face to be captured in the leachate system. Given the groundwater inflows from side walls will flow into the landfill cells and is managed in the leachate collection system, the groundwater inflows would be consumptive in nature, which has not been considered in the application.</p> <p>(a) Please confirm likely groundwater inflow volumes from the side walls and confirm the leachate system will be designed to accommodate these flows.</p> <p>(b) Please confirm whether climate change has been, or will be, taken into account when designing the leachate collection system.</p>	<p>(a) The sprayed on polyurea membrane system on the sidewalls of the landfill will ensure that there is no inflow of groundwater from the sidewalls and benches.</p> <p>(b) Climate change will be considered when designing the leachate system with the adoption of HIRDS v4 RCP8.5 for rainfall calculations.</p> <p>(c) The leachate system is most exposed to large rainfall events the day after it is commissioned, with the risk of a rainfall event affecting the leachate system diminishing as the waste is placed. One of the key objectives of a landfill operation is for the intermediate and final capping to shed stormwater to the perimeter stormwater system. C&D waste in Canterbury is generally very dry and large amounts of rainfall can be absorbed by the waste, with only any unabsorbed rainfall entering the leachate system.</p>

Item	Requested Information	Response
	<p>(c) Please confirm how the system would likely behave and be operated in a significant rainfall event such as the one experienced recently.</p> <p>(d) Please provide an assessment of this activity against the relevant regional plan provisions. If a resource consent is required, please provide an assessment of actual and potential effects of the consumptive groundwater take.</p>	<p>(d) The Applicant has applied for a groundwater take as part of the Application, and the AEE provides an assessment of effects.</p>
3.17	<p>The proposed resource consent conditions and LMP state that leachate may be treated on site.</p> <p>(a) Please provide further information on how leachate will be treated and what the fate of the treated leachate (and treatment by-products or wastes) will be.</p>	<p>It is not proposed to treat leachate on sites as part of this Application.</p> <p>(a) If leachate treatment is undertaken on site, it will require a separate consent at the time. It is not necessary to have this in the current Application.</p>
4	WASTE ACCEPTANCE	
	Waste Acceptance Criteria (WAC)	
4.1	<p>The application states that hazardous and medical waste is proposed to be accepted for deposition at the proposed landfill. Further, the proposed conditions state that the landfill will accept treated hazardous and medical wastes as 'Special Wastes' subject to an approval process.</p> <p>The WasteMINZ technical guidelines define 'hazardous waste' and state that (emphasis added) <i>"Hazardous waste contains contaminants such as heavy metals and human-made chemicals, at levels high enough to require treatment to render them acceptable for landfill disposal"</i>.</p>	<p>(a) Hazardous waste that exceeds the proposed WAC in Appendix D of the WasteMINZ Guidelines will not be treated at the site.</p> <p>(b) Any hazardous waste treatment will be required to be carried out off site by the waste generators, or at a specialist hazardous waste treatment facility.</p> <p>(c) Infectious substances and radioactive material will not be accepted at the proposed landfill.</p>

Item	Requested Information	Response
	<p>(a) Please confirm whether hazardous waste that exceeds the proposed WAC in Appendix D of the WasteMINZ Guidelines will be treated at the site to render it acceptable for the proposed landfill.</p> <p>(b) If these waste streams are treated on-site, please confirm where and how hazardous wastes will be treated and otherwise handled.</p> <p>Further, Attachment 4C of the Landfill Management Plan (LMP) describes which waste materials are prohibited from acceptance at the proposed landfill. This includes radioactive materials and pharmaceutical waste (such as infectious substances).</p> <p>(c) Please confirm whether infectious substances and radioactive material will be deposited at the proposed landfill, and how those materials, if accepted, are proposed to be handled.</p>	
4.2	<p>Emerging contaminants contained in the waste streams (e.g. PFAS/PFOS, etc.) to be deposited at the proposed landfill and their actual or potential effects on both the landfill engineering and receiving environments have not been considered.</p> <p>(a) Please confirm how emerging contaminants will be considered in the waste acceptance.</p> <p>(b) Please provide concentration ranges of emerging contaminants present in the proposed waste streams, their leaching characteristics, and an assessment of the potential consequences of accidental release.</p> <p>(c) Please provide a monitoring programme suitable to detect known emerging contaminants in landfill leachate and discuss how new contaminants will be added to the monitoring programme.</p>	<p>(a) The Applicant acknowledges that these emerging contaminants are a potential risk to human health. The main waste streams that contain these contaminants are fire extinguishing foam, manufacturing byproducts (for example chrome plating, electronics, textile and paper manufacturing) food packaging, household products and dust, and personal care products such as shampoo, dental floss, and cosmetics, and biosolids. Therefore the biggest risk from these emerging contaminants is in Municipal Waste from residential and commercial sources, which WQL will not be accepting. There was considerable evidence presented to the recent Auckland Regional Landfill applications regarding this matter but most of this was not relevant to this Application.</p> <p>(b) At this stage there is inadequate data to evaluate the concentration of these contaminants in the waste that is expected at the proposed landfill.</p> <p>(c) The Applicant will be required to implement a testing programme for leachate to be treated off site. It is likely that in the future facilities that accept leachate for treatment will amend their acceptance criteria to include these</p>

Item	Requested Information	Response
		contaminants. When these are introduced, they will need to be adopted by the landfill at that time.
4.3	<p>In the waste acceptance schedules, it is indicated that “Soil, rock, gravel, sand, silt, and clay” can be accepted on the basis of visual inspection only. Due to the anticipated level of containment in the proposed landfill, perhaps this is acceptable, but highly contaminated soils are often indistinguishable from less-contaminated soils.</p> <p>(a) Please provide further information on the potential for highly contaminated soil from a site not considered a source of ‘Special Waste’ (e.g., a contaminated site not listed as such on the Listed Land Use Register) to be accepted and to generate leachate that may not comply with the waste acceptance criteria (WAC) in the ‘Special Wastes’ acceptance criteria?</p>	<p>The Applicant acknowledges that visual inspection of some materials will not be sufficient.</p> <p>(a) The Applicant now proposes In Appendix 10 Proposed Conditions of Consent Issue 2 (Attachment 7) amended conditions that will require all soil, rock, gravel, sand, silt, and clay to be subject to the same waste acceptance processes including testing for total contaminants as a screening test, or TCLP testing.</p> <p>Appendix 10 Draft Landfill Management Plan Issue 2 (Attachment 6) has been amended to reflect the amended Conditions of Consent and processes.</p>
4.4	<p>Some soils may be considered a ‘potentially hazardous material’ and so should be subjected to Toxicity Characteristic Leaching Procedure (TCLP) analysis, as detailed the WasteMINZ technical guidelines.</p> <p>(a) Please confirm whether TCLP analysis will be carried out or will have been carried out at the source site for soils arriving at the site.</p> <p>(b) Please describe the process in place to confirm the adequacy of TCLP analysis and subsequent acceptance of soils.</p>	<p>The Applicant acknowledges that some materials will require TCLP testing prior to being accepted at the landfill.</p> <p>(a) All testing of soils will be required to be carried out at the source site before they are dispatched to the landfill. In addition, WQL will undertake audits of the waste generators processes, and also carry out random sampling / testing of soils either at the waste generators site or at the landfill.</p> <p>(b) The Applicant now proposes amended conditions In Appendix 10 Proposed Conditions of Consent Issue 2 (Attachment 7) that will require all soils to be subject to the same waste acceptance processes. For some waste streams this will include initial testing for total contaminants as a screening test, followed by a TCLP testing if required. For other waste streams TCLP testing will be mandatory.</p>

Item	Requested Information	Response
		Appendix 10 Draft Landfill Management Plan Issue 2 (Attachment 6) has been amended to reflect the amended Conditions of Consent and processes.
4.5	<p>Polycyclic aromatic hydrocarbons (PAHs) are not included in the waste acceptance criteria.</p> <p>(a) Please confirm whether or not PAHs or PAH-contaminated soils will be accepted at the proposed landfill.</p> <p>(b) If PAHs or PAH-contaminated soils are to be accepted, please confirm if there will be a maximum allowable concentration as well as the method used to determine the maximum allowable concentration.</p>	<p>PAHs are not contaminants that would be expected in the C&D waste stream, but most likely to be found in domestic and commercial waste streams. The most likely source of PAHs that may be encountered is if a large-scale development required the removal of sludges and sediments as part of a reclamation project.</p> <p>(a) PAH contaminated soils will not be accepted at the landfill.</p> <p>(b) If a large reclamation project were to be considered in Canterbury WQL would require the waste generator to undertake a specific assessment, including a risk assessment, and provide this information to WQL as part of an application for a Special Waste Permit. WQL would then consider taking the waste but not until an appropriate maximum allowable concentration had been agreed with Ecan, and an amendment to the WAC accepted. This process would also be followed for any contaminant not currently included in the proposed WAC.</p>
4.6	<p>It is not clear whether or not hydro-vac (or 'sucker truck' waste) or road sweepings will be accepted at the proposed landfill and these waste streams are not explicitly mentioned in the waste acceptance schedules.</p> <p>(a) Please confirm if these waste streams are to be accepted at the proposed landfill.</p> <p>(b) If sucker truck waste is accepted, please confirm the potential for that material to be putrescible/biodegradable, as well as otherwise hazardous.</p> <p>(c) If road sweepings are to be accepted, please confirm the potential for this waste material to generate hazardous leachate.</p>	<p>(a) Sucker truck waste would not be accepted at the landfill as it is be considered to be a Commercial waste.</p> <p>(b) NA</p> <p>(c) NA</p>

Item	Requested Information	Response
4.7	<p>It is noted that the proposed WAC align with WasteMINZ Class 1 landfill WAC, yet the proposed liner system differs from that required under WasteMINZ for Class 1 and Class 2 landfills.</p> <p>(a) Please provide further information on how the proposed liner system and associated other engineered systems will perform appropriately with the proposed Class 1 landfill WAC.</p>	<p>(a) Section 4.4.1 of the Addendum to Appendix 5 Engineering Report (Attachment 3) provides further details of the proposed liner system and confirms that it now complies as a Class 1 Type 2 liner system.</p>
4.8	<p>The LMP states that Staff will be provided with specific training to be able to identify acceptable and unacceptable Landfill materials.</p> <p>(a) Please confirm what the 'training' will entail.</p> <p>(b) Please provide further details on the processes in place to ensure staff will be able to carry out this function.</p>	<p>(a) Appendix 10 Draft Landfill Management Plan Issue 2 (Attachment 6) has been amended to include details of the training regarding waste acceptance. The management and administration of the waste acceptance processes will be under the supervision of an experienced environmental engineer or technician.</p>
4.9	<p>Visual inspections are proposed to determine content by load for vegetative matter and untreated wood.</p> <p>(a) Please provide detail on how the amount of vegetative material (limited to 3%) and untreated wood (limited to 1%) will be assessed visually in waste acceptance.</p> <p>(b) As these materials are in some sense putrescible, please confirm why contents exceeding the above percentages are not explicitly noted as an exception in the LMP Schedule 4C under 'putrescible, organic wastes'.</p>	<p>(a) Appendix 10 Draft Landfill Management Plan Issue 2 (Attachment 6) has been amended to include details of the waste acceptance processes including the assessment of vegetative material and untreated wood.</p> <p>(b) The materials listed in LMP Schedule C are listed as Prohibited for reasons other than being potentially putrescible. It is not possible to separate all vegetative material and untreated timber from C&D waste.</p>
	Waste Acceptance and Handling	
4.10	<p>The LMP states that <i>"any material not specified as acceptable must demonstrate that it is not leachable, degradable, putrescible, combustible, hazardous, liquid, or unsafe to be accepted at the landfill"</i>.</p>	<p>(a) Appendix 10 Draft Landfill Management Plan Issue 2 (Attachment 6) has been amended to include controls regarding waste acceptance.</p>

Item	Requested Information	Response
	<p>(a) Please confirm what controls will be in place to ensure this requirement can be met.</p> <p>(b) Please confirm who will be making decisions on whether or not material is suitable for acceptance.</p>	<p>(b) The management and administration of the waste acceptance processes will be under the supervision of an experienced environmental engineer or technician. In the event that there is some ambiguity regarding acceptance WQL would consult with Ecan, and if necessary, agree make application for an amendment to the WAC. The Applicant acknowledges that there is extensive expertise within Ecan and some consultancies on land contamination and wishes to establish a strong working relationship with these professionals.</p>
4.11	<p>Special Wastes will be accepted at the landfill subject to an approval process that requires the issuing of a Special Waste Permit. Special Waste is being described as solid waste requiring special handling or testing or certification procedures. No information about the approval process, how this waste is to be handled, tested or certified has been provided.</p> <p>(a) Please describe process of approving waste material as Special Waste and issuing a Special Waste Permit.</p> <p>(b) Please confirm how Special Wastes will be handled, tested and certified.</p> <p>(c) Please confirm what 'certification' means in that context and who will be carrying out the certification, including qualifications required to be held by the certifier.</p>	<p>(a) Appendix 10 Draft Landfill Management Plan Issue 2 (Attachment 6) has been amended to include details of these processes.</p> <p>(b) Appendix 10 Draft Landfill Management Plan Issue 2 (Attachment 6) has been amended to include details of these processes.</p> <p>(c) Certification is the process of issuing a Special Waste Permit (SWP) for a specific waste stream for a waste generator. In the case of the remediation of a specific site the SWP will be specific to that site and for each batch of the materials to be removed from that site. The management and administration of the waste acceptance processes will be under the supervision of an experienced environmental engineer or technician.</p>
4.12	<p>Any landfill material or soil deposited at the site that is required to be sampled and analysed for the appropriate contaminants at the source sites.</p> <p>(a) Please confirm who will be sampling the source material, including qualifications required to be held by the person carrying out the sampling.</p>	<p>(a) Appendix 10 Draft Landfill Management Plan Issue 2 (Attachment 6) has been amended to include details of these processes. In the case of the remediation of a specific site WQL will expect to receive the test results from a Detailed Site Investigation (DSI), or from an approved Remediation Action Plan (RAP) supervised by an experienced professional.</p>

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4.13	<p>The waste acceptance process described in the LMP appears to be relatively high level and does not provide sufficient details that provide the certainty needed for an operation of such scale and nature.</p> <p>(a) Please provide more detailed information on the proposed waste acceptance process, including further detail of how each step of the process will be implemented in practice.</p> <p>(b) Please provide a flow chart for the entire waste acceptance process to assist with the clarity of the process.</p>	<p>(a) Appendix 10 Draft Landfill Management Plan Issue 2 (Attachment 6) has been amended to include details of these processes.</p> <p>(b) Appendix 10 Draft Landfill Management Plan Issue 2 (Attachment 6) has been amended to include details of these processes and includes a flow chart.</p>
4.14	<p>Imported fill will be inspected for moisture content. Imported fill that is visibly wet, has the appearance of mud, or that does not readily break apart due to the presence of moisture will be laid aside and not inspected until dry.</p> <p>(a) Please confirm how moisture content will be determined and how it can be ensured that the measured moisture content is representative of the entire load.</p> <p>(b) Please provide more information about the nature, location and size of the laydown area and what measures will be in place to ensure the material reaches the required low moisture content (i.e., will the material be covered, etc.?).</p> <p>(c) Please confirm if leachate from the laydown areas will be collected and how the laydown area will be managed during rainfall.</p> <p>(d) Please provide an assessment of actual and potential effects from temporary storing the imported fill on the laydown area until it is dry.</p>	<p>The Applicant confirms that no waste is deposited at the laydown area (which is now shown as the Container Transfer Area). This is the area where sealed and covered waste containers will be unloaded from road truck and trailers, and the containers will then be uplifted by specialist off road trucks to transport the waste containers to the active landfill face where the containers are unloaded. The empty waste containers are then transported back to the Container Transfer Area for collection by the road truck and trailers.</p> <p>(a) The waste containers are able to be visually inspected when they are dropped off at the Container Transfer Area. In practice a load of soil that exceeds the maximum moisture content is not able to be transported in these containers as the contents would spill out when the containers are lifted onto the truck at the dispatching site. Also, it is in the interests of the waste generator to minimise the moisture content of the waste before it is dispatched.</p> <p>(b) The Applicant confirms that no waste is deposited at the laydown area (which is now shown as the Container Transfer Area)</p> <p>(c) No leachate will be generated at the Container Transfer Area. However, a three-stage oil and grit separator will be installed at the stormwater outfall of the Container Transfer Area.</p>

Item	Requested Information	Response
		(d) The Applicant confirms that no waste is deposited at the laydown area (which is now shown as the Container Transfer Area).
4.15	<p>Soils displaying evidence of contamination will either be set aside for chemical testing or rejected.</p> <p>(a) Please provide further explanation of what 'will be set aside' means in this context. This should include the time period required for soils to be tested.</p> <p>(b) Please confirm where and how these soils will be tested and who will be making the determination on the acceptability of the materials and describe the processes involved.</p> <p>(c) Please confirm how soils 'set aside' will be managed until such time that test results have been received (refer to Questions 4.14 (b) to (d) above and provide similar information and assessments).</p> <p>(d) Please confirm the fate of soils unacceptable/unsuitable that have been 'set aside' at the site. It is noted that the carrier of the materials is unlikely to still be present at the site when test results are received.</p>	<p>Appendix 10 Draft Landfill Management Plan Issue 2 (Attachment 6) has been amended to include details of these processes.</p> <p>(a) In the unlikely event that a load arrives on site and there is suspicion that it is not as described on the manifest and Special Waste Permit the container will be "quarantined" on the Container Transfer Area.</p> <p>(b) Sampling and testing of the material will be undertaken by WQL at the waste generators cost. The management and administration of the waste acceptance processes will be under the supervision of an experienced environmental engineer or technician.</p> <p>(c) The container will remain in "quarantine" until the test results are received. If the WAC is met the container will be unloaded in the landfill.</p> <p>(d) If the tests results do not meet the WAC the container will need to be taken away by the waste generator and the noncompliance will immediately be reported to Ecan.</p>
4.16	<p>If prohibited substances are suspected or confirmed at the tip-head the area shall be marked and the area closed off and prohibited substances are to be removed.</p> <p>(a) Please confirm who will be inspecting the tip areas for prohibited substances, including the training the persons carrying out this task have received, and any other qualifications required to be held.</p> <p>(b) Please confirm the fate of the prohibited substances removed from the tip areas, given the internal transport from the receiving</p>	<p>Appendix 10 Draft Landfill Management Plan Issue 2 (Attachment 6) has been amended to include details of these processes.</p> <p>(a) In the unlikely event that a load arrives at the tip area of the active landfill and there is suspicion that it is not as described on the manifest and Special Waste Permit the waste will not be spread out but will be loaded back into the container at the waste generators cost. Sampling and testing of the material will be undertaken by WQL at the waste generators cost. The management and administration of the waste acceptance processes, including the active landfill area, will be under the supervision of an experienced environmental engineer</p>

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	<p>area to tip areas will be carried out by landfill staff and not the carrier that transports the material to the site.</p>	<p>or technician. The engineer or technician will provide training and guidance for the staff working in the landfill.</p> <p>(b) The container will remain in “quarantine” until the test results are received. If the WAC is met the container will be unloaded in the landfill. If the tests results do not meet the WAC the container will need to be taken away by the waste generator and the noncompliance will be immediately reported to Ecan.</p>
4.17	<p>In record keeping requirements under the LMP, it is noted that “The physical address of the land the material was sourced from” will be recorded. We note the importance of recording the original source site, not the sorting facility or waste transfer site. If there is no information on the provenance of material other than the address of the sorting or transfer facility, it is recommended that the material be rejected.</p> <p>(a) Please confirm how recording of the source site will be addressed for material that comes via a sorting facility/waste transfer site.</p> <p>(b) Please confirm what mechanisms are in place to ensure the material from the sorting facility/waste transfer site will indeed contain only the material from the source site listed on the records.</p>	<p>Appendix 10 Draft Landfill Management Plan Issue 2 (Attachment 6) has been amended to include details of these processes.</p> <p>(a) The only material that will come through a sorting facility / waste transfer site will be true C&D waste, with very little risk of having contaminants of concern.</p> <p>(b) The Applicant will conduct regular audits to ensure that the sorting facility / waste transfer operator is keeping appropriate records of where the C&D waste is coming from.</p>
4.18	<p>The LMP described the record keeping requirements for all material accepted on site shall be kept.</p> <p>(a) Please confirm why the landfill cell into which material is deposited is not recorded.</p>	<p>(a) The Applicant confirms that a record of which cell waste has been deposited in will be kept. Regular GPS surveys of the waste filling process will provide a high level of detail as to where all waste has been deposited.</p>
4.19	<p>There is a lack of clarity in requirements (if any) for daily and intermediate cover requirements.</p>	<p>(a) Soils used for daily cover and intermediate cover will be sourced from on site. This is all virgin material and there is no known contamination of these materials.</p>

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	<p>(a) Please confirm if there will be any requirements for soil used as daily or intermediate cover, in terms of contaminant concentrations.</p> <p>(b) Will daily cover be tested to ensure compliance with the WAC?</p>	<p>(b) As the daily cover and intermediate cover will be sourced from on site there will be no need to test for compliance with the WAC.</p>
5	ENVIRONMENTAL RISK ASSESSMENT	
5.1	<p>During the review of the Environmental Risk Assessment report similarities to risk assessment carried out for the Auckland Regional Landfill at Dome Valley were noted (see https://www.aucklandcouncil.govt.nz/ResourceConsentDocuments/48BU N60339589RiskManagementAssessment.pdf).</p> <p>(a) Please confirm if the risks identified for the proposed landfill were assessed on the basis of the information provided with the application and that these are not based on a different landfill.</p> <p>(b) Please confirm whether there are any additional or different risks that need to be considered for the proposed landfill.</p> <p>(c) Please confirm whether the pre and post mitigation risk scores are specific to this site and have not been adopted from other landfills with potentially different environmental settings and associated risks.</p>	<p>(a) The Risk Assessment for Woodstock Landfill was completely specific to the Woodstock Landfill project, based on the technical reports produced for this Application. The format of the Risk Assessment is similar to that used for a wide range of engineering projects in New Zealand.</p> <p>(b) The risk assessment for the Woodstock Landfill has a lower risk profile compared to municipal landfills. The main areas of lower risk relate to health, traffic, noise, and odour. In addition, the geomorphology of the Woodstock Landfill site is such that the generation of sediment in stormwater is likely to be significantly lower than that which may be present at other sites with more soils, silts, and clays in their soil profiles.</p> <p>(c) The pre and post risk scores in the Risk Assessment for Woodstock Landfill are specific to the Woodstock Landfill project, based on the technical reports produced for this application.</p>
5.2	<p>Under Risk Item 1.1 a number of engineering and design controls are proposed to be in place to ensure the stormwater ponds are constructed adequately.</p> <p>(a) Please confirm if regular inspections during operation, closure and aftercare periods will occur to ensure that the ponds will remain in a good condition.</p>	<p>(a) The Landfill Management Plan (LMP) will have specific provisions for regular inspections and maintenance of the stormwater system during the operational and closure periods.</p> <p>A site specific Erosion and Sediment Control Plan (ESCP) will be prepared for each stage of the quarrying and landfill operation.</p>

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		During the Aftercare period the LMP will be modified but will still have specific provisions for regular inspections and maintenance of the stormwater system.
5.3	<p>Risk Item 1.2 addresses the stormwater treatment standard and includes the use of flocculants (if required) as mitigation measures to lower sediment concentrations in the discharge. Water treatment chemicals are considered a contaminant and generally require resource consent under Rule 5.100 of the LWRP.</p> <p>(a) Please confirm whether resource consent will be sought to discharge residual water treatment chemicals to land or water.</p> <p>(b) If water treatment chemicals will be used, please provide further information on how these will be used, including any bench testing and dosing requirements. Please also provide a draft chemical treatment plan.</p>	<p>(a) Due to the geomorphology of the proposed landfill site there is a depth of soils above the rock and the potential for sediment laden stormwater being difficult to manage is low. If it appears that flocculants will be required a separate consent will be applied prior to them being used.</p> <p>(b) At this stage water treatment chemicals are not being proposed to be used.</p>
5.4	<p>Under Risk Item 1.4 geotechnical assessments are proposed to identify high risk areas requiring stability measures.</p> <p>(a) Please confirm if ongoing inspections will be carried out of such areas and of any measures used, specifically following extreme weather events.</p>	The Landfill Management Plan (LMP) will have specific provisions for regular inspections and maintenance of the stormwater system during the operational and closure periods, including inspections and remedial actions following extreme weather events. These would be completed by an experienced geotechnical engineer or geologist.
5.5	<p>Risk Item 1.5 addresses the risk of runoff of contaminants from refuse entering the stormwater ponds and discharging from the ponds.</p> <p>(a) Please confirm why the pre-mitigation scenario was assessed as having a moderate impact and what assessment criteria were used to arrive at this conclusion.</p> <p>(b) Please confirm if this risk assessment represents a minor, moderate, major or significant discharge of contamination to the</p>	<p>(a) The pre mitigation scenario was based on not separating the construction activities from the landfill activities. As shown on the drawings and as detailed in the Landfill Management Plan considerable resources are to be employed to separate landfill activities from other activities.</p> <p>(b) The risk assessment was for a significant discharge of contamination based on a scenario of a major storm event causing widespread damage to capping and temporary structures.</p>

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	<p>stormwater ponds and provide a risk rating for each of these scenarios.</p> <p>(c) Please confirm the post-mitigation risk rating for the above scenarios.</p>	<p>(c) The post mitigation risk ratings for the various scenarios are shown in the table below. The Applicant has reviewed the Risk Assessment and now considers the original After assessment overstated the Risk Score.</p> <table><tr><th rowspan="2">Discharge</th><th colspan="3">Before</th><th colspan="3">After</th></tr><tr><th>Likelihood</th><th>Impact</th><th>Risk Rating</th><th>Likelihood</th><th>Impact</th><th>Risk Rating</th></tr><tr><td>Minor</td><td>Likely</td><td>Minor</td><td>8</td><td>Possible</td><td>Minor</td><td>6</td></tr><tr><td>Moderate</td><td>Likely</td><td>Minor</td><td>8</td><td>Possible</td><td>Minor</td><td>6</td></tr><tr><td>Major</td><td>Likely</td><td>Moderate</td><td>12</td><td>Possible</td><td>Moderate</td><td>9</td></tr><tr><td>Significant</td><td>Likely</td><td>Moderate</td><td>12</td><td>Possible</td><td>Moderate</td><td>9</td></tr></table>	Discharge	Before			After			Likelihood	Impact	Risk Rating	Likelihood	Impact	Risk Rating	Minor	Likely	Minor	8	Possible	Minor	6	Moderate	Likely	Minor	8	Possible	Minor	6	Major	Likely	Moderate	12	Possible	Moderate	9	Significant	Likely	Moderate	12	Possible	Moderate	9
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5.6	<p>Several Risk Items describe the failure of the liner or the leachate collection and disposal system and how this is proposed to be mitigated.</p> <p>(a) Please provide detailed information on the potential volumes and quality of leachate that could be released during the various stages of the operation under Risk Items 2.1, 2.3 to 2.11 and 2.15.</p> <p>(b) Please qualify the likelihood of any of these events occurring at the various stages of the landfill (during operation, closure and aftercare of the landfill) and duration that each event could last.</p> <p>(c) Please confirm the potential ecological receptors that could be affected and what the level of risk would be associated with each event. Please also confirm what contaminants of concern are likely to exceed relevant acute and toxic water quality guidelines for each event.</p>	<p>(a) Section 4.4.2 of Addendum to Appendix 5 Engineering Report (Attachment 3) provides details of the potential volumes of leachate that could be released due to leakage of leachate through the liner system.</p> <p>Section 9.2 of Addendum to Appendix 5 Engineering Report (Attachment 3) provides details of the potential volumes of leachate that could be released following a rupture of the liner caused by a failure of the toe bund.</p> <p>Section 6.1.2 of Addendum to Appendix 5 Engineering Report (Attachment 3) provides details of the range of contaminants that could be expected in the leachate at the proposed Woodstock Landfill.</p> <p>(b) The rupture of the liner as a result of a toe bund failure is most likely to occur within the first few years of the construction of a section of toe bund. This is when the potential volume of leachate is at its highest due to the ratio of waste volumes to liner area being at its lowest. It is also that this is the time when a potential defect in the toe bund construction may become apparent. This failure could occur for a period of a few hours before being spotted by a staff member or the alarms at the sedimentation ponds being activated. The potential for leakage through the liner system could occur at any time but is most likely to occur in the period immediately after the first placing of waste.</p>																																									

Item	Requested Information	Response
		<p>This failure could occur for a period of a few weeks before the alarms at the underdrainage manholes became activated.</p> <p>(c) Appendix 4A Hydrogeology Report 2 (Attachment 1) addresses these matters in some detail, with an assessment of effects from both liner leakage and liner rupture scenarios.</p>
5.7	<p>Risk Item 2.2 addresses unforeseen leachate production, describing prolonged rainfall leading to an increase in leachate generation. The main mitigation described are daily, intermediate and final cover installation and the use of clean water diversions. However, the proposed mitigation does not consider the rate of saturated flow through cover materials or leachate production from open landfill cells that have not been covered.</p> <p>(a) Please provide more information regarding the management of unanticipated leachate production from accepted materials (e.g., unintentionally-accepted putrescible waste, wastewater treatment plant sludge, and other 'Special Wastes', etc.).</p> <p>(b) Please provide more information regarding what an unforeseen leachate production event is, including a description of what could give rise to such an event.</p> <p>(c) Please quantify potential frequency of unforeseen leachate production events.</p> <p>(d) Please confirm what event could result in unacceptable ecological impacts and what potential contaminants of concern could result in adverse effects on which sensitive ecological receptors.</p>	<p>(a) The proposed Conditions of Consent are clear that putrescible waste, wastewater treatment plant sludge, and other 'Special Wastes' will not be permitted.</p> <p>(b) The most likely event that could produce a high level of leachate production is in the days after a new cell at basegrade is opened and there is only a small amount of waste in the cell. While the leachate produced would be very dilute, as compared to a cell that is almost full, it will still need to be treated at leachate. For new cells above basegrade the risk of high leachate production is minimal.</p> <p>(c) The frequency of the event described above could potentially happen once a year but would only coincide with the opening of a new basegrade cell which is entirely dependant on how much waste is received at the landfill.</p> <p>(d) The event described is unlikely to result in an increase in the risk of adverse ecological impacts but would present the landfill operator with challenges, and potentially increased costs, of leachate disposal.</p>
5.8	<p>A large number of controls and mitigation measures are proposed to manage the risk associated with leachate migrating to groundwater and surface water. However, all liners are likely to leak at some stage during</p>	<p>Hydrogeology Report 2 (Attachment 1) provides additional information on leachate leakage and potential impacts.</p>

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	<p>their lifespan (as stated in the Engineering Report) and not all leachate would be captured in the underdrains and be subject to electrical conductivity monitoring in the stormwater pond inlet. While the Engineering Report discusses the possibility to model leakage through the lining system, no attempt has been made to calculate the potential leakage that could bypass the underdrainage system and no assessment of potential environmental effects of such leakage has been provided by way of a fate and transport analysis. Further, the proposed resource consent condition and Landfill Management Plan (LMP) do not appear to appropriately address this risk (e.g. the only monitoring in the receiving environment is proposed to be in Woodstock Stream and only twice per year, but no information has been provided to confirm this would be the only receiving environment as a result of a liner breach).</p> <p>(a) Please provide a fate and transport analysis to predict and assess potential flow paths from the landfill in the event of a liner breach or toe bund failure or any other leachate discharge that would not be captured by the underdrainage system.</p> <p>(b) Please provide baseline information of groundwater and surface water quality in all locations that could be receiving environments to a discharge below the subsoil drainage system.</p> <p>(c) Please confirm whether the resource consent conditions and LMP appropriately address the risk of leachate bypassing the subsoil drainage system, including how a liner breach would be detected and what actions would be implemented as a result of a liner breach.</p> <p>(d) If additional groundwater and/or surface water monitoring is proposed, please confirm locations of sampling locations.</p>	<p>(a) This is included in Hydrogeology Report 2 (Attachment 1)</p> <p>(b) This is included in Hydrogeology Report 2 (Attachment 1)</p> <p>(c) Appendix 10 Proposed Conditions of Consent Issue 2 (Attachment 7) has been amended to address this matter.</p> <p>(d) Appendix 10 Proposed Conditions of Consent Issue 2 (Attachment 7) has been amended to address this matter.</p>

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5.9	<p>Risk Items 2.12 and 2.13 address cover failures and state that the cover is unlikely to fail on a scale that would present issues for leachate management.</p> <p>(a) Please confirm whether the risk assessment is associated with the daily cover, the intermediate cover or the final cover.</p> <p>(b) Please confirm whether a seismic event has been considered in determination of the pre and post-mitigated risk scenario.</p> <p>(c) Please confirm if weekly cover inspections will continue during the closure and aftercare periods.</p> <p>(d) Please clarify how issues identified in inspections will be addressed during closure and aftercare.</p>	<p>(a) The highest risk of cover failure relates to Daily Cover in the first few months of operation. This risk diminishes as intermediate and final capping is constructed.</p> <p>(b) The risk from a major seismic event is most likely to affect the final cover on the front (south facing) face of the landfill. Any such failure is unlikely to have any impact on leachate production or quality.</p> <p>(c) Fortnightly inspection of the cover would continue during the closure and first 10 years of the aftercare periods and would reduce to monthly inspections for the remainder of the aftercare period. The Aftercare fund makes provision for the cost of these.</p> <p>(d) If any defects are identified they will be repaired. The Aftercare fund makes provision for the cost of these.</p>
5.10	<p>Risk Item 2.14 described leachate breakouts through the cover and discharge to the stormwater system.</p> <p>(a) Please confirm in what areas of the landfill and in what form a leachate breakout would be most likely.</p> <p>(b) Please confirm whether leachate breakout could destabilise the cover, thereby increasing the risks assessed under Risk Items 2.12 and 2.13.</p>	<p>(a) The highest risk of leachate breakout would be to the intermediate cover on the front (south facing) face of the landfill. Such breakouts are generally in the form of seeps that may cover a few square metres.</p> <p>(b) Any such failure is unlikely to destabilise the cover but may require some remedial repair to the intermediate cover.</p>
5.11	<p>Risk Item 2.15 assessed the risk from slope movement within placed waste resulting in waste outside liner containment or a tear in the liner beneath placed waste.</p> <p>(a) Please confirm the likely/potential scale of such occurrences and the mechanism of damage (e.g. size of liner tear, amount of waste deposited outside of cell, etc.).</p>	<p>Section 4.4.1 of the Addendum to Appendix 5 Engineering Report (Attachment 3) provides clarification of the proposed liner system, including amendments to the materials to be used.</p> <p>(a) The risk from slope movement within placed waste resulting in waste outside liner containment, or a tear in the liner beneath placed waste is greatest in the vicinity of toe bund. This type of failure is most likely to occur where</p>

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	<p>(b) Please provide more information regarding the actions that will or can be taken in response to such a containment breach in order to repair the breach (if this is possible) and/or mitigate potential effects.</p>	<p>waste is placed on a slope but as the base of the proposed landfill is flat it is only in the toe bund area that a localised failure of the toe bund could occur.</p> <p>(b) To mitigate the risk of waste slope failure on the western slopes of the waste filling area the Applicant has proposed, shown on Drawing C1, a temporary bund to be placed between the landfill operation and the quarry operation. This will ensure that any slope failure would be contained, and easily repaired.</p> <p>To mitigate the risk in the vicinity of the toe bund the Applicant has proposed a temporary overfill of the toe bund, as shown on Detail L of Drawing C4 to increase the level of containment. In addition, the placing of waste, daily cover, and intermediate cover in the vicinity of the toe bund will be subject to a high level of supervision by an experienced engineer.</p>
5.12	<p>Risk Item 2.17 states that subsoil drains are designed to exclude sediment from entering the pipe or accumulating within the pipe.</p> <p>(a) Please confirm the likelihood of the free-draining material surrounding the subsoil drains to blind (i.e. becoming less transmissive or blocked) over time?</p> <p>(b) Please confirm whether blinding could result in the same consequences as a blocked subsoil drainage pipe.</p> <p>(c) Please confirm whether a factor of safety been applied to the subsoil drainage system design to account for blinding.</p> <p>(d) Please confirm how it can be ensured that the subsoil drainage will operate effectively (as required) over the operational, closure and aftercare periods, and beyond.</p>	<p>(a) As noted in other parts of this response the primary purpose of the subsoil system is to prevent uplift of the liner system during, and immediately after, construction. Once the waste has been placed over the liner the need for the subsoil system diminishes and may not be required at all. The risk of blinding is therefore very low.</p> <p>(b) The consequences of blinding (clogging) of the drainage blanket are likely to be similar to a localised blockage of a subsoil pipe.</p> <p>(c) Due to the minimum pipe sizes that are available, and considering expected groundwater flows, the factor of safety for the underdrainage system would be in the tens, and certainly account for any potential blinding.</p> <p>(d) As noted in other parts of this response the primary purpose of the subsoil system is to prevent uplift of the liner system during, and immediately after, construction. Once the waste has been placed over the liner the need for the</p>

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		<p>subsoil system diminishes and is unlikely to be required during later operation stages, and highly unlikely to be required in the closure and aftercare periods.</p>
5.13	<p>Under Risk Item 2.19 it is considered likely that the method of reticulation would result in leachate running into the stormwater system.</p> <p>(a) Please provide a consideration of alternative stormwater system and leachate system designs to prevent or further limit leachate discharging to the stormwater system.</p> <p>(b) Please confirm what measures will be taken to remediate any leachate being discharged to the stormwater system. Will the leachate accumulating in the stormwater ponds be removed? How would a compromised cell liner be remediated permanently (if required)?</p> <p>(c) Please confirm whether the stormwater treatment system is appropriate to cope with the small amounts of leachate entering the stormwater system or whether alternative treatment is necessary in the event that conductivity and pH measurements indicate a liner failure.</p> <p>(d) Please confirm whether the upward groundwater hydraulic gradient could result in the leachate leaking through compromised parts of the liner to be flushed out with the drainage water, potentially accelerating leachate flow from cells.</p>	<p>(a) To significantly reduce the likelihood of leachate recirculation on the waste filling area entering the stormwater system the Applicant has proposed, on Drawing C1, that a temporary bund be placed between the landfill operation and the quarry operation. This would be moved across as each of the basegrade cells was constructed. This will ensure that any leachate would be contained.</p> <p>To further reduce the risk of leachate entering the stormwater system the layout of the whole leachate storage and recirculation has been amended, as shown on Drawing C1.</p> <p>The Applicant now considers the After Risk Rating to drop from 8 to 6 and is confident that alterations to the leachate system are not required.</p> <p>(b) As noted in Hydrogeology Report 2 (Attachment 1) the assessment of leakage from the liner shows that such an event would have a negligible effect on the receiving environment, and no remediation is likely to be needed. In the event that excessive amounts of leachate are discharged to the sedimentation ponds as a result of a rupture of the liner caused by a toe bund failure the outlet to the ponds would need to be closed and the contaminated water pumped back to the leachate storage tanks.</p> <p>(c) As noted in Hydrogeology Report 2 (Attachment 1) the assessment of leakage through the liner showed that such an event would have negligible effect on the receiving environment, and no remediation is likely to be needed.</p> <p>(d) As noted elsewhere in this response the amount of groundwater from upward groundwater hydraulic gradient is very low. The chances of the</p>

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		leachate leaking through a compromised part of the liner to be flushed out with the drainage water, potentially accelerating leachate flow from cells, is very low.
5.14	<p>The risk assessment identifies risks associated with a system/material failure, toe bund failures or compromise of leachate collection system, which could result in a discharge of leachate to receiving groundwater and/or surface water environments. The post-mitigation risk is reduced as a result of engineering controls and monitoring. However, the appropriateness of the WAC in that context and whether changes to the WAC are required to further reduce the risk has not been addressed (e.g. for Risk Items 2.3, 2.7, 2.15, 2.16 and 2.17), specifically for worst case scenario failures of the liner, toe bund, or leachate collection system.</p> <p>(a) Please confirm whether a liner, toe bund or leachate collection system failure has been considered when developing the proposed WAC for this landfill.</p> <p>(b) Please confirm what the cumulative effects would be of small amounts of leachate discharges from the landfill over time as a result of small defects or failures of the liner, toe bund or leachate collection system.</p> <p>(c) Please confirm whether and how the WAC will be appropriate to protect downgradient receiving environments in the event of a worst case scenario liner, toe bund or leachate collection system failure.</p>	<p>(a) The Applicant has proposed a liner system that is fully in accordance with the WasteMINZ Technical Guidelines for a Class 1 landfill, and the proposed WAC is also the same as the recommended WAC for a Class 1 landfill.</p> <p>(b) This matter is addressed in the Hydrogeology Report 2 (Attachment 1)</p> <p>(c) The Applicant is of the view that the adopted WAC is entirely appropriate to protect the downgradient receiving environment for a range of worst-case scenarios as it complies with the recommended WasteMINZ Technical Guidelines.</p>
5.15	<p>The pre-mitigation impact of a subsurface fire (Risk Item 5.1), a surface landfill fire (Risk Item 5.2) or a fire migrating to adjacent forest or bush areas (Risk Item 5.4) was rated as major. However, fires can have catastrophic effects and given the local topography of the site and access</p>	<p>(a) The risk of a fire having a Major effect is based on the proximity of the forested areas to the east of the site, and a fire coinciding with a strong northwest wind. This was not rated as Catastrophic as this area is not populated and rarely used by the public. In addition, the close proximity of</p>

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	<p>to water, catastrophic (5) may be a more appropriate pre-mitigation impact score. Further, subsurface fires can last for a long period, requiring large amounts of water to manage and extinguish.</p> <p>(a) Please confirm how an impact score of major (4) was arrived at for these risks.</p> <p>(b) Please confirm whether a water truck will be appropriate as an immediate response to a fire.</p> <p>(c) Please confirm what other sources of water supply will be available to combat a fire at the landfill site.</p> <p>It is also noted that earthworks machinery used to combat fires will need to be operated by on-site staff and that firefighting training and skills will be necessary to combat fires without risking human health and safety.</p> <p>(d) What are the firefighting training requirements for staff?</p> <p>(e) Will trained staff always be present on site during operation?</p> <p>(f) What are the contingencies if a fire breaks out outside of operating hours?</p>	<p>earthmoving equipment at the landfill and quarry means that a firefighting plan could be quickly implemented. The perimeter road also acts as a firebreak and enables ready access for machinery. There are also a significant number of helicopters within 50km of the site that can be quickly mobilised for firefighting.</p> <p>(b) The Applicant confirms that there will be always a water truck on site which would be able to quickly respond to a fire.</p> <p>(c) The Applicant also proposes to install approximately five large water tanks on the hill above the landfill that will be kept full for firefighting. A 100mm gravity water main, with fire hydrants at key locations, will be installed on the eastern perimeter road.</p> <p>(d) All staff on site will be required to receive basic firefighting training to NZQA Unit Standard 9020 within three months of commencing employment on site.</p> <p>(e) All staff on site will be required to receive basic firefighting training to NZQA Unit Standard 9020 within three months of commencing employment on site.</p> <p>(f) While most of the quarry and landfill is well screened for dust, noise, and visual amenity purposes the general site area is visible by many neighbours and road users who would be able to raise an alarm. Most of the quarry and landfill staff live locally and can attend to a fire at short notice.</p>
5.16	<p>The risk of a subsurface fire (Risk Item 5.1) or a fire migrating to adjacent forest or bush areas (Risk Item 5.4) to still be moderate post-mitigation. The proposed controls and mitigation measures seek to reduce or address effects if a fire were to occur; however, they provisions do not directly address any significant effects to the ecological values of the site and surrounding environments that may occur as a result of a fire.</p>	<p>(a) The adjacent forest or bush area is regenerating bush following major sawmilling operations over a 100 years ago. This area is not populated and rarely used by the public.</p> <p>The Applicant has made extensive and numerous attempts to engage with the Department of Conservation to date to try and understand the ecological values of the surrounding environments. To date the Applicant has not had a response.</p>

Item	Requested Information	Response
	<p>(a) Please confirm whether the inclusion of provisions to address any significant effects to the ecological values of the site and surrounding environments is warranted and how mitigating effects from a fire would be achieved.</p>	
5.17	<p>Risk Item 5.19 describes a moderate risk pre-mitigation and low risk post mitigation to surface water/aquatic ecosystems and terrestrial ecosystems in terms of pests and diseases introduced as a result of the landfilling activity. Further, a number of other Risk Items describe risks to surface water/aquatic ecosystems and terrestrial ecosystems, including risks in relation to sediment discharges (Risk Items 1.4,1.6 and 1.8). Lining system/material failures, toe bund failures or compromise of leachate collection system and handling systems have not been assessed in terms of risk to surface water/aquatic ecosystems and terrestrial ecosystems, noting that leachate discharges into land may emanate in nearby surface water bodies.</p> <p>(a) Please confirm what criteria were used in the risk assessment to assess the levels of risk to surface water/aquatic ecosystems and terrestrial ecosystems under Risk Items 1.4,1.6, 1.8 and 5.19.</p> <p>(b) Please confirm the level of risk pre-mitigation and post mitigation for lining system failures in relation to the relevant acute and chronic water quality criteria, Numeric Attribute State as outlined in the NPS Freshwater Management 2020, the dissolved oxygen saturation, as well as bioaccumulation and secondary toxicity effects accounted for when assigned low risks.</p> <p>(c) Please confirm the sensitive ecological receptors that would be impacted by one of the above risks.</p>	<p>(a) The criteria for assessing the risk for Risk Items 1.4, 1.6, and 1.8 was whether the proposed landfill would significantly change the frequency and scale of exposure to events such as major rainfall events, or an increase in contaminants entering the existing waterways. The Applicant acknowledges that could be an increase in exposure when the landfill is operational, even though the local area has been extensively modified for farming and forestry</p> <p>The criteria for assessing the risk for Risk Item 5.19 (pests and diseases) was considering the extent to which the existing environment has been exposed to external biosecurity risks, and whether the proposed landfill would increase this exposure. While the local area has been extensively modified for farming and forestry there would be a small increase in exposure when the landfill is operational.</p> <p>(b) The Hydrogeology Report 2 (Attachment 1) addresses all these matters</p> <p>(c) Hydrogeology Report 2 (Attachment 1) addresses all these matters</p> <p>(d) Hydrogeology Report 2 (Attachment 1) addresses all these matters</p>

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	(d) Provide a quantitative ecological risk assessment to answer questions.	
5.18	<p>The technical review by Tonkin & Tylor Limited of the environmental risk assessment provided with the application has raised a number of questions in addition to the above.</p> <p>(a) Please provide responses to all question in Section 3 of the attached <i>CRC214073 Landfill Compliance Review Woodstock Quarries Limited</i> letter, dated 31 May 2021.</p> <p>Please note that the attached questions may be similar or overlap with the questions asked above. Where questions are similar or overlap, please refer in your responses to the above questions to the responses provided for the external engineering design review.</p>	
6	ECOLOGY	
6.1	<p>It is not clear whether the landscaping bund area and extraction areas B and D have been considered within the AEE.</p> <p>(a) Please confirm if the Ecological Impact Assessment (EIA) has considered the Landscape Bund Area and the Extraction Areas B and D.</p>	The Applicant advises that the “Optional Bunding” shown on Drawing B3 of Appendix 2 Drawings Issue 2 (Attachment 8) is no longer proposed. The areas shown as Extraction Area B, Extraction Area D, Landscape Bund, and Southern Bund are also no longer part of the Application. These areas were not essential to the proposed landfill construction and have therefore not been evaluated.
6.2	Paragraph 118 of AEE concludes no significant indigenous vegetation or habitats within or near the site and that an ecological assessment (presumably the EIA provided by NZ Ecology) confirms this. However, this is not clear from the EIA. The EIA does note that the structure, composition and extent of habitats were mapped (Section 2.2) for the purposes of the herpetofauna assessment. This may inform the AEE’s conclusion.	<p>(a) This matter is addressed in Attachment 4 Letter from Ecology Consultant.</p> <p>(b) This matter is addressed in Attachment 4 Letter from Ecology Consultant.</p>

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	<p>(a) Please provide mapping of vegetation and habitats and an assessment of the ecological significance of vegetation and habitats against Canterbury Regional Policy Statement criteria for ecological significance¹.</p> <p>(b) Please assess the proposal's effects on the ecological values identified by the assessment in (a) above.</p>	
6.3	<p>Paragraph 13 of AEE notes the confirmation of wetlands by the EIA downstream of the disposal area and concludes that no direct linkage occurs between the current or proposed landfill site with these wetlands. However, the Woodstock Stream would appear linked hydraulically to these wetlands and the EIA notes that this would need confirmation (Section 3.1). The EIA further indicates that wetland vegetation is present within the disposal area of beech dieback.</p> <p>(a) Please confirm whether the disposal area within beech die back area is a wetland (EIA, Section 3.1, Figure 6).</p> <p>(b) Please provide an assessment of the hydrological connection between the landfill area (where groundwater is taken, diverted and discharged elsewhere) and confirmed wetland areas. If a hydrological connection exists, please provide an assessment of effects of the proposal in its entirety on these areas.</p>	<p>(a) This matter is addressed in Attachment 4 Letter from Ecology Consultant and concludes that it is not a wetland.</p> <p>(b) An assessment of groundwater matters, including hydrological connection, and includes recommendations for monitoring groundwater is included in Hydrogeology Report 2 (Attachment 1)</p>
6.4	<p>It was evident during the site visit that water discharging in the location of the proposed discharge area would likely emanate in the stream below.</p>	<p>Hydrogeology Report 2 (Attachment 1) includes commentary on this matter. Appendix 6 Ecology Assessment also provides commentary on this.</p>

¹ Wildland Consultants. 2013. Guidelines for the application of ecological significance criteria for indigenous vegetation and habitats of indigenous fauna and wetlands in Canterbury. Contract Report No. 2289c prepared for Environment Canterbury. Available from council online document library

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6.5	<p>During site visit it was explained that water from Woodstock Stream flows through and around the dug-out pond area near south of the stream vehicle crossing, and that the stream or spills out over the far side of it.</p> <p>(a) Please confirm whether the pond will remain in place for future quarry and/or landfill operations.</p> <p>(b) Please confirm whether any the formation and ongoing operation of the pond requires any resource consents.</p> <p>(c) Please provide an assessment of effects of diverting water through the dug-out pond, considering effects on both water quantity and quality.</p>	<p>(a) The Applicant is assessing the future use of this pond.</p> <p>(b) The location of the pond is within the area of this Application.</p> <p>(c) The Applicant is assessing the future use of this pond.</p>
6.6	<p>Paragraph 120 of the AEE concludes that the proposal will unlikely increase pests in the area due to the proposed landfill not providing a food source or habitat for pest species. However, the EIA recommends a site-specific pest animal survey should be completed to obtain baseline information on the number and diversity of pests present at the site. The pest survey is also part of the proposed conditions.</p> <p>(a) Please confirm why the EIA recommends the pest animal survey be completed and whether there is a risk to increase pests at the site although no putrescible and household waste is proposed to be accepted at the landfill.</p> <p>Further, the environmental risk assessment provided with the application states that there is likely to be pests on site and that this could have a moderate impact. A pest control plan is proposed to be implemented if there is an increase in vermin at the site. The pest control measures are also referred to in the proposed conditions; however, it is not clear what these measures entail.</p>	<p>(a) The Applicant is cognisant that there is a perception that landfills can attract pests whereas a well-run landfill is unlikely to have a pest issue. The Applicant has proposed pest animal surveys as being a conservative measure and pre-empting a potential pest issue.</p> <p>(b) Section 5.8 of the Appendix 10 Draft Landfill Management Plan Issue 2 (Attachment 6) includes details of the management of animal pests on the site. Section 6.5 of the Appendix 10 Draft Landfill Management Plan Issue 2 (Attachment 6) includes details of the monitoring of animal pests on the site.</p> <p>(c) The Applicant is keen to work with the relevant authorities, and neighbours, to coordinate pest monitoring and control programmes.</p>

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	<p>(b) Please provide the draft pest control plan or a more detailed description of the mitigation and management measures to be put in place in case pest species increase at the site.</p> <p>(c) Please confirm if the pest control plan will align with any existing pest management programme on the adjoining properties.</p>	
6.7	<p>The EIA notes that habitat within the expansion area is not suitable for lizards with example of habitat typical of the area shown in Figure 10. While we agree that past vegetation clearance would have altered habitats, there appears to have been grassland habitats prior to scrub/shrubland cover, which may have supported a grass skink population, which can persist within small areas within wider disturbance areas, and then disperse.</p> <p>(a) Please confirm what the level of confidence is for the area shown in Figure 10 not to provide Canterbury grass skink habitat. A further survey may be required to confirm this, or additional information on the survey that has been carried out to confirm the effort was reasonable (i.e. information on survey conditions at the time (temperature, cloud cover, precipitation, previous day conditions, etc.; time spent searching; the extent of search (e.g. track-log); high quality photographs of site incl. geo reference information; etc.).</p> <p>(b) Please provide an assessment of actual and potential adverse effects on the following lizard species as a result of the proposed activities:</p> <p>(i) Species listed in EIA: Southern Alps gecko (<i>Woodworthia</i> "Southern Alps"; Not Threatened); McCann's skink (<i>Oligosoma maccanni</i>; Not Threatened).</p>	<p>(a) This matter is addressed in Attachment 4 Letter from Ecology Consultant.</p> <p>(b) This matter is addressed in Attachment 4 Letter from Ecology Consultant.</p> <p>(c) Appendix 10 Proposed Conditions of Consent Issue 2 (Attachment 7) provide details the requirement to implement a Lizard Management Plan.</p> <p>Section 5.7 of Appendix 10 Draft Landfill Management Plan Issue 2 (Attachment 6) includes details of the management of lizards on the site.</p>

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	<p>(ii) Other species potentially present: Canterbury grass skink (<i>Oligosoma polychroma</i> clade 4; At Risk - Declining).</p> <p>(iii) Species less likely to be present but possible: Spotted skink (<i>Oligosoma lineocellatum</i>; Nationally Vulnerable); Jewelled gecko (<i>Naultinus gemmeus</i>; At Risk - Declining).</p> <p>(c) Please describe any mitigation that will be employed.</p>	
6.8	<p>The EIA further recommends a lizard monitoring program is implemented to determine the presence of lizards within the 'expansion area' (excluding area shown in Figure 10). Any Lizard Management Plan (LMP) or monitoring plan would entail alignment with a Department of Conservation wildlife permit (an LMP template is available online).</p> <p>(a) Please confirm whether the recommended lizard monitoring programme (e.g. scoping surveys for presence of lizards) will be implemented at the site and whether this will form part of the resource consent conditions.</p> <p>(b) Please confirm whether a copy of the LMP will be sent to Environment Canterbury.</p> <p>(c) Please confirm contingency provisions where LMP outcomes are not met and how this will be addressed in the resource consent conditions.</p>	<p>(a) Appendix 10 Proposed Conditions of Consent Issue 2 (Attachment 7) provide details the requirement to implement a Lizard Management Plan.</p> <p>(b) A copy of the Lizard Management Plan will be included in the final Landfill Management Plan that will be forwarded to Ecan.</p> <p>(c) The Lizard Management Plan will include contingency provisions. The resource consent conditions include a raft of monitoring and reporting provisions which the Applicant is required to adhere to.</p>
6.9	<p>The EIA recommends a 'site-specific Aquatic Monitoring Program for the Woodstock Stream'.</p> <p>(a) Please clarify that the water quality monitoring program aligns with the proposal regarding any dispersion area of water off the</p>	<p>An assessment of the potential effects on surface waters, for a range of potential contaminants, which includes recommendations for monitoring surface waters is included in Attachment 1 Hydrogeology Report 2.</p> <p>The conditions of Appendix 10 Proposed Conditions of Consent Issue 2 (Attachment 7) provide details of the proposed monitoring programme for surface waters, and the management of detected adverse effects.</p>

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	<p>quarry/landfill, and capable of detecting adverse effects of the activity on the water resources.</p> <p>(b) Please clarify how the monitoring program will allow management to address detected adverse effects.</p>	
7	AIR QUALITY	
7.1	<p>The technical review by Tonkin & Tylor Limited of the air quality assessment provided with the application has raised a number of questions in addition to the above.</p> <p>(a) Please provide responses to all question in Section 4 of the attached <i>CRC214073 Landfill Compliance Review Woodstock Quarries Limited</i> letter, dated 31 May 2021, including:</p> <ul style="list-style-type: none"> (i) The extent that gas generation may occur and how potential odorous hydrogen sulphide (H₂S) will be managed; (ii) An assessment of air quality effects associated with the combustion of the generated landfill gas; (iii) An assessment of the Frequency, Intensity, Duration, Offensiveness and Location (FIDOL) prepared in accordance with Schedule 2 of the CARP and the Ministry for the Environment <i>Good Practice Guide for Assessing Odour</i>. 	<ul style="list-style-type: none"> (i) The Applicant recognised at an early stage of the project that the generation of hydrogen sulphide and other odorous VOCs is a possibility and has proposed to install a Landfill Gas (LFG) at a very early stage of the project. This will ensure that any gases, which will be a mixture of mainly methane and other gases (including hydrogen sulphide) can be captured and destroyed in a flare. (ii) The primary purpose of installing an LFG destruction system is to destroy gases that are harmful to the environment or may cause nuisance. The conditions in Appendix 10 Proposed Conditions of Consent Issue 2 (Attachment 7) details how LFG is to be combusted in accordance with best practice. (iii) A preliminary FIDOL is shown as Attachment 10 Preliminary FIDOL Assessment
7.2	<p>Questions 1.1 and 1.5 above request further information and an assessment of the discharges of dust from quarrying activities against the relevant CARP rules.</p> <p>(a) If the permitted activity rules cannot be complied with, please provide a full assessment of actual and potential adverse effects of the handling and or storage of bulk solid materials. As raised in the</p>	<p>(a) The Applicant currently complies with the CARP Rules.</p> <p>(b) The conditions in Appendix 10 Proposed Conditions of Consent Issue 2 (Attachment 7) details how dust management is required to be implemented. Section 5.2 of the Appendix 10 Draft Landfill Management Plan Issue 2 (Attachment 6) provides updated details of the management of dust.</p>

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	<p>technical review by Tonkin & Tylor Limited (Section 4 – Review of effects on air quality assessment in AEE), this should include a qualitative FIDOL assessment of potential dust effects undertaken in accordance with the Second Schedule of the CARP and the MfE <i>Good Practice Guide for Assessing Dust</i>, taking account of local wind conditions that have the potential to propagate dust discharges from the site.</p> <p>(b) If a resource consent is required, please provide proposed consent conditions that reflect the operation of the quarry in terms of key dust management measures.</p>	
8	CONSULTATION	
8.1.	<p>The application states that consultation with the Department of Conservation and Mahaanui Kurataiao Limited has commenced.</p> <p>(a) Please provide an update on the outcome of consultation efforts made with the above parties.</p> <p>(b) Please confirm if any other parties such as neighbouring property owners and/or occupiers have been consulted.</p>	<p>a) Attachment 9 provides a summary of consultation with Department of Conservation and Mahaanui Kurataiao Limited.</p> <p>b) There has not been any consultation with the neighbouring property owners and / or occupiers.</p>
	BOND	
5.19	<p>The risk assessment appears to describe the current risks and how these are to be mitigated and controlled while the landfill is operational and within the closure and aftercare stages. However, waste materials will be buried at the site in perpetuity and future risks after the 20 to 30 years of aftercare have not been considered.</p> <p>In most instances, landfills are (partially) owned and operated by local councils or publicly owned entities, which provides some certainty that</p>	<p>There are many landfills, and mine sites, around New Zealand that are owned and operated by private companies, and the use of a bond is common practice. The responses to the specific questions on the left are shown below:</p> <p>a) The site will be monitored and managed by the consent holder during the aftercare period. The consent authorities will determine how long the aftercare</p>

Item	Requested Information	Response
	<p>adverse effects will be addressed even after the aftercare period. A bond is proposed by the applicant to ensure appropriate stewardship and ongoing management of the landfill site in the event of an adverse event or default by the consent holder up to the completion of the aftercare period. The bond period will be a minimum of 25 years and can be extended if a risk assessment carried out 25 years after landfill closure indicates that the landfill continues to pose a threat to the environment.</p> <p>To assess the likelihood of the necessity to exercise the bond, further information is needed:</p> <ul style="list-style-type: none"> (a) Please confirm how and by who the site will be monitored and managed post-aftercare period. Please provide more information regarding the extent of monitoring and mitigation necessary post-closure and post-aftercare. (b) Please confirm whether the leachate collection system still remain in place and what the ongoing maintenance and management will be. (c) If the leachate collection system is no longer actively managed following the closure and/or aftercare period, please confirm the risk of the system to create preferential pathways for contaminant transport. (d) Please confirm what the risk of a major liner breach would be post-aftercare (e.g. from a significant earthquake) and what the remedial actions and/or mitigation options would be to address the liner breach. (e) Please confirm what the risk of a major capping layer breach would be post-aftercare (e.g. from a significant earthquake) and what the 	<p>period will be and can only end the aftercare consents once they are satisfied that there is no residual risk to the environment.</p> <ul style="list-style-type: none"> b) The leachate system will remain in place and be maintained by the consent holder until the consent authorities are satisfied that there is no residual risk to the environment and the leachate system can be sealed up. c) The leachate system will remain in place and be maintained by the consent holder until the consent authorities are satisfied that there is no residual risk to the environment and the leachate system can be sealed up. d) The consent authorities will determine how long the aftercare period will be and can only end the aftercare consents once they are satisfied that there is no residual risk to the environment, including the risk of a major liner breach. e) The consent authorities will determine how long the aftercare period will be and can only end the aftercare consents once they are satisfied that there is no residual risk to the environment, including the risk of a major capping layer breach. f) The consent authorities will determine how long the aftercare period will be and can only end the aftercare consents once they are satisfied that there is no residual risk to the environment, and that the waste has stabilised sufficiently.

Item	Requested Information	Response
	<p>remedial actions and/or mitigation options would be to address the liner breach.</p> <p>(f) Please confirm the risks of contaminant release from leachate generation due to post-aftercare the liner or cap breach. In doing so, please confirm whether the waste is likely to have stabilised sufficiently to pose a low risk post-aftercare, or whether a liner or cap breach could remobilise contaminants in the now stabilised waste.</p>	
9.1.	<p>The technical review by Tonkin and Taylor Limited recommends that the bond conditions be streamlined and updated to provide a tighter scope and better focus on the key issues.</p> <p>(a) Please provide updated bond conditions that are line with recent research and development of the principles of landfill bonds elsewhere in New Zealand.</p>	<p>The Conditions for the proposed Auckland Regional Landfill have been reviewed and the Applicant considers that the bond conditions proposed for the Woodstock Landfill to be far more focused than those associated with the Auckland Regional Landfill.</p> <p>The Applicant considers that the methodologies for calculating the Bond are essentially identical and are consistent with each other.</p>