I hereby give notice that a hearing by commissioners will be held on:

Dates:	**Monday 9 - Thursday 12 November 2020** **Tuesday 17 - Friday 20 November 2020** **Tuesday 24 - Friday 27 November 2020** **Monday 30 November - Thursday 3 December 2020** **Tuesday 8 - Friday 11 December 2020** **<u>Overflow days should the panel require them</u>** **Wednesday 16 - Friday 18 December 2020**
Time:	**9.30am each day**
Meeting Room:	**Warkworth Town Hall**
Venue:	**2 Alnwick Street, Warkworth**

HEARING REPORT – RESOURCE CONSENT

1232 STATE HIGHWAY 1, WAYBY VALLEY

WASTE MANAGEMENT NZ LIMITED

COMMISSIONERS

Chairperson	**Sheena Tepania**
Commissioners	**Alan Watson**
	David Mead
	Wayne Donovan
	Michael Parsonson

Sam Otter
SENIOR HEARINGS ADVISOR

Telephone: 09 353 9587 or 021 196 2582
Email: sam.otter@aucklandcouncil.govt.nz
Website: www.aucklandcouncil.govt.nz

Note: The reports contained within this document are for consideration and should not be construed as a decision of Council. Should commissioners require further information relating to any reports, please contact the hearings advisor.

WHAT HAPPENS AT A HEARING

At the start of the hearing, the Chairperson will introduce the commissioners and council staff and will briefly outline the procedure. The Chairperson may then call upon the parties present to introduce themselves to the panel. The Chairperson is addressed as Mr Chairman or Madam Chair.

Any party intending to give written or spoken evidence in Māori or speak in sign language should advise the hearings advisor at least five working days before the hearing so that a qualified interpreter can be provided.

Catering is not provided at the hearing. Please note that the hearing may be audio recorded.

Scheduling submitters to be heard

A timetable will be prepared approximately one week before the hearing for all submitters who have returned their hearing appearance form. Please note that during the course of the hearing changing circumstances may mean the proposed timetable is delayed or brought forward. Submitters wishing to be heard are requested to ensure they are available to attend the hearing and present their evidence when required. The hearings advisor will advise submitters of any changes to the timetable at the earliest possible opportunity.

The Hearing Procedure

The usual hearing procedure is:

- The applicant will be called upon to present his/her case. The applicant may be represented by legal counsel or consultants and may call witnesses in support of the application. After the applicant has presented his/her case, members of the hearing panel may ask questions to clarify the information presented.
- The relevant local board may wish to present comments. These comments do not constitute a submission however the Local Government Act allows the local board to make the interests and preferences of the people in its area known to the hearing panel. If present, the local board will speak between the applicant and any submitters.
- Submitters (for and against the application) are then called upon to speak. Submitters may also be represented by legal counsel or consultants and may call witnesses on their behalf. The hearing panel may then question each speaker. The council officer's report will identify any submissions received outside of the submission period. At the hearing, late submitters may be asked to address the panel on why their submission should be accepted. Late submitters can speak only if the hearing panel accepts the late submission.
- Should you wish to present written information (evidence) in support of your application or your submission please ensure you provide the number of copies indicated in the notification letter.
- Only members of the hearing panel can ask questions about submissions or evidence. Attendees may suggest questions for the panel to ask but it does not have to ask them. No cross-examination - either by the applicant or by those who have lodged submissions – is permitted at the hearing.
- After the applicant and submitters have presented their cases, the chairperson may call upon council officers to comment on any matters of fact or clarification.
- When those who have lodged submissions and wish to be heard have completed their presentations, the applicant or his/her representative has the right to summarise the application and reply to matters raised by submitters. Hearing panel members may further question the applicant at this stage.
- The chairperson then generally closes the hearing and the applicant, submitters and their representatives leave the room. The hearing panel will then deliberate "in committee" and make its decision.
- Decisions are usually available within 15 working days of the hearing.

A NOTIFIED NON-COMPLYING ACTIVITY RESOURCE CONSENT APPLICATION BY WASTE MANAGEMENT NZ LIMITED

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Attachment Three	List of Submissions The full submissions have not been re-produced in this agenda. They can be found at https://www.aucklandcouncil.govt.nz/have-your-say/hearings/find-hearing/Pages/resource-consent-hearing-documents.aspx?HearingId=299	593-608
Attachment Four	Written Approvals	609-612
Attachment Five	Local Board comments	613-620
Attachment Six	Draft Conditions	621-688

Mark Ross, Planner

Reporting on an application to construct and operate and landfill at 1232 State Highway 1, Wayby Valley. The reporting officer is recommending, subject to contrary or additional information being received at the hearing, that the application be **REFUSED**.

APPLICANT: WASTE MANAGEMENT NZ LIMITED

Report on notified application for resource consents under the Resource Management Act 1991 (RMA)

Non-complying activity

To:	Independent Hearing Commissioners
From:	Mark Ross, Consultant Planner
Hearing date:	Commencing 9 November 2020

Note:

- This is not the decision on the application.
- This report sets out the advice and recommendation of the reporting planner.
- This report has yet to be considered by the independent hearing commissioners delegated by Auckland Council to decide this application for resource consents.
- The decision will be made by the independent hearing commissioners only after they have considered the application and heard from the applicant, submitters and council officers.

1. Application description

Application and property details

Application number:	BUN60339589 – please see section 4 'reasons for the application' for consent number details of each relevant component of this application
Applicant's name:	Waste Management NZ Limited
Site address:	1232B State Highway 1, Wayby Valley
Auckland Unitary Plan (Operative in part)	
Zoning:	Rural – Rural Production Zone
Overlays, controls, special features, designations, etc:	Natural Stream Management Areas Overlay Significant Ecological Areas Overlay Wetland Management Areas Overlay Outstanding Natural Landscapes Overlay

	Designation – 9101, Taupaki to Topuni Gas Pipeline, First Gas Limited
	Designation – 6500, Petroleum Pipeline – Rural Sections – New Zealand Refining Company Limited
	Designation – 6763, State Highway 1: Puhoi to Topuni, New Zealand Transport Agency
	Notice of Requirement, Warkworth to Wellsford Project, Notified
	Private Plan change 42 – Auckland Regional Landfill, Zone, Notified
Lodgement date:	30 May 2019
Notification date:	26 March 2020
Submission period ended:	26 May 2020
Number of submissions received:	10 in support
	958 in opposition
	12 neutral
	1 indeterminate

Locality Plan

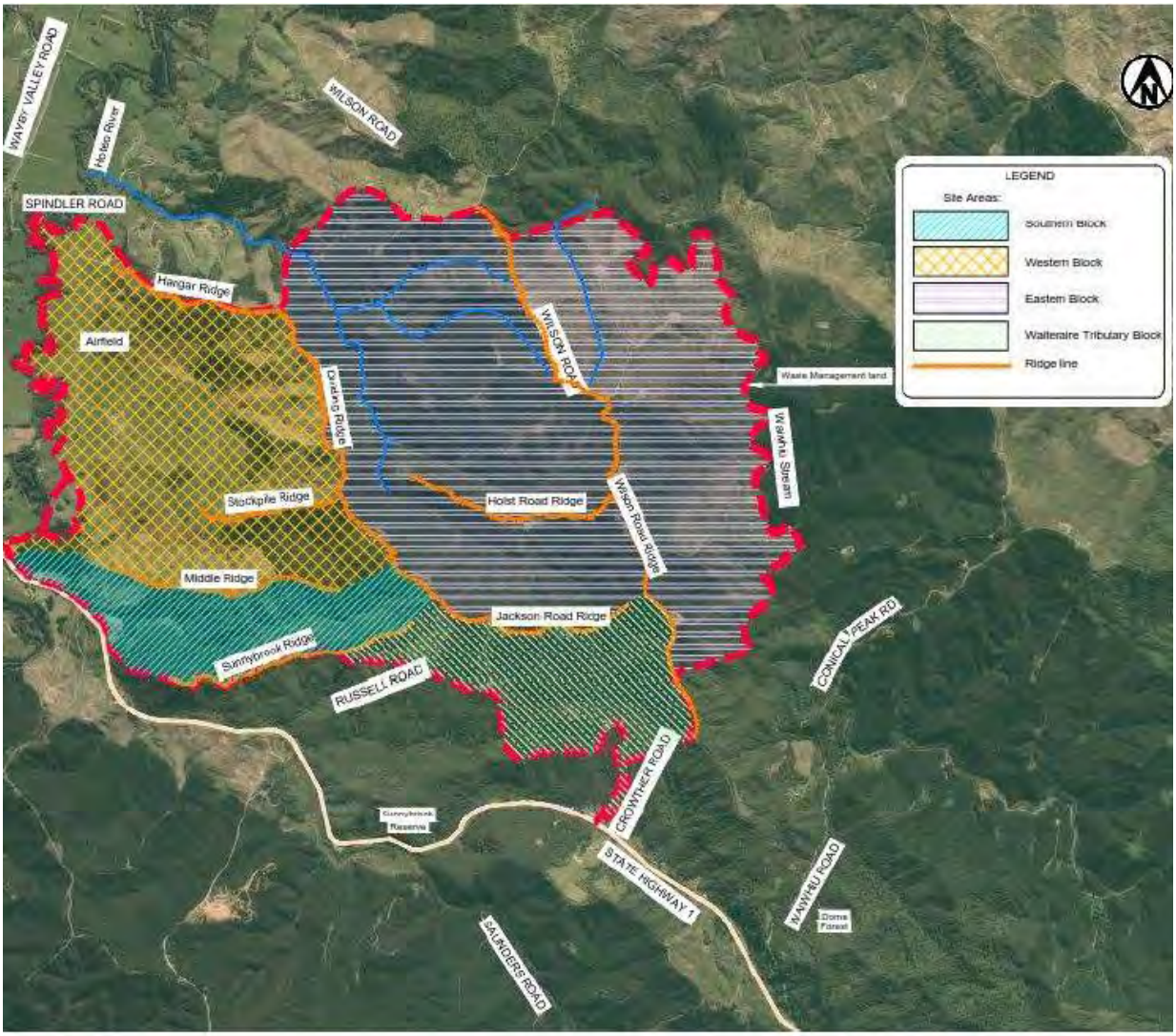


Figure 1: Aerial photograph showing subject site and its surroundings – Source, Figure 4.2 of the submitted AEE

Application documents

The application documents and plans are set out as follows and included in attachment 1 of this report.

Adequacy of information

The information submitted by the applicant is sufficiently comprehensive to enable the consideration of the following matters on an informed basis:

- The nature and scope of the proposed activity that the applicant is seeking resource consent for.
- The extent and scale of the actual and potential effects on the environment.
- Those persons and / or customary rights holders who may be adversely affected.
- The requirements of the relevant legislation.

Report and assessment methodology

The application is appropriately detailed and comprehensive and includes a number of expert assessments. Accordingly, no undue repetition of descriptions or assessments from the application is made in this report.

I have made a separate and independent assessment of the proposal, with the review of technical aspects by independent experts engaged by the Council, as required.

Where I agree with descriptions or assessments provided in the application material, I have identified that agreement in this report.

Where professional opinions differ, or extra assessment and / or consideration is needed for any reason, the relevant points of difference of approach, assessment, or conclusions are detailed.

The assessment in this report also relies on reviews and advice from the following specialists:

- Alan Pattle, Specialist – Landfill Engineering
- Steve Cavanagh, Specialist – Development Engineering
- Ross Roberts, Specialist – Geotechnical Engineering
- Aslan Perwick, Specialist – Hydrogeology
- Stephen Crane, Specialist – Water Allocation
- Gary Black, Specialist – Traffic Engineering
- Fiona Harte, Specialist – Regional Earthworks
- Arsini Hanna, Specialist - Stormwater and Industrial and Trade Activities
- Don Tate, Specialist – Dam Safety
- Paul Crimmins, Specialist – Air Quality
- Sharon Tang, Specialist – Human Health Risk
- Natalie Webster, Specialist – Waste Acceptance and Environmental Risk
- Mark Lowe, Specialist – Streamworks (Freshwater Ecology)
- Simon Chapman, Specialist – Terrestrial Ecology
- Peter Kensington, Specialist – Landscape Architect
- John McKensey, Specialist – Lighting
- Jon Styles, Specialist – Noise and Vibration
- Shyamal Maharaj and Shane Martin, Specialists - Economics
- Joe Mills, Specialist – Historic Heritage

These assessments are included in attachment 2 of this report.

Qualifications and experience

My full name is Mark Andrew Ross. I am a consultant planner at Sentinel Planning Limited, a company that provides independent and professional advice and services related to planning, resource management, resource consenting and plan-making. I hold a Bachelor of Science specialising in resource and environmental planning from the University of Waikato. I am a full member of the New Zealand Planning Institute. I have a total of 19 years planning experience working for local authorities and the private sector in New Zealand and the United Kingdom. In my current position with Sentinel Planning Limited, I am responsible for supervising and mentoring fellow work colleagues as well as managing my own caseload of both private consents and the processing of consents for Auckland Council. I have processed a number of large infrastructure projects, including resource consents, notice of requirements and outline plan of works for roading, wastewater and stormwater projects. These include works associated with the Western Ring Route (State Highways 16 and 18), the Northern Corridor Improvement Project (State Highways 1 and 18) and the Central Interceptor. I have not had any prior involvement with processing landfill consents.

This report is prepared by: Mark Ross, Consultant Planner, Sentinel Planning

Signed:

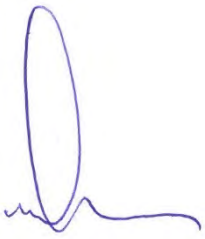
Date: 23 September 2020

Reviewed and approved for release by: Warwick Pascoe

Principal Project Lead

Premium Resource Consents

Signed:



Date: 24 September 2020

2. Executive summary

Waste Management NZ Limited has applied to Auckland Council for a range of district and regional land use, streamworks, discharge and water resource consents associated with the construction and operation of a landfill at 1232B State Highway 1, Wayby Valley. Overall, the activities are classified as non-complying.

There are numerous relevant matters that require consideration, with the key issues including:

- Cultural values;
- Land stability / geotechnical;
- Groundwater diversion and dewatering;
- Flooding;
- Freshwater and terrestrial ecology;
- Landfill liner installation and quality (to address leachate leakages);
- Leachate quality, collection and disposal;
- Sedimentation discharges;
- Stormwater discharges;
- Discharges from industrial and trade activity processes;
- Air discharges;
- Environmental and human health risks;
- Landscape and visual effects;
- Traffic safety;
- Rural character and amenity.

Having reviewed the documentation submitted as well as taking into account the expert assessments provided by Council's specialists and the content of the submissions received, I consider that, in most respects, the subject site is well suited for the development of a landfill.

Its location along State Highway 1 ensures that it will be readily accessible, while the level of traffic generated and the design of the roundabout access into the site along with the upgrades being undertaken along the state highway will ensure that traffic safety is not compromised.

The location of the working landfill centrally within the site is such that it will be suitably separated from sensitive receivers, with associated adverse landscape and visual amenity and operational effects, including noise and air discharges, able to be internalised or addressed through the mitigation measures proposed.

The construction of a quality landfill lining system and a leachate collection and disposal system will ensure that generated leachate will be highly unlikely to leak into the surrounding environment, with rigorous monitoring proposed to ensure that any leaks that do result can be identified and remediated. While the liner is the key leachate control mechanism, the site's geology will assist with assimilating the small amounts of leachate leakage predicted to occur over the lifetime of the landfill without resulting in groundwater contamination that would result in adverse environmental or human health effects, although further testing is required to confirm this (which can be achieved by condition).

Other adverse effects from sedimentation, stormwater runoff and industrial and trade activity discharges will be addressed by the control and stormwater quality treatment measures proposed, which in combination with the measures proposed to manage leachate and air discharges, ensures that the risk of adverse human health and environment effects will be suitably addressed.

However, in order to establish the landfill, approximately 14 km of streams will be reclaimed. Notwithstanding the requirement to avoid such activity in the first instance, the ecological effects management package proposed will not be sufficient to achieve a no net loss of ecological values outcome and residual adverse effects are likely to remain. Furthermore, there is uncertainty that some of the compensation measures detailed within the effects management package will achieve the ecological benefits proposed, such that the true extent of unaddressed residual adverse effects will be unlikely to be known. This is not acceptable in respect of freshwater ecology outcomes, particularly in circumstances where the ecological values of the streams being reclaimed are 'very high'. These works and the proposed vegetation removal and wetland reclamation works will also result in adverse effects with respect to Hochstetter's frogs, fernbird, spotless crake and Australasian bittern that cannot be reduced to levels that are minor or less.

There are also cultural values effects to consider, an evaluation of which can only be undertaken once these matters have been presented by Mana Whenua to the commissioners at the hearing, and discussed further in the necessary level of detail.

I therefore consider that adverse ecological effects will be more than minor and unacceptable. The appropriateness of the landfill in all other aspects does not reduce the scale of the effects to a minor level or allow for them to be considered acceptable, nor do the likely positive effects.

For similar reasons to those outlined above, the development will be consistent with a number of the provisions within the applicable planning documents. However, it will be inconsistent with (but not contrary to) those relating to the protection of ecological and biodiversity values in terrestrial and freshwater systems from the adverse effects of development and potentially those that relate to the interests, values and customary rights of Mana Whenua in the sustainable management of natural and physical resources and the protection of cultural landscapes of significance to Mana Whenua.

Accordingly, while the development would meet the objective and policy test of s104D, it does not meet the relevant statutory tests of s104 and 104B of the RMA and I consider that it will not achieve the purpose of the RMA as outlined in s5. Unless further evidence is presented at the hearing that alters this assessment, I recommend that consent be **REFUSED**.

The detailed reasons for this conclusion are substantiated within the body of this report.

3. The proposal, site and locality description

Proposal

A description of the proposed development is contained in sections 5 to 7 of the submitted Assessment of Effects on the Environment (AEE) from pages 41 to 75. I refer to and adopt

the information contained in the AEE for a detailed description of the proposed works along with supplementary information in the submitted specialist assessments. With the above in mind, I note the following salient points below, with specific reference made to those parts of the application that have been modified and may differ from the referenced sections of the AEE.

General Landfill Details

- The proposed landfill will have a footprint of approximately 60 hectares, with capacity to contain approximately 25.8 million m^3 of municipal solid waste. This includes residential, commercial, construction and demolition waste, industrial waste that meets strict acceptance criteria, and contaminated soils. Hazardous substances such as explosives, flammable liquids (petrol, diesel etc.), infectious substances and radioactive material will not be accepted. The landfill will be located within what the AEE refers to as the Eastern Block, and specifically within the area referred to as Valley 1.

- Noting the location of the landfill within the Eastern Block and away from State Highway 1, an access road is proposed from a point approximately 100m east of the boundary with 1207 State Highway 1. The accessway will be approximately 2km long will provide access from State Highway 1 to the landfill tipping face and other associated landfill amenities (the working landfill).

- A bin exchange area is proposed adjacent to the entrance from State Highway 1. Waste will be delivered to this area by road haulage trucks in specially designed sealed bins, which will then be exchanged for empty bins, allowing the trucks to leave the site without travelling to the tipping face. Specially designed mule trucks will then transport the bins to the tipping face for disposal, with the empty bins then returned to the exchange area. Vehicles without sealed bins will travel directly to the tipping face to allow for disposal. It is estimated that 25% of trucks will use the bin exchange area with the remaining 75% proceeding directly to the tipping face. A building containing amenities for drivers and office space will be located within the bin exchange area. Existing vegetation will remain around the perimeter of the bin exchange area, and along with additional planting will provide for screening from State Highway 1.

- Amenities proposed in proximity to the landfill tipping face include a weighbridge, a wheel wash, a leachate collection tank, and staff office and workshop buildings. A renewable energy centre will also be constructed to allow for electricity generation from the combustion of landfill gas.

- In addition to the above buildings, a series of stormwater ponds and a wetland are proposed immediately to the west of the landfill toe. A temporary pond is also proposed to the east of the landfill during initial landfill operations. A large soil stockpile (stockpile 1) is proposed to the west of the landfill, with a clay borrow area located further to the west. A smaller topsoil stockpile is also proposed. A series of roads will be constructed to provide access between these various amenities (including the buildings referred to above) and the main access road. It is noted that stockpile 2, which was originally proposed to the east of the landfill, is no longer proposed.

- The working face of the landfill will operate from 5am to 10pm Monday to Saturday and 7am to 5pm on Sunday, with the bin exchange area to operate 24 hours a day. Approximately 45 staff will be required to operate the landfill along with a range of

vehicles, including bulldozers, excavators, compactors, water trucks and utility vehicles. The area of landfill exposure will generally be no greater than 80m by 80m at any one time.

- Lighting is proposed at the site entrance (from State Highway 1), within the bin exchange area, around the main office and staff car park area, and at the landfill tipping face. No lighting is proposed along the access road. Lighting at the tipping face will be via a portable lighting rig. A range of measures including the use of low-level and directional lighting, downlights and shields will be implemented to address adverse effects associated with glare and light spill.

Landfill Design and Management

- Earthworks will be undertaken to allow for the formation of the landfill area and all associated amenities, including formation of roads and creation of the ponds, wetlands, soil stockpiles and clay borrow areas. These works are expected to occur over a five-year period, with the landfill not accepting waste until they are completed. Construction noise, vibration and traffic management plans are proposed to manage associated adverse effects.

- The entire landfill area will not be formed at once, but will be separated into seven stages with each designed to have approximately five years of capacity. Earthworks are also required in association with cover and capping operations. In total, earthworks are proposed over an area of approximately 136.4 hectares and will involve a volume of 5.5 million m^3, noting that there will be on-going earthworks throughout the lifetime of the landfill.

- Once earthworks are completed within the proposed landfill area, a lining system will be installed, the purpose of which is to contain leachate within the landfill and prevent it from seeping into underlying soils. The lining system will include the placement of compacted clay (sourced from the clay borrow area) above the formed landfill area, with a high-density polyethylene (HDPE) flexible membrane liner and additional sealing and protective layers placed above the clay. A drainage layer is then placed above to collect leachate (the liquid produced when water percolates through landfill material) in order to minimise pressure on the liner and the potential for leakage. Leachate will be collected and stored in a holding tank, and as far as practical, will be recirculated into the landfill (to allow for additional biodegradation opportunities). All leachate that cannot be redistributed will initially be transported offsite for treatment, with this likely to be the applicant's Redvale facility. Once sufficient landfill gas is available, an evaporator or equivalent treatment technology will be installed on-site to allow for on-site treatment, such that off-site transportation will no longer be required.

- Landfill gas will be collected through a series of extraction wells installed throughout the landfill, which will be delivered to the proposed renewable energy centre for electricity generation purposes. A total of 14 1MW generators will be installed within the centre, being installed progressively as landfill gas generation increases. However, only a maximum of 12 generators will operate at any one time, with the additional generators required to allow for programmed maintenance. Any excess gas collected will be flared.

- All water that enters the landfill will be treated as leachate and will be collected by the leachate drainage system. Upgradient stormwater will be diverted and drained around

and underneath the working landfill and will flow to the proposed stormwater ponds. Stormwater from the areas around the working landfill, being the office and workshop buildings, the wheel wash, the renewable energy centre and associated access roads (other than the main access road) will be diverted to a range of treatment devices and then onto the proposed stormwater ponds. The ponds and wetland will provide both detention and stormwater quality treatment functions. Stormwater quality treatment for the main access road will be via filter strips, with the bin exchange area runoff diverted to two rain gardens.

- Landfill cover (which will be sourced from the soil stockpiles) will be placed on top of the landfill to minimise leachate generation and landfill gas discharges and to reduce the exposure of waste and adverse effects associated with odour, windblown waste, vermin and birds. This will be applied on a daily and intermediate basis and as a final cap when the landfill reaches its design capacity. The final cap will be compacted clay on top of the upper level of waste, with subsoil and topsoil above and then grass. Any vegetation in addition to the grass will be selected at the time, with species needing to be shallow rooted to ensure that they do not penetrate the lower clay cap.

- To ensure that the required on-going monitoring and management of the various landfill operations occur, a range of management plans will be designed and implemented for the lifetime of the landfill (including an after-care period following closure), including with respect to: leachate, groundwater, stormwater, landfill gas and sedimentation. A post closure management plan will be prepared a minimum of two-years after closure to address the on-going measures required to ensure that the site is stabilised appropriately and that environmental controls in respect of stormwater, leachate and landfill gas are suitably managed.

Traffic

- The landfill will be accessed from State Highway 1 with a new roundabout proposed to allow for this. The roundabout will have a single circulation lane with a 40m diameter central island. The AEE notes that consultation with the New Zealand Transport Agency (NZTA) has occurred with respect to design requirements, with the design to be subject to further detailed design and safety audit requirements. This is confirmed in the submission from NZTA.

- Approximately 740 vehicle movements (both inbound and outbound) are anticipated per day, with approximately 55 movements proposed during morning and evening peak hours. Most vehicles will approach the site from the south along State Highway 1, noting that this would change, with most vehicles approaching from the north if the Warkworth to Wellsford highway upgrade is consented and constructed. However, as there is no certainty that this will occur, traffic has been modelled based on a majority southern approach.

- The access road into the site will be just under 2 km in length, extending from the proposed roundabout to the working landfill. The width of the road will be 7.2m with an overall gradient of approximately 7.4%, with a design of less than 8% required to allow for use by refuse trucks.

- To allow for the proposed access road to be constructed, a bridge is proposed over the Waiteraire Stream and a 105 m culvert is proposed approximately three quarters of the

way along its length.

Water Take

- A previously drilled (and consented) bore is located to the southeast of the landfill office building and will be utilised to allow for a potable water supply. While it is anticipated that the daily demand will be 20m^3, consent is sought for a take and use of up to 50m^3 per day.
- To allow for a non-potable water supply for dust suppression, vehicle washing, road washing and firefighting purposes, a 150m^3 per day take is proposed from the stormwater ponds.

Streamworks and Vegetation Clearance

- To allow for the development of the proposed landfill area and associated works, including the access road, the following streamworks and vegetation clearance works are proposed:
    - Removal of approximately 86.88 hectares of plantation forestry, approximately 9.11 hectares of wattle forest, approximately 4.83 hectares of indigenous regenerating forest, approximately 0.67 hectares of indigenous mature forest and 17.3 hectares of pasture
    - Installation of a 105 m length culvert.
    - Approximately 13,915 m of stream reclamation, including approximately 7,724 m of intermittent streams and 6,191 m of permanent streams. This excludes approximately 1,300 m of reclamation associated with stockpile 2, given that this stockpile is now no longer proposed.
    - Approximately 1.37 hectares of wetland reclamation, including approximately 0.7 hectares of indigenous wetland, 0.64 hectares of exotic wetland and 0.03 ha of kahikatea pukatea forest.
- To address adverse effects associated with these works, a range of measures are proposed by the applicant, including:
    - Enhancement and / or protection of approximately 15 km of identified streams within and outside the applicant's landholdings and within a further 30km of streams that are yet to be identified.
    - Planting of approximately 9.9 hectares of native terrestrial vegetation within the applicant's landholdings.
    - Protection via covenant of 111.9 hectares of indigenous forest outside the applicant's landholdings.
    - Planting and protection of approximately 4.63 hectares degraded wetlands within the subject site.
    - Planting of wetland buffers of 10 m or 5 m around significant ecological area (SEA) and non-SEA wetlands within the subject site, with a total area of approximately 15.18 hectares.

- Covenant protection of all wetland habitats within the subject site, being an area of approximately 25.59 hectares.
- The implementation of a general ecological management plan and a range of specific management plans relating to Hochstetter's frogs, long-tailed bats, avifauna, lizards, fish, invertebrates and vegetation.
- Pest management over an area of approximately 856.9 hectares within and outside the applicant's landholdings.

- In addition to the proposed planting for ecological purposes, shelterbelt and additional plantings are proposed to provide visual screening of the site entrance, bin exchange area and working landfill, both during its operation and upon closure.

Other Amenities

- The AEE notes that walking and cycling opportunities will be provided within the applicant's landholdings where practical and that additional recreational opportunities, including mountain bike tracks, will be explored within the adjoining Sunnybrook Scenic Reserve, noting that the latter would require landowner approval.

Site, locality, catchment and environs description

A description of the subject site and the surrounding location, including the associated natural and human environment characteristics, is contained in section 4 of the submitted AEE from pages 23 to 38. I refer to and adopt these details as contained in the AEE for the purpose of describing the subject site and its surroundings, along with the supplementary details in the submitted specialist assessments, and note the following salient points below:

- The subject site is a large landholding consisting of numerous parcels of land with a total area of approximately 1,020 hectares that is located on the northern side of State Highway 1 and to the west of Wayby Valley Road, Wayby Valley. At its closest points, the subject landholding is approximately 3km southeast of Wellsford and 8km northwest of Warkworth. The site is of irregular shape and undulating topography.

- As detailed in the AEE, the subject site is essentially separated into four areas based on topography and land use, as shown in Figure 1. These are described below:
  - The Eastern Block, being an area of pine forest within an area characterised by a series of steep ridges and valleys. It is within this area that the working landfill is proposed (Valley 1), along with the proposed stormwater ponds and wetland and associated buildings.
  - The Western Block, being an area of undulating land that is occupied by Springhill Farm and an airfield, with the Hōteo River running along most of its western boundary. Stockpile 1, the topsoil stockpile and the clay borrow area are located within this portion of the site.
  - The Southern Block, being a strip of vegetated land between a ridgeline to the north that separates it from Springhill Farm and a ridgeline to the south that separates it from Sunnybrook Scenic Reserve. The proposed access road and bin exchange area will be located in this portion of the site.

- The Waiteraire Tributary Block, being an area of pine forest and native vegetation located on the southern side of a ridgeline that separates it from the Eastern and Southern Blocks. With stockpile 2 no longer proposed, no works associated with the landfill are proposed in this area, although Crowther Road, which runs along its eastern side, will be used for construction access.

- The subject site contains a number of permanent and intermitted streams, all of which are tributaries to the Hōteo River and some of which are subject to natural stream management area overlays. Some are also located within significant ecological area overlays. None of the streams within the working landfill footprint are affected by these overlays, although it is noted that a small portion of the culvert and associated works will be within the natural stream management area overlay within the Southern Block. The ecological values of the streams in the Eastern and Southern Blocks are assessed as being very high.

- There are wetlands located within the Western Block, two of which are subject to wetland management area overlays. No works associated with the provision of landfill amenities are proposed to the wetlands within these overlays, other than the proposed offset planting works.

- An outstanding natural landscape overlay, referred to as Area 32, Dome Forest (sizable area of steeply dissected hill country containing a sequence of prominent ridges that are covered in mature remnant forest), runs through the southern portion of the site and within parts of the Eastern, Southern and Waiteraire Tributary Blocks. No works are proposed within this area of outstanding natural landscape overlay.

- A range of fauna is located within the site, including bats, birds, frogs, lizards and invertebrates. Two species are classified as threatened-nationally critical (long-tailed bat and the Australian bittern), with three species (fernbird, spotless crake and Hochstetter's frog) being at risk-declining. A range of introduced mammals including possums, pigs, goats, feral cats, rats and mustelids are also present on site.

- In terms of vegetation, a majority of the site is covered with Pine forest (approximately 729 hectares), with another 213 hectares utilised as pasture. The remaining land is covered with native vegetation, including a mixture of puriri, kahikatea, tararie, tawa, kauri and manuka.

- Dwellings at 1232, 1232A and 1282 State Highway 1 are located to the west, being directly adjacent to the Western and Southern Blocks. They are located on relatively low-lying land and will have a level of visibility of the proposed clay borrow area, stockpile 1, and potentially, the topsoil stockpile, all of which will be located within the Western Block. Visibility of the remainder of the landfill operation will be limited. It is noted that the site at 1232 State Highway 1 is now owned by the applicant with 1282 State Highway 1 being a property identified for purchase by NZTA to facilitate their proposed Warkworth to Wellsford State Highway upgrade.

- 70, 72, 74, 76 and 78 Spindler Road are located to the north of the Western Block. They are located over a ridgeline and are at a lower level such that there will be no visibility of any portion of the proposed landfill from dwellings on these properties.

- Sunnybrook Scenic Reserve is located to the south, in between the Southern and Waiteraire Tributary Blocks. It is covered entirely with dense vegetation. 762, 776 and 792 State Highway 1 are located to the south of Sunnybrook Scenic Reserve, being the only other landholdings on the northern side of State Highway 1 adjacent to the applicant's landholdings. The presence of dense vegetation and topographical differences are such that dwellings on these properties will have no visibility of any portion of the proposed landfill.
- Land to the east is occupied by a mixture of pine forests and native vegetation. The closest dwellings are located on 149, 172 and 190 Waiwhiu Road with intervening vegetation and topographical differences being such that the proposed landfill will not be visible from the dwellings on these properties.
- There are no other matters that require further detail, noting that the relevant environmental characteristics (e.g. geology, groundwater, wind, noise, rainfall, air quality etc.) are detailed in section 4 of the AEE and as necessary in the submitted specialist reviews.

4. Reasons for the application

Resource consents are required for the following reasons:

Auckland Unitary Plan (Operative in Part)

Land use consents (s9) – LUC60339671

District

Land Disturbance – District

- The undertaking of earthworks over an area of approximately 136.4 hectares within a rural zone, is a **restricted discretionary activity** under Rule E12.4.1(A6)
- The undertaking of earthworks involving a volume of approximately 5.5 million m^3 within a rural zone, is a **restricted discretionary activity** under E12.4.1(A10).

Vegetation Management and Biodiversity

- The removal of approximately 5.5 hectares of contiguous indigenous vegetation within a site outside the rural urban boundary, is a **restricted discretionary activity** under Rule E15.4.1(A10).
- The removal of vegetation within a riparian area and within a Natural Stream Management Area Overlay, is a **restricted discretionary activity** under E15.4.1(A12).
- The removal of vegetation within 10m of a rural stream within the Rural – Rural Production Zone, is a **restricted discretionary activity** under Rule E15.4.1(A17).
- The removal of vegetation within 20m of a natural wetland, is a **restricted discretionary activity** under Rule E15.4.1(A18).

Infrastructure

- The provision of an electricity generating facility within a rural zone, is a **discretionary activity** under Rule E26.2.3.1(A63).

Transport

- The construction and use of a vehicle crossing from State Highway 1, being a situation where a vehicle access restriction applies, is a **restricted discretionary activity** under Rule E27.4.1(A5).

Natural Hazards and Flooding

- The provision of new structures and buildings within a flood plain, is a **restricted discretionary activity** under Rule E36.4.1(A37).
- Diverting or reducing the capacity of an overland flow path, is a **restricted discretionary activity** under Rule E36.4.1(A41).
- The provision of new structures and buildings within an overland flow path, is a **restricted discretionary activity** under Rule E36.4.1(A42).
- The provision of new infrastructure within a flood plain and an overland flow path, is a **restricted discretionary activity** under Rule E36.4.1(A56).

Rural Zones

- The establishment of a managed fill in the Rural – Rural Production Zone, is a **discretionary activity** under Rule H19.8.1(A66).
- The establishment of a landfill in the Rural – Rural Production Zone, is a **non-complying activity** under Rule H19.8.1(A67).

Regional

Land Disturbance – Regional

- Earthworks over an area greater than 2,500m^2 where the slope is greater than 10 degrees within a rural zone, is a **restricted discretionary activity** under Rule E11.4.1(A8).
- Earthworks over an area greater than 2,500m^2 within a sediment control protection area within a rural zone, is a **restricted discretionary activity** under Rule E11.4.1(A9).

Note: the total area of earthworks is 136.4 hectares with these works to occur on land where the slope is greater than 10 degrees and within a sediment control protection area. However, the exact breakdown of the area of works applicable to each has not been provided, hence the reason specific areas have not been listed within these consenting reasons.

Industrial and Trade Activities

- The use of the site for a new industrial or trade activity, being a landfill, which is listed as high risk in Table E33.4.3, is a **controlled activity** under Rule E33.4.1(A8).

Streamworks consent (ss13 and 14) – LUS60339672

Lakes, Rivers, Streams and Wetlands

- The crossing of a wetland with a road, being an activity not otherwise provided for, is a **discretionary activity** under Rule E3.4.1(A1).
- The placement of felled logs within wetlands to improve biodiversity values, being an activity for the purposes of habitat enhancement, is a **restricted discretionary activity** under Rule E3.4.1(A5).
- The diversion of streams to a new course and associated disturbance and discharge of sediment, is a **discretionary activity** under Rule E3.4.1(A19).
- The construction of culverts within streams that are more than 30m in length when measured parallel to the direction of water flow and located outside a prescribed overlay, is a **discretionary activity** under Rule E3.4.1(A33).
- The construction of culverts within streams that are more than 30m in length when measured parallel to the direction of water flow and located within a Natural Stream Management Area Overlay, is a **non-complying activity** under Rule E3.4.1(A33).
- The reclamation of approximately 13,915 m of intermittent and permanent streams, is a **non-complying activity** under Rule E3.4.1(A49).
- The reclamation of approximately 1.37 hectares of wetlands, is a **non-complying activity** under Rule E3.4.1(A49).

Note: The applicant has confirmed that all discharge outlets within streams will be designed to meet the relevant permitted activity standards such that they do not require consents.

Water permit (s14) – WAT60339673

Taking, Using, Damming and Diversion of Water and Drilling

- The take and use of up to 150m^3 per day of surface water from the proposed stormwater pond / dams for non-potable water use, is a **discretionary activity** under Rule E7.4.1(A9).

Water permit (s14) – WAT60343935

Taking, Using, Damming and Diversion of Water and Drilling

- The take and use of up to 50m^3 per day of groundwater for potable water use, is a **discretionary activity** under Rule E7.4.1(A26).

Water permit (s14) – WAT60343932

Taking, Using, Damming and Diversion of Water and Drilling

- The diversion of groundwater associated with excavations that exceed the permitted activity standards in terms of the duration of the works and the depth of excavation relative to groundwater levels, is a **restricted discretionary activity** under Rule E7.4.1(A28).
- Dewatering associated with a groundwater diversion that does not meet the associated permitted activity standards as set out above, is a **restricted discretionary activity** under Rule E7.4.1(A20).

Water permit (s14) – WAT60343937

Taking, Using, Damming and Diversion of Water and Drilling

- The provision of an off-stream dam (stormwater pond 2) that does not meet the permitted activity standards set out in E7.6.1.11 and E7.6.1.12, as it is greater than 4m in height and will impound more than 20,000m^3 of water, is a **discretionary activity** under Table E7.4.1 (A35).

Water permit (s14) – WAT60343938

Taking, Using, Damming and Diversion of Water and Drilling

- The provision of an off-stream dam (stormwater pond 3) that does not meet the permitted activity standards set out in E7.6.1.11 and E7.6.1.12, as it is greater than 4m in height and will impound more than 20,000m^3 of water, is a **discretionary activity** under Table E7.4.1 (A35).

Water permit (s14) – WAT60343939

Taking, Using, Damming and Diversion of Water and Drilling

- The provision of an off-stream dam (stormwater pond 4) that does not meet the permitted activity standards set out in E7.6.1.11 and E7.6.1.12, as it is greater than 4m in height and will impound more than 20,000m^3 of water, is a **discretionary activity** under Table E7.4.1 (A35).

Discharge permit (s15) – DIS60339670

Other Discharge of Contaminants

- The discharge of contaminants to land, being leachate irrigation back onto the proposed landfill, is a **discretionary activity** under Rule E4.4.1(A15).

Discharge permit (s15) – DIS60343735

Stormwater – Discharge and Diversion

- The diversion and discharge of stormwater from more than 5,000m^2 of impervious area outside an urban area, being an activity that is not otherwise provided for, is a **discretionary activity** under Rule E8.4.1(A10).

Discharge permit (s15) – DIS60343736

Cleanfills, Managed Fills and Landfills

- Discharges from managed fills, are a **controlled activity** under Rule E13.4.1(A4).
- Discharges from a new landfill, are a **non-complying activity** under Rule E13.4.1(A9).
- Discharges associated with the placement and compaction of material associated with a landfill, being an activity that is not specifically classed in a rule as a permitted, controlled, restricted discretionary, discretionary, non-complying or prohibited activity, are a **discretionary activity** under Rule C1.7.(1).

Discharge permit (s15) – DIS60343780

Air Quality

- Discharges to air from evaporation of leachate, being an activity that may not meet permitted activity standards and is not provided for by any other rule, are a **discretionary activity** under Rule E14.4.1(A2).
- Discharges to air from the combustion of landfill gases, being an activity not meeting permitted, controlled or restricted discretionary activity standards, are a **discretionary activity** under Rule E14.4.1(A54).
- Discharges to air from the bin exchange area, which functions as a refuse transfer station, are a **controlled activity** under E14.4.1(A154).
- Discharges to air from a landfill that do not comply with restricted discretionary or discretionary activity standards, are a **non-complying activity** under E14.4.1(A160).

Discharge permit (s15) – DIS60343781

Industrial and Trade Activities

- The discharge of contaminants from a new industrial or trade activity, being a landfill, which is listed as high risk in Table E33.4.3, is a **discretionary activity** under Rule E33.4.2(A24).

5. Status of the application

The appropriate practice as derived from case-law is to consider the applications together

("bundling") if there is an overlap between: the consents required; the matters over which the plan has limited its discretion; the effects of the activities; and whether consideration of one would likely affect the outcome of another.

In this instance, consent is required under the AUP(OP) for controlled, restricted discretionary, discretionary and non-complying activity matters. With all of the relevant assessment matters overlapping, consent overall as a **non-complying activity** is required.

6. Notification and submissions

Notification background

The application was lodged with public notification requested by the applicant. Following on from a further information request and the submission of additional information that allowed for all likely adverse effects to be understood for the purpose of public notification, the application was publicly notified on 26 March 2020. Under s37 of the RMA, the time period for submissions to be made was doubled to 40 working days, given that the proposal was large and complex, and of high public interest.

At the close of the submission period on 26 May 2020, a total of 753 submissions were received.

A further 226 submissions were received by 31 July 2020, with a decision made under delegated authority to accept them all, noting that WMNZ had advised that they would have no objection to the acceptance of late submissions received by this date.

Two additional late submissions have been forwarded to the hearing commissioners to decide whether to accept them or a not, pursuant to s37 of the RMA. It is considered that neither submission raises any new issues that were not addressed in submissions received on time, such that there are no adverse implications for the applicant associated with their late acceptance. WMNZ have also advised that they have no objection to the acceptance of these submissions (Ian Kennedy *pers comm* 16 September 2020).

Full copies of all submissions are included in attachment 3 Written Approvals

Written approval has been provided by Matariki Forests as an adjoining landowner. A copy of this approval is contained as attachment 4.

Consideration of the application

7. Statutory considerations

Resource Management Act 1991

When considering an application for resource consent for a non-complying activity, the council must have regard to Part 2 ("purpose and principles" – sections 5 to 8), and sections 104, 104B, 104D and 104E, and where relevant, sections 105, 107 and 108.

In considering any application for resource consent and any submissions received, the council must have regard to the following requirements under s104(1) – which are subject to Part 2 (the purpose and principles):

- Any actual and potential effects on the environment of allowing the activity.
- Any measure proposed for the purpose of ensuring positive effects on the environment to offset or compensate for any adverse effects on the environment that will or may result from allowing the activity.
- Any relevant provisions of national policy statements, New Zealand coastal policy statement; a regional policy statement or proposed regional policy statement; a plan or proposed plan, a national environmental standard (NES), or any other regulations.
- Any other matter the council considers relevant and reasonably necessary to determine the application.

Under s104(2), when considering any actual or potential effects, the council may disregard any adverse effects that arise from permitted activities in a NES or a plan (the permitted baseline). The council has discretion whether to apply this permitted baseline.

Under 104(3) the council must not:

- Have any regard to trade competition or the effects from trade competition or any effects on a person that has provided written approval.
- Grant a resource consent if the application should have been notified and was not.

As a non-complying activity, the proposal under consideration is subject to the 'threshold test' under s104D. The council may only grant consent to a non-complying activity if satisfied that the adverse effects on the environment are minor, and/or that the activity will not be contrary to the objectives and policies of the relevant plan or proposed plan. If the proposal satisfies either, or both, of the limbs of the test then the application can be considered for approval, subject to consideration under s104 and 104B.

Section 104E states that when considering an application for a discharge permit where the proposal would otherwise contravene s15 (or ss15A or 15B) relating to the discharge into air of greenhouse gases, the council must not have regard to the effects of such a discharge on climate change, except to the extent that the use and development of renewable energy enables a reduction in the discharge into air of greenhouse gases.

Sections 105 and 107 address certain matters (in addition to the matters in s104(1)), relating to discharge permits where the proposal would otherwise contravene s15 (or ss15A or 15B).

Section 108 provides for consent to be granted subject to conditions and sets out the kind of conditions that may be imposed.

8. Actual and potential effects on the environment – s104(1)(a)

Effects that must be disregarded

Any effect on a person who has given written approval to the application

Effects on adjoining landowner, Matariki Forests, must be disregarded, as they have provided their written approval.

Trade competition

Trade competition is not relevant in this instance, with no submissions having been made by trade competitors of the applicant

Effects that may be disregarded – Permitted baseline assessment

The permitted baseline refers to permitted activities on the subject site and comparing the adverse effects that may result from those activities with adverse effects that may result from the proposed development.

Noting the scale of the proposed development, and that no works similar to those proposed could be undertaken on site as a permitted activity, I consider that, in this instance, there is no permitted baseline that can be used for comparative purposes in assessing adverse effects that may result from the proposed development. I note that the submitted AEE has not incorporated a permitted baseline assessment.

Receiving environment

The receiving environment is made up of:

- The existing environment and associated effects from lawfully established activities.
- Effects from any consents on the subject site (not impacted by the proposal) that are likely to be implemented.
- The existing environment as modified by any resource consents granted and likely to be implemented.
- The environment as likely to be modified by activities permitted in the plan.

In this instance, the receiving environment includes the subject site, which is large in size and located within a rural setting, being occupied by a mixture of plantation pine forest, indigenous vegetation and open pasture land. Land topography is undulating, with a series of ridgeline and gullies present throughout and particularly in the northern, southern and eastern portions. It is within these areas that the Pine forests and indigenous vegetation is located, with access provided via a series of unsealed tracks that are navigable by 4WD. Pasture is located to the west along with an airstrip. Streams are located throughout the subject site with wetlands located in the Western Block. Ecological values are confirmed as being very high, noting that the site provides habitat for a range of flora and fauna, some of which are defined as nationally threatened or at risk.

The surrounding environment, other than Sunnybrook Scenic Reserve to the south (which is zoned Open Space – Conservation), is entirely rural in nature. Vegetation, whether it be pine forests or indigenous vegetation, occupies most of the land to the north, south and east, with open pasture land being the primary land use to the west and northwest. The settlement of Wellsford commences approximately 3 km to the northwest of the closest point from the subject site. There are adjoining sites that contain residential dwellings, with a mixture of

distance, topographic differences and intervening vegetation being such that most will have limited, if any, visibility of the areas where the landfill amenities are proposed. Dwellings at 1232, 1232A and 1282 State Highway 1 are located to the west on relatively low-lying land and will have a level of visibility of the proposed clay borrow, stockpile 1 and potentially the topsoil stockpile, all of which will be located within the Western Block. Visibility of the landfill operation will be limited as a consequence of dwelling orientation and distance. As previously noted, 1232 State Highway 1 is now owned by the applicant with 1282 State Highway 1 being a property identified for purchase by NZTA to facilitate their proposed Warkworth to Wellsford State Highway upgrade. Dwellings to the northwest along Wayby Valley Road and within the closest portions of Wellsford will likely have visibility of portions of the working landfill but only at distance and only once the landfill nears completion.

There are no unimplemented consents of relevance that are likely to be implemented that I am aware of.

Assessment of effects

Having regard to the above and after analysis of the submitted application documentation, undertaking a site visit on 7 March 2019 as part of pre-application discussions (along with a previous site visit on 21 February 2019 to the applicant's Redvale landfill), reviewing the submissions received and taking advice from appropriate experts, I have concluded that there are a range of adverse effects that need to be considered. In my assessment, they can be separated into two distinct categories: those associated with the establishment of the landfill, and those associated with its on-going operation.

Landfill Establishment

In order to allow for establishment of the landfill, vegetation removal, earthworks and streamworks are required to allow for:

- Construction of the roundabout and access from State Highway 1, the bin exchange area and a new access road approximately 2 km in length to the proposed working landfill. Further ancillary roads will be required to access the various landfill amenities, including a weighbridge, wheel wash, leachate collection tank, staff office, workshop buildings and a renewable energy centre;
- Installation of groundwater bore for potable water supply;
- Formation of the working landfill noting that it will not be formed at once, but will be undertaken in seven stages with each designed to have approximately five years of capacity. These works will also result in soil stockpiling and use of the clay borrow area;
- Installation of the landfill liner system (relative to each stage) and the leachate collection system;
- Construction of stormwater ponds and a wetland, and the installation of all necessary stormwater drainage. Of note is that three of the stormwater ponds are also classified as dams; and
- Reclamation and works within streams and wetlands, and the removal of vegetation to enable all of the above enabling works to occur.

An assessment of the effects associated with these works is as follows:

Sedimentation

The sedimentation aspects of the proposed works have been detailed within the submitted sediment and erosion control assessment and associated further information responses, all of which have been reviewed and assessed by Ms Fiona Harte, the Council's Regional Earthworks Specialist.

A summary of the key comments from her technical review, dated 1 September 2020, is set out as follows:

- The applicant has provided an outline of the erosion and sediment controls proposed in order to minimise the potential for erosion to occur, and to address sediment discharges. These works will be undertaken in general accordance with Auckland Council's *"Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region, June 2016, Guideline Document 2016/005"* (GD05). An adaptive management regime will also be adopted.
- While specific erosion and sediment control plans have not been provided, the measures that will be implemented include:
    - Stabilised access ways to reduce the risk of construction vehicles tracking sediment onto roads;
    - Clean water diversions to direct surface water around the earthworks area;
    - Progressive stabilisation of the earthworks, and stabilisation of earthwork areas where they have not been worked for more than two weeks;
    - Minimisation of open earthworked areas through staging;
    - The installation of sediment retention ponds (SRPs), decanting earth bunds (DEBs) and silt fencing to impound sediment laden water, and provide treatment prior to discharge to the receiving environment; and
    - Initial baseline monitoring of the receiving environment and ongoing construction monitoring of the receiving environment (to allow for the implementation of adaptive management practices).
- To ensure that appropriate measures are implemented, a final set of erosion and sediment control plans (including site-specific drawings and updated sediment load calculations) would need to be provided to Council prior to any earthworks or streamworks commencing at any given area of the site. This is to ensure that any plan includes the final specifications and exact location of the controls to be utilised for that area, and could be dealt with through appropriate consent conditions.
- The use of rainfall activated chemical treatment for the SRPs and DEBs is considered industry best practice, and accords with GD05 as its application significantly increases the sediment removal efficiency of these devices and will assist with ensuring that downstream water quality is maintained by providing the highest sediment removal efficiencies possible. The applicant does not support the use of chemical treatment as a default requirement, stating that they do not support the continued discharge of chemicals into the environment if it is not necessary. This position is not accepted as technical publications have concluded that the benefit of reduced sediment levels in

discharges outweigh any risks associated with the presence of residual flocculants. Accordingly, chemical treatment is considered a necessity.

- Noting that the site is subject to high levels of rainfall and contains a number of flood plains, there is a risk that erosion and sediment controls will be overwhelmed with flood waters, resulting in the discharge of unmanaged and untreated sediment laden water. This needs to be factored into the design of the final erosion and sediment control plans.
- Some earthworks will be undertaken adjacent to protected vegetation that is being retained. In these instances, detail needs to be provided confirming how erosion and sediment controls will be installed in a manner that also ensures that the roots of adjacent vegetation are suitably protected.
- The applicant has used a total 'maximum bare earth during works of 5.65 hectares when calculating sediment loads for the bin exchange area, main access road, stockpile 1, topsoil stockpile and the clay borrow area. However, during each earthworks season, multiples catchments are proposed to be worked meaning that the maximum exposed area could range between nine and 14.5 hectares. Noting the sensitivity of the receiving environment to sediment discharges and the high rainfall levels, a six-hectare open area limit should be applied, which can be broken into two stages per earthworks season (a total of 12 hectares over one season). This will allow the applicant to undertake the works they propose over the four sequential earthworks seasons.
- Noting the sensitivity of the receiving environment and the high levels of rainfall, winter earthworks should only be undertaken where it is absolutely necessary, or where the area of works is very small.
- Earthworks associated with formation of the landfill will be undertaken over small areas and will be directed to permanent SRPs. The application assumes a maximum exposed area of 3.4 hectares for construction of each portion, which is likely to be significantly less noting the nature of the landfill operation. Erosion and sediment control measures will be further managed through the implementation of the overall landfill management plan.
- The implementation of an adaptive management plan (AMP) approach requires baseline monitoring to set trigger levels such that changes in erosion and sediment control methodologies can be implemented when on-going monitoring indicates that the earthworks are generating, or will potentially generate, adverse effects. Details of the final AMP need to be submitted to Council prior to any works occurring, including measures to address adverse effects on kākahi (freshwater mussel) if they are found to be present. This is because kākahi are sensitive to sediment discharges.
- A range of measures will be implemented to ensure that sedimentation effects relating to the proposed streamworks are suitably managed, including works to be undertaken in dry weather and during periods of low stream flow and the damming and diversion of upstream flows. A site-specific stream and wetland management plan needs to be submitted to Council prior to any works occurring.

Based on her review, as summarised above, Ms Harte has provided the following conclusion as set out in sections 4.47 to 4.49 (pages 17 and 18) of her technical memorandum:

> *4.47 Although detailed erosion and sediment control drawings have not*

been provided with the application, the detail within the SECR and LMP is sufficient to demonstrate how the applicant would manage the effects relating to potential sediment discharges resulting from the proposed earthworks, including implementation of an adaptive management regime.

4.48 The Hoteo River and Kaipara Harbour are sensitive receiving environments that are already under stress from sediment discharges related to land development, stream bank erosion, forestry & farming activities, and highly erodible soils. Many of the streams and wetlands proposed to be retained at the subject site contain high ecological values and contain aquatic fauna that is sensitive to sediment discharge. The applicant has calculated estimated sediment loads within the immediate catchments resulting from the proposed earthworks. Comparisons against the baseline sediment loads are also provided. The applicant has calculated that the percentage increases within the immediate catchments will be small. As such, it is not expected that large quantities of sediment will be deposited in the Kaipara Harbour that would lead to significant adverse effects within the Harbour. In Addition to this, I have recommended further measures in this report that will further mitigate the potential adverse effects that would result from the proposed earthworks.

4.49 Should the proposed landfill be granted consent, provided the erosion and sediment controls are installed, constructed and maintained in accordance with the application documents, any additional requirements as deemed necessary by the guidance outlined in GD05, my specific recommendations, along with the adaptive management regime, I consider the sediment discharges generated during the earthworks can be managed appropriately to maintain a low level of effect.

I rely on the expert assessment of Ms Harte in assessing the appropriateness of the erosion and sediment control measures proposed in respect of the proposed enabling earthworks and streamworks.

Noting the subject environment, with high levels of rainfall, steep topography and a sensitive receiving environment, I consider that the implementation of correct and best practice erosion and sediment control measures to be of the utmost importance.

The provision of clean water diversions will reduce the amount of water entering the works area and therefore minimise the potential for erosion to occur. Progressive stabilisation of worked areas, and particularly those that have not been worked for more than two weeks, will further reduce erosive potential. Noting that the applicant has used a maximum exposed area scenario of 5.65 hectares to calculate predicted sediment loads, I adopt Ms Harte's assessment that a six-hectare exposed area limit at any one time is appropriate. Based on earthworks proposed by the applicant over four earthworks seasons, I further note that such a limit would be achievable noting that staging over each earthworks season is also proposed. I consider that implementation of the above measures will ensure that erosive potential is reduced to the lowest levels practical noting the level of enabling works required.

To ensure that sediment runoff from all earthwork areas is suitably controlled, contained and treated, a combination of sediment retention ponds (SRPs), decanting earth bunds (DEBs) and silt fencing will be implemented. Silt laden water will be directed to the SRPs and DEBs by dirty water diversion bunds. Silt fencing will be used in those areas where silt laden water cannot be directed to SRPs and DEBs. The provision of stabilised accessways will also minimise the tracking of sediment onto the local road network from exiting vehicles. I adopt the requirement for chemical treatment of the SRPs and DEBs as recommended by Ms Harte, noting that this is considered industry best practice and accords with guidance document GD05, improving the overall functionality of these devices in terms of sediment removal. I have not been provided with any evidence from the applicant that the adverse effects from the release of flocculant into the receiving environment would outweigh those resulting from increased levels of sediment discharge. Subject to the implementation of chemical treatment, I consider that appropriate measures will be implemented to maximum sediment removal from water that is discharged from the proposed area of earthworks.

Specific plans have not been provided, noting that the manner in which measures are implemented is often dependent on the appointed contractor and detailed design issues. Given that the primary measures to be implemented have been confirmed, I consider the submission of final plans for certification, should consent be granted, to be an appropriate mechanism (as is commonly the case for regional earthworks activities) for ensuring that the required measures are implemented, noting that certification will be required before works can commence. The need to ensure that the functionality of the erosion and sediment control measures proposed will not be affected by flooding hazards and that they will have regard to the root zone of protected vegetation where relevant, will also form part of the certification process.

Given the sensitivity of the environment, I agree that caution is required when undertaking winter works due to the increased risk of adverse sediment discharges occurring. As such, I adopt Ms Harte's recommendation for a more restrictive approach to these works than would otherwise be prescribed. I also consider that, in the circumstances, an adaptive management plan process is a necessary requirement in order to ensure that the necessary measures are implemented to achieve the optimum outcome in terms of the minimisation of sediment discharge. It will also ensure that the implemented measures are adaptable to change in the instance that adverse effects result as confirmed via on on-going monitoring. Measures that will likely be implemented to address such adverse effects should they result include stabilisation of open areas, minimising opening of new areas and installation of additional erosion and sediment controls. I also support the inclusion of measures to address potential adverse effects on kākahi, noting that they are sensitive to sediment discharges.

I adopt Ms Harte's conclusion with respect to the appropriateness of the measures proposed to address adverse effects associated with physically undertaking the streamworks, and consider that their implementation will ensure that adverse sedimentation effects are suitably managed.

Based on the above, I consider that the implementation of the comprehensive range of erosion and sediment control measures proposed, including the incorporation of adaptive management, will ensure that adverse sedimentation effects are suitably mitigated, should consent be granted. Although the area of earthworks is large and the subject site is within a sensitive receiving environment, the implementation of the above measures will ensure that the overall environmental risk from sediment runoff, as assessed by Ms Harte, is low. While

all sediment will not be contained, an avoidance scenario is not possible, with the level discharged to be minimised to the greatest extent possible such that it is able to disperse within the receiving environment in a manner that ensures that adverse effects on the local environment and receiving waters will be no more than minor and acceptable.

Geotechnical

The submitted geotechnical reports have been reviewed and assessed by Mr Ross Roberts, the Council's Geotechnical Specialist.

In his technical review dated 7 September 2020, Mr Roberts comments that based on the geotechnical information submitted, and having undertaken a site walkover and a review of other available data sources including aerial photography, it is evident that the subject site is subject to instability. However, the reviewed evidence strongly suggests that the instability is shallow, being limited to surficial soils and not extending into the bedrock. That being said, Mr Robert comments that shallow instability has the potential to be an issue during construction. In some areas, the works will remove areas of unstable soils, which would be expected to improve stability, while excavations in others areas will steepen slopes and reduce levels of stability. However, Mr Roberts concludes that adverse slope stability effects can be managed through the implementation of conventional geotechnical engineering techniques, and that the conditions of consent contained within the submitted application, subject to minor variations in wording, will appropriately manage any associated adverse effects. This includes with respect to the potential need for imported clay for the liner subgrade in the instance that the material within the clay borrow area is unsuitable, noting that limited testing has been undertaken.

I rely on the expert assessment of Mr Roberts in assessing the quality of the submitted geotechnical information and the potential adverse effects that may occur.

Based on his review, I consider that all matters associated with geotechnical risk have been appropriately assessed and addressed. This is important given the identified areas of instability on site, and the need to ensure that all areas of the working landfill, and its associated amenities, are suitably protected from future instability events, which would likely compromise its safe functioning once operational.

Subject to the implementation of the recommended conditions to ensure that the recommended geotechnical measures are implemented, I consider that adverse effects associated with land stability will be less than minor and acceptable.

Historic Heritage

The applicant has submitted an archaeological assessment in order to describe the history of the existing environment and assess adverse effects as they relate to historic heritage values. Issues of importance include the presence of any recorded archaeological sites (including those with Māori cultural association), 19th century house sites and any other historic heritage values of importance.

This assessment has been reviewed by the Council's Historic Heritage Specialist, Mr Joe Mills. Based on his review of this assessment and other supporting documentation, Mr Mills has confirmed in this technical review dated 28 August 2020 that the proposed works will not affect any scheduled archaeological sites in Schedule 14.1 (Schedule of Historic Heritage) of the AUP(OP), nor will they affect any unscheduled historic heritage sites or places. Mr Mills

has therefore concluded that the risk to identified historic heritage is nil. He notes that while there is a level of risk that unrecorded historic heritage material may be affected by the proposed works, this can be addressed through the implementation of accidental discovery protocols.

I am entirely reliant on the expert assessment of Mr Mills in assessing the quality of the submitted archaeological assessment, and confirming that there are no identified historic heritage sites or places that will be affected. I note that while there is a farm cottage and woolshed within the subject landholding that may have some historic heritage value, they will not be affected by the proposed landfill. The application of accidental discovery will ensure that if any items that may be of archaeological value are discovered, works within 20m of the item will cease, with all interested parties (Council, Heritage New Zealand, the New Zealand Police, if the discovery is of human remains or kōiwi, and Mana Whenua if the discovery is an archaeological site, Māori cultural artefact, or kōiwi) informed and an inspection undertaken. Only once this has occurred and the necessary action taken, as outlined in Standard E12.6.1.(f) of the AUP(OP), shall works recommence. Examples of necessary action could include: the retention of kōiwi where discovered or removal in accordance with appropriate tikanga; obtaining an archaeological authority from Heritage New Zealand; and/or the recovery and preservation of any material of importance.

Subject to ensuring that the accidental discovery protocols as now proposed, and supported by Mr Mills, are implemented, I consider that adverse effects in respect of identified historic heritage will not result, and that adverse effects relating to unrecorded historic heritage will be mitigated to less than minor and acceptable levels.

Groundwater and Water Take

The submitted hydrogeology report and attachments and associated further information responses have been reviewed and assessed by Mr Aslan Perwick, the Council's Consultant Hydrogeology Specialist.

A summary of the key comments from his technical review, dated 18 September 2020, is set out as follows:

- The proposed landform changes and drainage system would result in significant volumes of groundwater being drained and / or diverted, and a permanent lowering of the water table / pressure beneath the working landfill. As a consequence, a reduction in groundwater recharge is expected to occur. Groundwater recharge influences both the shallow and deep aquifer zones, with the shallow 'upper aquifer' zone providing baseflow for streams and the remaining flows infiltrating to recharge the deeper 'regional aquifer' zone.

- Recharge / infiltration losses to the regional aquifer are estimated at approximately 1.2 L/s, approximately 104 m^3/day, and approximately 38,000 m^3/year. While the proposed take from groundwater bore TB01 will increase the net loss to the regional aquifer to approximately 1.8 L/s, approximately 156 m^3/day, and approximately 56,765 m^3/year, the overall reduction on a regional scale is small and it will not suffer any 'sustainability stress' as a consequence. Noting that there are no other water takes within a 2 km radius from TB01 (other than the applicant's own boreholes), the proposed potable water take is acceptable from an overall perspective, with allocation available in the subject water management zone.

- The applicant's assessment that the proposed works would have no measurable effect on baseflows differs from Mr Perwick's assessment which estimates that baseflow reductions of up to 20% could result for streams immediately adjacent to Valley 1. This could have flow-on effects such as a reduction in permanent and / or intermittent stream lengths, and associated adverse ecological effects. To address this, stream baseflow monitoring and contingency planning is recommended, which could include supplementary augmentation of stream flows until natural flows return.

I rely on the expert assessment of Mr Perwick in assessing the groundwater and water take issues and the potential adverse effects that may occur.

The level of earthworks proposed within the landfill footprint are extensive and once completed, will result in a notable change to groundwater recharge and groundwater levels (head). This will have an impact on both the shallow flows that provide base flow for streams and the deeper regional aquifer.

The proposed water take from groundwater bore TB01 would be abstracted from the regional aquifer. In respect of the impact on this aquifer, being the reduced level of recharge and the further abstraction of groundwater for potable use, I am very much reliant on the expertise of Mr Perwick in assessing that the net reduction in flows, being 1.8 L/s, approximately 156 m^3/day, and approximately 56,765 m^3/year, would not adversely affect its sustainability and ongoing function. I do, however, note that there are no other water takes within a 2 km radius (other than the applicant's own boreholes), which ensures that other users would not be adversely affected in terms of drawdown effects, while 3,892,016m^3 of the 5,558,000m^3 of water available within the aquifer (approximately 70%) would remain available for abstraction (should the applicant's net take be granted). Noting these factors and the assessment of Mr Perwick, I consider any adverse effects on the regional aquifer and other water users from the loss of recharge and the proposed water take to be less than minor and acceptable.

The impact on shallow flows and stream base flow is less conclusive, noting that there is a disagreement between the applicant's experts and Mr Perwick in terms of potential adverse effects. The applicant's experts consider that there will be no measurable effect on baseflows, whereas Mr Perwick considers that baseflow reductions of up to 20% could result for streams immediately adjacent to the landfill. This disagreement is a consequence of scale, whereby the applicant's assessment of recharge reduction is applied at a larger 'catchment wide' scale, where as Mr Perwick's assessment applies the recharge reduction on a more local individual stream / reach scale.

While I do not have any evidence before me to favour one assessment over the other, the ideal scenario would have been for expert agreement to be reached. In the absence of such agreement, I consider that a worst-case scenario on the potential impact on stream baseflows needs to be addressed.

Mr Perwick has stated that baseline monitoring should be undertaken prior to works commencing, with further monitoring then undertaken during and following the proposed landfill formation earthworks to assess actual changes to baseflows, if any. If reductions do result, contingency measures could be implemented, which could include supplementary augmentation of stream flow via a groundwater bore or stormwater infiltration, or low flow drainage from the landfill (being clean stormwater diverted from up-gradient catchment areas), or potentially other measures. I rely on Mr Perwick's expertise that monitoring works

can be undertaken to ascertain baseline baseflow levels and then measure associated changes once earthworks have commenced. I am, however, reluctant to endorse the use of the potential contingency measures to address reduced baseflow noting that such measures may require further resource consent approval, particularly in the case of a groundwater bore. Flows could potentially be diverted from TB01 noting that the daily maximum take of $50m^3$ would exceed the potable supply estimate of $20m^3$, but it is uncertain if this would be sufficient or if the applicant would be willing to do so. This matter requires further input from the applicant, either through detailed evidence to confirm with the necessary level of certainty that adverse effects from reduced baseflow will not result, or through confirmation that contingency measures could be implemented that would not require further resource consent approval. Should this be satisfactorily resolved, I would then likely be able to confirm that adverse effects are no more than minor and acceptable.

Landfill Liner

The landfill liner design as proposed by the applicant has been assessed by Mr Alan Pattle, the Council's Consultant Landfill Engineering Specialist.

A summary of the key comments from his technical review, dated 7 September 2020, is set out as follows:

- The landfill liner (a HDPE flexible membrane liner is proposed) is a critical element and must be designed and constructed carefully to ensure that it serves as a leachate and gas containment barrier for potentially several hundred years until leachate strength becomes benign. The applicant's assessment is that the liner proposed is expected to have a life of 400 to 750 years, which is supported by technical research / reporting.
- Maximum grades will be limited to 1V:2.5H, and more generally 1V:3H, due to the difficulty of installing liners on steep slopes, with historic landslide features around the edge of the landfill footprint to be stabilised prior to liner installation. This approach in terms of slope gradient and addressing surrounding stability is critical to achieving the long-term performance standards that are required, particularly in terms of liner longevity and low leakage rates.
- Wrinkles in the HDPE liner that are not smoothed out when it is covered are the major potential source of leakage that require careful construction control. Wrinkles are noted in literature to result in leakage rates many times over those from other defects. Worst case leakage rates from poor construction has been modelled, with reservations expressed (by Mr Pattle) about the validity of the modelling to cover all the potential water quality and flow effects. That reservation notwithstanding, the liner system chosen is considered robust and contains significant redundancy measures, being a multi-barrier approach. Even if the HDPE liner has defects and / or degrades during the period it is required to contain contaminants (potentially several hundred years), the underlying natural material layers have an indefinite life. This ensures that the risk of escape of significant quantities of leachate through the liner (once the landfill becomes operational) will be very low, with the small residual risk able to be monitored and remedied if necessary through contingency planning.
- Subsoil drains will be installed to address groundwater springs and seepages, as they can result in uplift pressures and associated liner failure. Following the placement of waste, the application documents state that the drains will either be blocked to allow

groundwater pressure to return to the outside of the liner or retained, noting that they could be used for leachate detection.

I rely on the expert assessment of Mr Pattle in assessing the overall landfill design and the quality of the proposed landfill liner.

It is not possible to physically verify whether or not the proposed HDPE flexible membrane liner will be 'fit for purpose' in terms of its expected lifespan, as there are no situations whereby it has been in use for several hundreds of years. However, I note that technical papers testing the longevity of composite liners similar to that proposed indicate that they will retain their containment characteristics for 500 plus years. While some submissions have cited scientific papers that indicated that liner life may be significantly less (10-30 years), Mr Pattle has noted that references are not provided to support the statement made, with no evidence having been provided that landfill liners have failed. Subject to reliable evidence to the contrary being produced, I therefore consider that there are no valid reasons to doubt that the proposed liner will perform as proposed for the several hundred years required.

In addition to the HDPE flexible membrane liner, I note that a compacted clay layer and potentially, a geosynthetic clay liner, will be installed underneath, which Mr Pattle confirms as having an indefinite life. As noted in the geotechnical review, clay will be sourced from the clay borrow area, or from outside the site if that available within the clay borrow area is found to be unsuitable following further testing. This provides additional layers of protection and ensures that the potential for leachate leakage (once the landfill is in operation) is very low, with monitoring and contingency planning to be implemented in the instance such leaks do result. This will be assessed further within the operational landfill effects. However, it is noted that Mr Pattle prefers the option of retaining the subsoil drains to assist with leachate detection. I adopt that assessment.

Accordingly, I consider that the landfill liner will be 'fit for purpose' with adverse effects associated with its design and installation being less than minor and acceptable. Adverse effects associated with potential leakage scenarios will be assessed further below within the operational landfill effects section.

Stormwater Dams

Stormwater ponds 2, 3 and 4, while serving as ponds for stormwater management purposes, will also meet the definition of dams, and as they do not comply with the applicable permitted activity standards, their construction requires consent as off-stream dams.

The construction aspects of these dams have been detailed in further information responses submitted by the applicant, which have been reviewed by the Council's Consultant Dam Safety Specialist, Mr Don Tate.

In this technical review dated 21 September 2020, Mr Tate notes that the dams have been designed in accordance with required flooding requirements, including a maximum 1 in 1,000-year flooding event. Dam geometry, levels, spillway dimensions, batter slopes, foundations and internal drainage also comply with the applicable design requirements. Mr Tate further states that the application confirms that a contractor with experience in dam construction will undertake the works under the guidance of an experienced dam safety engineer. Geotechnical testing, including the need to address probable landslide activity, will also be undertaken to confirm compliance with specified requirements throughout the

construction phase, and to ensure the dams are suitably protected from future landside risks. In summary, Mr Tate is satisfied with the level of information provided in respect of dam design and construction and has not raised any issues of concern.

I am entirely reliant on the expert assessment of Mr Tate, noting that he has confirmed that the dams have been designed to required standards, including being capable of managing water from a 1 in 1,000-year flooding event. While further investigations will be required, Mr Tate has confirmed that this is appropriate and will allow for any necessary modifications to be incorporated into the final dam designs, ensuring that adverse effects associated with landslip risks are suitably addressed. Conditions of consent could be imposed to ensure that this occurs, noting as well that the dams will require building consent approval and will need to be designed by a suitably experienced dam engineer.

Accordingly, I consider that the dams will be constructed in accordance with required standards thereby ensuring that they will be capable of functioning for their designed purpose (the impoundment of stormwater), noting that adverse effects associated with their on-going operation will be assessed within the 'landfill operation' section of this report. However, any adverse construction related effects will be less than minor and acceptable.

Flooding and Natural Hazards

The flooding and natural hazard aspects have been detailed in the submitted engineering report and associated further information responses, which have been reviewed and assessed by Mr Steve Cavanagh, the Council's Development Engineering Specialist.

Mr Cavanagh, in his review dated 4 September 2020, notes that the stormwater pipe beneath the landfill has been designed to accommodate flows from a 1% annual exceedance probability (AEP) event, which is required given the location of the landfill within a series of overland flow paths. Mr Cavanagh states that the perimeter drains along the upstream catchment of the landfill also need to be designed to 1% AEP requirements to ensure that clean water from storms of equal to or lower magnitude discharge to the proposed stormwater ponds and not into the landfill. As there is some uncertainly as to whether or not the perimeter drains have been designed to 1% AEP requirements, a condition is recommended by Mr Cavanagh to ensure this design detail is provided at engineering plan approval stage.

I rely on the expert assessment of Mr Cavanagh and consider that the perimeter drains need to be designed to 1% AEP requirements to ensure that the function performed by the overland flow paths that the landfill will occupy is maintained, and that clean water does not discharge into the landfill which would have implications in terms of leachate generation. Noting the central location of the landfill within the applicant's landholdings, and that the proposed drainage system will be capable of collecting and containing stormwater flows from a 1% AEP event, Mr Cavanagh has not raised concern with adverse flooding effects being exacerbated beyond the subject site. I therefore consider that the proposed works will not result in adverse upstream or downstream flooding effects. I also note that these works will ensure that the building platforms for proposed landfill buildings, while technically located within an overland flow path, will not be subject to adverse flooding effects.

Mr Roberts, the Council's geotechnical expert, has confirmed that the proposed works will remedy all areas of instability as they relate to the proposed landfill and that compliance with geotechnical recommendations will ensure that associated landfill amenities are suitably

protected from future instability events.

Noting that there is no evidence that the site is susceptible to any other natural hazard risks (the earthquake risk is low), I consider that any adverse effects relating to flooding and natural hazards will be no more than minor and acceptable.

Freshwater Ecology

The freshwater ecology aspects of the proposed development have been detailed in the submitted aquatic and terrestrial ecological values and effects assessment and associated further information responses. The streamworks and associated freshwater ecology effects components of these documents have been reviewed and assessed by Mr Mark Lowe, the Council's Consultant Streamworks Specialist (and Freshwater Ecologist).

As a background comment, Mr Lowe, in his technical review dated 21 September 2020, raises issue with respect to the suitability of the site for the proposed landfill from a freshwater ecology perspective, commenting that the site selection process appears to have been limited to consideration of AUP(OP) overlays, including significant ecological areas (SEAs), natural stream management areas (NSMAs) and wetland management areas (WMAs). Ecological field surveys were only undertaken once the site was selected, at which time several 'at risk' freshwater species were identified including longfin eel, kākahi, and inanga.

In terms of freshwater ecology matters, a summary of the key comments from Mr Lowe is set out as follows:

Ecological Values

- The proposed stream reclamation and culverting predominantly occur within the Southern and Eastern Blocks, with the submitted ecological assessment reporting that the streams within these areas have 'very high' ecological values.
- The submitted application states that the freshwater systems within the applicant's landholdings with the highest ecological values have been avoided. It is unclear how this conclusion has been reached noting the 'very high' ecological values of the streams proposed for reclamation. It is accepted, however, that the development largely avoids reclamation impacts on wetlands, with the larger areas with higher ecological value having been avoided.

Sedimentation

- Sedimentation as a consequence of the streamworks has been considered as part of the assessment by Ms Harte.

Fish Injury / Mortality and Passage

- The submitted draft native freshwater fish and fauna management plan outlines overarching principles for native fish salvage that are appropriate and reasonable, although changes are recommended to ensure that best practice procedures are implemented and the correct guidelines are referenced. However, as salvage will only be possible from approximately 70% of the impacted streams, a level of unmitigated residual adverse effects will result.
- Where freshwater fish habitat exists upstream of any of the proposed culverts, fish

passage is proposed to be incorporated into the final design. Where upstream fish habitat is not present, being those required for the main access road in the Southern Block, fish passage is not proposed. The provision of fish passage across six existing culverts where no passage is currently provided is also proposed. These measures are accepted, with modifications to the design of the proposed baffles recommended.

Offset and Compensation

Mr Lowe comments that offsetting should only be considered after avenues to avoid, remedy, or mitigate adverse effects have been consider and exhausted, with compensation only considered after offsetting options have been considered and exhausted. With this in mind, the following is a summary of Mr Lowe's assessment on the offset and compensation works proposed in respect of the stream and wetland reclamations:

Streams

- As part of the applicant's 'effects management package', the length of reclaimed / culverted streams being offset through quantified actions that meet the key principles of offsetting is 2,130 m, or 15.2%, being works proposed within the Southern Block. The remaining 11,890 m (84.8%) of stream reclamation / culverting is proposed to be addressed through a combination of on-site and off-site compensation measures. This includes a further 10,890 m (approximately) of riparian enhancement and / or protection actions undertaken within the applicant's landholdings and identified sites nearby, as well as approximately 30 km of compensation actions to be undertaken off-site at yet to be identified locations.
- In respect of the proposed offset works, those measures proposed would achieve the key principles of proximity, additionality and permeance. However, the like-for-like principle is arguably not achieved as intermittent and permanent stream ecological values have been used interchangeably. Furthermore, the ecological values and characteristics of the impact and offset enhancement streams are different. While the proposed three-year time lag would impact upon achievement of the no net loss principle, this could be reduced to one year by condition.
- In respect of the proposed compensation works, the following issues are noted:
    - The submitted ecological assessment confirms that there are 'high' to 'very high' freshwater ecological values and a 'very high' magnitude of impact as a consequence of the proposed reclamations. The EIANZ Ecological Impact Assessment Guidelines [Section 6.4 Evaluation of the level of effects] note that works with 'very high' levels of adverse effects are unlikely to be acceptable on ecological grounds (even with compensation proposals) and that such works should be avoided. However, the guidelines note that where a 'very high' level of adverse effects cannot be avoided [noting that it is not the ecologist's role to make determinations on project viability], a net gain in ecological values would be appropriate. The compensation works will achieve neither a net gain in ecological values or a no net loss outcome.
    - Notwithstanding that a no net loss outcome will not be achieved, the compensation actions proposed have not been presented in a manner that clearly details the level of adverse effects that have been addressed. That is to say, the resulting level of

residual adverse effects is unknown.

- Some of the compensation actions proposed would appear to provide little additional protection, with some of the areas proposed for protection unlikely to be a credible risk of removal or substantial loss noting existing levels of protection.
- Approximately 65% of the compensation proposed on-site is protection only, with no weed control or planting proposed.
- Without having secured the compensation sites, which can be difficult in its own right, there can be no certainty that the ecological gains that are proposed to compensate residual adverse effects can be achieved.
- At the minimum rate proposed of 1.5 km of stream enhancement per year, it could take up to 20 years to complete the compensation works following the stream reclamation and culverting works. While the reclamation will be staged (albeit that fish will be removed upon commencement), evidence has not been provided to show that the 1.5 km of stream enhancement per year is commensurate to the rate of adverse effects from staging.

Wetlands

- To offset the residual adverse effects from the loss of wetland areas in respect of freshwater ecological values, the following works are proposed:
  - Planting of native wetland vegetation within all degraded exotic wetlands located on-site that are not affected by the proposed works (4.63 hectare);
  - 10 m wetland margin buffer plantings around SEA wetlands (9.03 hectares) and 5 m wetland margin buffer plantings around all non-SEA wetlands (6.15 hectares); and
  - Protection by covenant and pest control across all wetland habitats within the WMNZ landholdings (25.59 hectares of wetland area, excluding buffer areas).
- The principles of proximity, additionality, like for like, no net loss and permeance will be achieved by the proposed offset works, although the 5m buffer around the non-SEA wetland is highlighted as a particular concern. However, the offset works as proposed will result in a net positive ecological value outcome with respect to wetland biodiversity within 10 years.

I rely on the expert assessment of Mr Lowe in assessing the submitted ecological assessment and all further supporting information (which includes the effects management package) and providing commentary on adverse effects as they relate to freshwater ecology.

Sedimentation effects have been considered within the review undertaken by Ms Harte, with a range of measures to be implemented to ensure that sedimentation effects relating to the proposed streamworks are suitably managed. This includes undertaking works during dry weather and periods of low stream flow and the damming and diversion of upstream flows, all of which will be managed through the provision of a site-specific stream and wetland management plan.

Subject to the implementation of the measures outlined in the draft native freshwater fish and fauna management plan, including the amendments recommended by Mr Lowe to ensure that the correct guidelines and best practice measures are followed, I consider that native

fish in the streams to be reclaimed and subject to culverting will be rescued and relocated to appropriate alternative habitats. I do note, however, that not all fish will be recovered, resulting in residual adverse effects that require offsetting / compensation and which have not been factored into the effects management package.

I adopt the assessment of Mr Lowe with respect to the need for fish passage within proposed culverts, and accept that this is not required where upstream habitats suitable for fish are not present. I further adopt his assessment with respect to the need to modify proposed baffles to follow the 'stream simulation' approach, and subject to these measures, I consider that appropriate levels of fish refuge and passage will be provided for.

The primary issue with respect to freshwater ecology effects result from the proposed stream and wetland reclamations and the loss of ecological function and habitat area.

Offsetting of the 1.37 hectares of wetland to be reclaimed will be achieved by the planting of degraded exotic wetlands with native species over an area of 4.63 hectares and buffer planting of 15.18 hectares. Covenanting of all on-site wetland habitats and the undertaking of pest control, is also proposed. Despite raising concerns with the 5m planting buffer, Mr Lowe notes that the offset works will result in a net positive ecological value outcome with respect to wetland freshwater values within a 10-year period. Noting that this also takes into account a very conservative approach to considering potential values (undertaken by Mr Lowe noting that this was not factored into the applicant's model), I consider this assessment to be suitably robust. With the wetland offsets meeting the principles of proximity, additionality, like-for-like, no net loss and permeance, and adopting the expert assessment of Mr Lowe in respect of a net positive freshwater outcome within a 10-year time period, I consider that the more than minor residual adverse freshwater ecology effects that result from the wetland reclamation will be suitably offset.

In terms of stream reclamations, the ecological value of 2,130 m of the reclaimed streams will be offset by works proposed within the Southern Block. The remaining 11,890 m will be addressed by compensation measures, being approximately 10,890 m of identified riparian enhancement and / or protection actions undertaken within the applicant's landholdings and identified sites nearby and approximately 30 km of compensation actions at yet to be identified locations.

Taking into consideration Mr Lowe's expert review, I consider that a significant / very high level of residual adverse effects will result from the proposed stream reclamation works even when taking into consideration the offset works proposed. This is because the offset works will only address approximately 15% of the lost ecological function and habitat area of the streams being reclaimed. Even then, it is uncertain that this 15% will be realised noting that Mr Lowe has raised concerns with achieving the like-for-like principle. This leaves a best-case shortfall of 85%, which the applicant seeks to address by way of compensation. In this respect, the EIANZ Ecological Impact Assessment Guidelines (as referenced by Mr Lowe, being guidelines that set out a framework for assessing the level of effect) are clear that if very high levels of adverse effects cannot be avoided, a net biodiversity gain (as will be achieved with the wetland reclamation offsets) is the appropriate outcome. In instances of high and moderate adverse effects, the above guideline, in a situation where adverse effects cannot be avoided, states that a no net loss of ecological values would be appropriate. Neither of these outcomes will be achieved. Only for low and very low levels of adverse effects is a 'minimise adverse effects' outcome noted as being appropriate. As detailed

above, that is not the instance in this case.

The above notwithstanding, there is doubt that the compensation package proposed will achieve its intended outcome (being less than a no net loss outcome). As assessed by Mr Lowe, there is no certainty as to what level of residual adverse effects will remain following implementation of the compensation works i.e. what the actual scale of the no net loss outcome will be. Furthermore, some of the compensation actions proposed would appear to provide little additional protection over and above those already afforded, while the fact that sites for the 30 km (approximately) of compensation actions required have not yet been identified, provides a significant level of doubt that the ecological actions required to compensate residual adverse effects can actually be achieved. The potential 20-year time lag for full implementation of the compensation works is also of concern, with the applicant not having provided any evidence that this implementation timeframe will be commensurate with the reclamation staging proposed, with fish to be removed from the streams when the first reclamation works commence.

Noting the above, I consider it likely the compensation measures proposed within the applicant's effects management package will not realise the ecological values it seeks to achieve. Even if it did, the level of compensation achieved will still not be sufficient to achieve a no net loss of biodiversity values outcome, let alone the net ecological value gain that I consider necessary in a situation where very high adverse effects result from the undertaking almost 14 km of stream reclamation.

Accordingly, I consider that adverse effects relating to freshwater ecology can be mitigated by undertaking fish trapping and relocation and providing fish passage, while the offsetting proposed to address wetland reclamation will achieve an acceptable long-term ecological outcome, being a net gain in ecological values. However, even upon full implementation of the proposed effects management package (on the assumption that all of the proposed outcomes can be achieved), it is likely that residual adverse effects will remain as a consequence of the reclamation of 13,915 m of streams and the installation of a 105m culvert and the associated irreversible loss of freshwater habitat. The result will be a net loss of ecological values with respect to streams such that, overall, I consider adverse freshwater ecology effects to be more than minor and unacceptable.

Terrestrial Ecology

The terrestrial ecology component of the submitted ecological assessments has been reviewed and assessed by Mr Simon Chapman, the Council's Consultant Terrestrial Ecologist. Mr Chapman, in his technical review dated 18 September 2020, has echoed the concerns of Mr Lowe with respect to the selection of the site and the apparent reliance on a desktop exercise to inform ecological impacts as opposed to field surveys. That notwithstanding, a summary of the key comments from Mr Chapman are set out as follows:

Fauna

- While removal of stockpile 2 from the application has reduced the impact on Hochstetter's frogs (surveys found that they are located in this area), they will still be affected by the proposed culvert within the Southern Block associated with the proposed main access road, being a Hochstetter's frog hotspot. This does not demonstrate avoidance of effects on Hochstetter's frogs and is not supported.

- A draft Hochstetter's frog management plan has been provided, which includes a range of methodologies for managing effects, including relocation and habitat enhancement (at relocation sites). Noting the uncertainty of relocation success, it is likely that residual adverse effects will result, with a range of offset and compensation measures proposed to address this, including pest management, monitoring and research. However, the management options put forward to manage adverse effects on frogs are largely experimental and unproven such that there is a high degree of uncertainty as to whether the offset and compensation outcomes will be achieved. Adaptive management with contingency / remedial actions may be a way of addressing this.
- The measures proposed with respect to the management of lizards reflect current standard industry practice, with the pest management measures proposed likely to also assist with their on-going survival at relocation sites. However, as lizards will be present within the wattle and pine plantations, management needs to extend into these areas to ensure that all adverse effects are suitably addressed.
- A bat management plan (BMP) is proposed with respect to the management of effects on long-tailed bats. However, as some of the highest level of long-tailed bat activity has been identified in the pine plantations, the BMP should be extended to include these areas. It also needs be amended to address lighting effects and ensure that the measures it lists as 'can' be implemented 'will' be implemented.
- There is an uncertainty that the proposed habitat protection and management works will result in an acceptable outcome for Australasian bittern as a consequence of the loss of wetland habitat.
- The loss of wetlands will result in a net loss of habitat for spotless crake and it is unlikely that the provision of wetland infill and buffer planting at the existing wetlands on site will be sufficient to offset this loss (noting that these wetlands are likely already being utilised by spotless crake). This results in uncertainty that the management measure proposed will result in an acceptable outcome for spotless crake.
- The loss of existing wetland habitat and the territorial nature of fernbirds are such that the wetland offsetting works proposed may not be sufficient. This is particularly so noting that the value of the wetland as habitat for fernbird and the level of effect has been underrepresented in offset calculations.
- The management of kauri and rhytid snails is generally supported. However, there is a lack of information on the duration of management measures and whether or not the management works extend into the pine plantation.
- Adverse effects on other avifauna (birds) including whitehead and pipit will be appropriately managed by the effects management package proposed.

Flora

- The proposed restoration and covenanting of 9.9 hectares of native terrestrial vegetation and associated pest management and the covenanting of 111.9 hectares of indigenous forest areas will address adverse effects associated with the removal of 4.83 hectares of indigenous regenerating forest and 0.67 hectares of indigenous mature forest. However, the measures proposed in respect of regionally rare species of kawaka and koromiko

need to be increased in terms of seedling translocation.

- Adverse edge effects on the areas of indigenous vegetation (including wetland buffers) that are not proposed to be covenanted have not been addressed.

Wetlands

- To demonstrate like for like in terms of terrestrial ecological values, the wetland planting should be undertaken in a manner that attempts to recreate these ecosystems while undertaking an appropriate assessment of existing wetland hydrology and substrate. A comprehensive analysis of each wetland in terms of form and function is also required to enable an accurate understanding of the amount of buffer planting required. The 5 m and 10 m buffers may not be adequate. In-perpetuity protection of the buffers should also be provided by way of covenant.
- Noting the commentary above, it is unclear how the management and protection of wetlands will achieve the like for like a no net loss principles of offsetting such that the form and functioning of the wetlands many not increase over time and additional habitat for wetland birds may not be provided.

Pest Control

- There is an expectation that plant pest control will occur in-perpetuity for all areas that are subject to a covenant.
- It is difficult to assess the effectiveness of animal pest control measures, which are proposed as an offset for a wide range of ecological factors, for additionality and appropriateness for offsetting without a detailed pest management plan. By way of an example, it is not possible to determine whether the effects on frogs will be offset adequately in the absence of baseline data on rat abundance in the off-site areas. If rats are already at low abundance in those areas, then there will be little or no potential to increase the frog populations as a consequence of the proposed rat control measures. As such, it is uncertain whether pest animal control will address the residual effects on various fauna and indigenous forest loss.

I rely on the expert assessment of Mr Chapman in assessing the submitted ecological assessment and all further supporting information (which includes the effects management package) and providing commentary on adverse effects as they relate to terrestrial ecology.

The removal of pine and wattle forest and pasture is an ecological issue in terms of a loss of habitat for fauna, the associated adverse effects of which will be evaluated below. The only other adverse ecological effect that may result from their removal is increased edge effects, which Mr Chapman notes have not been addressed. He does, however, confirm that these adverse effects are resolvable and could be addressed by condition through incorporation of management measures within the ecological and landscape enhancement and restoration plan.

Adverse effects with respect to flora, which generally relates to the removal of 4.83 hectares of indigenous regenerating forest and 0.67 hectares of indigenous mature forest, will generally be addressed through the proposed restoration and covenanting of 9.9 hectares of native terrestrial vegetation and the associated pest management and the covenanting of 111.9 hectares of indigenous forest areas. Further measures, as recommended by Mr

Chapman relating to seedling translocation for the regionally rare species of kawaka and koromiko, could be included within the ecological and landscape enhancement and restoration plan.

A range of management plans have been proposed with respect to the management of fauna, including Hochstetter's frogs, lizards, long-tailed bats, avifauna (birds) and invertebrates (snails). This is required as the proposed vegetation clearance and earthworks will result in the loss of habitat. In general, these plans are supported as the management measures they propose will ensure that adverse effects are suitably mitigated, either through rescue and relocation or preserving roosting habitats during construction. Alterations to the lizard, bat and invertebrate management plans will be required to ensure that works extend into the pine and / or Wattle plantations, noting the habitat these areas provide. I consider that extension of management requirements into the pine plantation is necessary.

The need to implement the management measures with respect to lighting is also a key requirement for bats. The Council's Lighting Specialist, Mr John McKensey, who has had previous experience with designing lighting to manage effects on long-tailed bats, has confirmed that the measures proposed will generally be suitable to adequately manage lighting effects (on long-tailed bats). I adopt this assessment.

The management of Hochstetter's frogs is experimental and no certainty of a successful outcome can be provided as a consequence of their proposed translocation. Further to this, while a management plan has been provided, there are no details of: relocation release sites; existing frog abundance at the proposed release sites; pest control prior to carrying out the translocation operations; and measures for in-perpetuity protection. As advised by Mr Chapman, such omissions add to the uncertainty around whether adverse effects on Hochstetter's frogs will be appropriately managed. With the frog population estimated as being 'in the late hundreds to early thousands', it is of high ecological significance. The loss of all frogs, which is an outcome that cannot be discounted, would result in a loss of biodiversity. To address this, Mr Chapman notes that an adaptive management plan that includes appropriate contingency and remedial actions could be developed. If the applicant was to prepare such a plan and present it at the hearing, subject to review and agreement, this may be sufficient to ensure that adverse effects on Hochstetter's frogs are managed to minor and acceptable levels.

Irrespective of the implementation of an adaptive management plan, I note that Mr Chapman has confirmed that the proposed culvert along the main access road will result in an unacceptable level of adverse effects on Hochstetter's frogs in respect of injury / mortality, habitat loss, and severance of habitat connectivity. Noting that the area where the culvert is proposed is a Hochstetter's frog hotspot, I adopt Mr Chapman's assessment and consider likely adverse effects to be more than minor. I further note that an alternative, less invasive, design option is available (i.e. a bridge).

In respect of fernbird, spotless crake and Australasian bittern, the issues identified by Mr Chapman essentially relate to a loss of wetland habitat and whether the proposed offsetting measures will be sufficient to confirm than an acceptable outcome will be achieved in respect of habitat provision. This dovetails in with the concerns Mr Chapman has expressed in terms of wetland planting and the provision of enhanced buffers. On the basis of the information submitted, I am unable to confirm that wetland offsetting measures proposed will address adverse effects with respect to habitat loss for fernbird, spotless crake and Australasian

bittern to minor or less levels. It should be noted that this is a separate matter to the assessment of Mr Lowe, who has confirmed that the wetland offsetting works will address residual adverse effects relating to freshwater ecology.

Overlapping with the above issues, I note Mr Chapman's assessment that a detailed and comprehensive pest management plan is required to confirm that the measures proposed by the applicant will achieve the assessed levels of offsetting and compensation in respect of adverse terrestrial ecology effects.

Accordingly, I consider that some adverse effects relating to terrestrial ecology can be addressed through the careful management of fauna, the methodologies for which will be provided within detailed management plans (being further developments of the submitted draft plans). This is subject to a number of these plans being extended to include works within the wattle and pine plantations and the implementation of an adaptive management plan with respect to Hochstetter's frogs, noting that the latter will need to be subject to further review to confirm acceptability. The undertaking of replacement planting and the covenanting of notable areas of indigenous vegetation will also address most adverse effects associated with the indigenous vegetation removal works proposed, with measures to address seedling translocation and edge effects able to be integrated into an updated ecological and landscape enhancement and restoration plan. However, there are uncertainties with respect to the level of offsetting and compensation that will be achieved by the pest management measures proposed, while the wetland offsetting works may not address adverse effects with respect to habitat loss for fernbird, spotless crake and Australasian bittern. The culverting works proposed to allow for development of the main access road will also adversely affect an area of identified Hochstetter's frog habitat, resulting in injury / mortality, habitat loss, and severance of habitat connectivity. For these reasons, I consider that, overall, adverse terrestrial ecology effects will be more than minor and unacceptable.

Construction Effects

Adverse effects relating to construction include those relating to physically undertaking the works and associated adverse effects associated with issues such as noise, vibration, air discharges, traffic and landscape and visual amenity.

These adverse effects have been assessed within reviews by a range of persons with expertise in assessing these adverse effects, which I summarise as follows:

Noise and Vibration

- The Council's Consultant Acoustic Specialist, Mr Jon Styles, has reviewed the submitted noise assessment and comments, in his review dated 18 September 2020, that subject to the development and implementation of a detailed construction noise and vibration management plan, particularly with respect to activity along Crowther Road and construction of the proposed roundabout access, compliance with the applicable construction noise and vibration standards within Chapter 25 'Noise and Vibration' of the AUP(OP) will be achieved. This also includes the need for blasting requirements.

Air Discharges

- The Council's Air Quality Specialist, Mr Paul Crimmins, has reviewed the submitted air quality assessment and associated further information responses, and comments in his

review dated 9 September 2020, that all construction works will be undertaken in accordance with GD05, which requires that exposed surfaces and vehicle accessways are stabilised to minimise the potential for dust discharges. He further notes that standard dust control measures will be implemented in accordance with *Good Practice Guide for Assessing and Managing Dust* Ministry for the Environment, 2016 (GPG:Dust), including limiting vehicle speeds and using water to dampen surfaces. Subject to the implementation of these measures, Mr Crimmins considers that discharges of dust during the construction phase are unlikely to adversely affect flora within the site or human receptors beyond site boundaries.

- The emission of hazardous air pollutants (HAPs) from on-site machinery is not raised as concern by Mr Crimmins given that the number of diesel machines likely to be used, and separation distances are such, that any emissions will be negligible when measured against ambient concentrations.

Traffic

- The Council's Consultant Traffic Engineer, Mr Gary Black, has reviewed the submitted integrated transport assessment and associated further information responses. In his technical review, dated 17 September 2020, he comments that construction traffic will access the site via Crowther Road, with approximately 72 heavy vehicle movements per day and 200 light vehicle movements per day being generated. Approximately 90% will approach Crowther Road from the south, requiring a right turn to access it. Wait times to enter will, on average, be 10 seconds, increasing to 20 seconds during the evening peak, although the tidal nature of traffic movements is such that only three movements are expected during these times. The widened centreline and the width of the sealed road shoulder, along with the implementation of management measures to warn traffic and potentially reduce speeds, will ensure that negligible adverse effects result from traffic turning right into Crowther Road.

- The above notwithstanding, the implementation of a construction traffic management plan will ensure that adverse effects on the safe and efficient management of State Highway 1 are appropriately managed. This will include details such as the timing of traffic movements, including avoiding accessing the site during school bus operational hours and public holidays (including the day before public holiday weekends), and the provision of signage and traffic management measures. The need for a right turn bay into Crowther Road has also been noted as a potential requirement.

Landscape and Visual Effects

- The Council's Consultant Landscape Specialist, Mr Peter Kensington, has reviewed the submitted assessment of landscape and visual effects. In his technical review, dated 17 September 2020, he concurs with the application assessment, that during the site establishment and construction phase there will be moderate (more than minor) adverse landscape effects on the topography associated with the access road in the Southern Block, the landscape character of the Southern Block and the streams within the Eastern Block (the landfill footprint). Furthermore, during the site establishment and construction phase the is the potential for moderate-high (more than minor) adverse visual effects on residents adjacent to Springhill Farm.

- To avoid, remedy or mitigate these adverse effects, a number of measures are

proposed, which include:

- Avoidance of native vegetation clearance within SEA areas and Wetland Management Areas as far as practicable;
- Avoidance of project footprint on the identified Outstanding Natural Landscape (ONL) (Area 32, Dome Forest);
- Planting of poplar trees in proximity to the site entrance to replace the existing trees proposed for removal;
- Native revegetation planting along the cut and fill slopes particularly along the main access road;
- Adverse effects affecting receivers adjacent to Springhill Farm will be temporary and will only affect a small number of viewers. Furthermore, one of these sites is now owned by the applicant, another will likely be purchased by NZTA and the other will be screened by existing and proposed planting; and
- A detailed ecological offset package, which has a clear overlap with addressing adverse landscape effects.

- Noting these factors, Mr Kensington concludes that adverse landscape and visual effects will be effectively avoided, remedied or mitigated during the site establishment and construction period.

I rely on the assessments of the various specialists in assessing the construction related matters that relate to their areas of expertise.

As noted by Messrs Styles and Crimmins, a majority of the works will be located away from site boundaries such that compliance with permitted noise, vibration and air discharge standards will be achieved. Mr Styles notes that construction traffic along Crowthers Road will need to be carefully managed to ensure that compliance is achieved, with the provision of such detail required within a final construction noise and vibration management plan. Air discharges will be addressed through the general construction management plan. Both of these plans will provide the necessary direction to the contractors employed by the applicant to ensure that construction works are undertaken in a manner that achieves compliance with permitted requirements and suitably mitigates adverse effects.

For the most part, the works will be separate from surrounding properties noting the large size of the subject site and the location of the works. As assessed by Mr Crimmins, this, along with the use of dust minimisation and suppression measures, will ensure that persons and flora are not adversely affected by dust emissions. I adopt this assessment.

The level of construction traffic generated, while notable, will be a low overall percentage of the total traffic volume along State Highway 1, and will not be dissimilar to the type of traffic that currently utilise it. There is no expert evidence before me that suggests otherwise. Expert traffic evidence confirms that Crowther Road can be utilised for access purposes, with a combination of existing conditions and traffic management measures being such that construction vehicles can enter and exit this road without resulting in adverse traffic safety effects along State Highway 1. This includes the potential requirement for a right turn bay. Further measures will be implemented via the proposed construction traffic management plan to ensure that other issues are also addressed, including the timing of traffic to avoid

conflict with school bus movements and during school holidays. I also note that NZTA have stated in their submission that they support the proposed construction access arrangements from a traffic safety perspective, noting that they would also have input into the measures required within the construction traffic management plan.

Adverse landscape and visual effects will result during the construction period as a consequence of the removal of vegetation, the reclamation of streams and the undertaking of earthworks. As assessed by Mr Kensington, measures will be implemented to avoid adverse effects, including the avoidance of works within the ONL. The clearance of vegetation along the access road will be mitigated by the replacement planting proposed along its length, albeit that temporary adverse effects will result while planting establishes. Noting the limited viewing audience of this area, these temporary adverse effects are, in my assessment, acceptable in this instance.

While streams will be reclaimed, they are located within a central valley and while there is a level of intrinsic landscape value associated with their presence, their overall contribution to wider landscape values is, in my assessment, limited, particularly noting that they are flanked by pine trees. I therefore adopt Mr Kensington's assessment that the effects management package offered by the applicant, which includes over 20 hectares of native planting and covenanting within the subject site, will ensure that landscape and visual effects associated with the proposed reclamations are minor and appropriate / acceptable.

Properties in proximity to Springhill Farm will experience adverse effects during the site establishment and construction period, primarily due to visibility of stockpile 1 and the clay borrow area, and potentially, the topsoil stockpile. These areas will be most notable from the properties at 1232, 1232A and 1282 State Highway 1 and from properties to the west along Wayby Valley Road. Distant views will also be available from the southeastern end of Wellsford. I agree with Mr Kensington that such adverse effects will be gradual and temporary, with the stockpiles to be grassed as soon as practical, both for erosion control and visual amenity purposes. While temporary effects still need to be considered, their temporary nature does of itself provide a level of mitigation given that adverse effects associated with the exposed stockpiles will only occur for a short period of time. I further note that exposed soils are not unexpected in a rural context and particularly in an area with forestry activity, where tree removal often leaves large areas of land exposed until such time that replacement plantations start to grow. Also of relevance is that 1232 State Highway 1 is now owned by the applicant and that no submission in respect of the application was received from 1232A State Highway 1. Should the Warkworth to Wellsford State Highway extension be consented and constructed, 1282 State Highway will no longer be used for residential purposes. Noting these factors and the further mitigation that results as a consequence of a combination of distance and the screening provided by vegetation located along the Hōteo River and topographical undulations, I consider associated landscape and visual effects during the landfill establishment period to be minor and acceptable.

Accordingly, I consider that the design of the landfill and the range of management measures proposed will ensure adverse construction related effects in respect of landscape, visual and general amenity values and traffic safety, will be no more than minor and acceptable.

Landfill Operation

Adverse effects associated with the operation of the landfill are assessed as follows:

Leachate

The assessment of adverse effects associated with leachate is multifaceted. First, the leachate itself needs to be assessed, with the contamination it contains and its production being a function of the type of waste that the landfill will receive. The next element relates to the management of leachate within the landfill and the manner in which any leachate generated is managed in terms of containment and collection. An assessment of potential leachate leakage is then required, noting the migration pathways into the surrounding environment that are possible. The final assessment is on the environmental and human health risks associated with the leakage of leachate.

The Council's Consultant Contamination Specialist, Ms Natalie Webster, has reviewed and assessed the proposed waste acceptance procedures and criteria (WAC), which determine the level of contamination contained within the leachate and its rate of production.

A summary of the key comments from her technical review, dated 17 September 2020, is set out as follows:

- The information provided by the applicant in terms of WAC, which is based on their Redvale operation and accepted landfill and Ministry for the Environment guidelines, provides a good indication of likely leachate quality. In some instances, a conservative approach has been taken to setting WAC by assuming a greater contaminant leaching potential than is standard. However, this approach does not provide an adequate assessment of the full range of contaminants that may be present, particularly in respect of new / emerging contaminants, and existing contaminants that have not been recognised as toxic, persistent, or bio-accumulative, or have been poorly understood. To address this, detailed protocols and processes need to be established and described in the Landfill Management Plan with respect to emerging contaminants, including how they are tracked so that intervention decisions, including the prohibition of certain waste types, could be made.
- Regular review of the WAC will be required to ensure that they reflect advances in industrial chemistry and ongoing scientific research into the toxicity, and environmental fate and transportation of contaminants. The proposed WAC review condition will address this.

The management of leachate within the landfill, and the manner in which any leachate generated is managed in terms of containment and collection, has been reviewed and assessed by Mr Pattle as part of the same technical review referenced in respect of the landfill liner assessment. A summary of his key comments are as follows:

- The landfill liner design and leachate leakage assessment are based on a maximum leachate head of 300 mm. However, the design of certain aspects of the system presents a risk of leachate ponding and blockage. While the applicant has proposed additional measures to address this, including additional and over-sized pipes and the flushing of blocked drains, concern still remains with respect to the design of the eastern floor noting its size, grade and location under the thickest portion of future fill. To address this, further mitigation could be provided at the detailed design stage by steepening the grade and / or providing further conveyance piping. This will depend on the outcome of hydraulic modelling of potential blockages but could be addressed by way of condition.

- Leachate production is variable, particularly as a consequence of rainfall and stormwater leakage during new cell construction. The bottom up staging approach to landfill construction may result in large volumes of water entering the completed downstream landfill stages and increasing the generation of leachate. To address this, contingency options are required in respect of the provision of on-site buffer capacity and additional disposal options. This could be achieved by way of condition.

- Leachate collected at the outlet sump will be pumped to tanks for storage. While this is supported, a condition is required to limit the maximum period and duration that leachate could be allowed to build up in the fill in order to avoid excessive head on the liner.

- Collected leachate will be recirculated within the landfill where practical, with additional leachate disposed of off-site until such time that sufficient landfill gas is produced to allow for on-site treatment / reduction via an evaporator. Other than the need for on-site buffer capacity and additional disposal options as outlined above, the leachate collection and disposal system proposed is appropriate.

- In the event that leachate leaks from the outlet sump, it will enter the stormwater pond below. Should such a scenario occur, the pond will be closed and contaminated water pumped out, either for disposal back into the landfill or to the leachate management system (as detailed above). Contingency plans will be in place to ensure these actions occur.

- When the landfill has reached capacity, it will be lined with a 2m thick cap (approximately), which along with drainage will minimise stormwater infiltration. Aftercare management requirements will include maintenance of the cap and the stormwater and leachate management systems.

Mr Perwick, as part of the same technical review referenced in respect of the groundwater and water take assessment, has reviewed and assessed the existing groundwater flow regime, which is important in understanding what might occur to leachate should it leak through the liner and enter groundwater. Based on the specific contaminants and leachate concentrations the applicant has assessed (as per the WAC assessment), Mr Perwick considers that the base case and 1,000 times leachate leakage scenarios will be unlikely to result in adverse water quality effects at the six identified receptor locations. However, Mr Perwick does note the following issues:

- The applicant's reliance on regional scale computer modelling as opposed to actual field gauging influences the stream dilution factors that have been applied to the contaminant fate and transport risk assessment e.g. dilution factors may be over-estimated

- The downwards flow direction between the upper (stream baseflow) and lower (regional) aquifer zones is likely to be more significant than accounted for by the applicant. The data submitted suggests that the regional aquifer is of higher permeability and is an important discharge zone for the upper aquifer. There are also indications, as per borehole (BH15) results, of vertical hydraulic connections between the aquifers such that groundwater travel times may be significantly more rapid than accounted for. While limited investigations have been undertaken, it is likely that similarly transmissive, or potentially more transmissive, connections between the upper aquifer zone and the deeper regional aquifer zone are present beneath the landfill footprint.

- Flow direction in the regional aquifer from the area beneath the proposed landfill footprint is likely to be in a more south-westerly direction and towards the Waiteraire Stream.
- It is plausible that at least 10% of groundwater flow paths beneath the landfill liner may evade the proposed sub-liner drains, and will likely migrate downwards and eventually into the regional aquifer. Further propensity for downward flows to the regional aquifer will likely result if the sub-liner drains are removed or decommissioned.
- Due to the identified permeability and likely flow direction of the regional aquifer, TB01 (the applicant's proposed potable water supply), and the portion of the regional aquifer south through west-south-west of the proposed landfill to the Waiteraire Stream, are two additional receptors that need to be risk assessed and monitored in terms of water quality.

To address the above issues, Mr Perwick considers that the following measures are required, which could be achieved by way of condition:

- The placement and monitoring of additional up-gradient and down-gradient boreholes with spatial and vertical screen zones covering all plausible contaminant migration pathways. This is required to confirm the flow directions and permeability of the regional aquifer, and the likely vertical hydraulic connections to it in order to assess the likelihood for the potential migration of any leaked leachate and the need for contingency planning.
- The installation and permanent operation of a sub-liner drainage system during the operational landfill and aftercare periods, including continuous monitoring for leachate leakage detection. If the sub-liner drainage system is to be decommissioned, additional boreholes and contingency planning will be required as the risk of leachate migration to the regional aquifer, and the upper aquifer (and stream receptors), will be notably increased.
- Rigorous monitoring against the relevant drinking water quality standards / regulations and contingency planning for both TB01 and the regional aquifer (within the area south through west-south-west of the proposed landfill to the Waiteraire Stream) as they are receptors that will potentially be affected by leachate in groundwater.

While Mr Perwick has commented on the need for monitoring of water quality at the six identified receptor locations with additional and more rigorous monitoring of TB01 and the regional aquifer, a further assessment on the environmental and human health risks from leachate leakage has been undertaken by Ms Webster.

Ms Webster comments that the information submitted by the applicant indicates that the risk to the identified receptors from leachate, including cumulatively with other potential contamination sources, is low, with the modelled concentrations of contaminants not exceeding the applicable environmental guidelines. To confirm this and allow for a more rigorous assessment of the potential risks to receptors from a more substantial liner failure, Ms Webster recommends the assessment of potential effects on receptors at leachate leakage rates higher than those currently assumed. She has also highlighted the issues raised by Mr Perwick in terms of groundwater flow paths and the likely need for monitoring of additional receptors.

I rely on the expert assessment of Messrs Pattle and Perwick and Ms Webster in assessing

the various adverse effects associated with the generation of leachate, its containment and collection within the landfill and migration into the surrounding environment and potential adverse environmental and human health effects in the instance of leachate leakages.

Waste accepted by the landfill, being a Class 1 landfill, has been outlined within the submitted application material, and will include a mixture of residential, commercial, construction and demolition waste. Industrial waste that meets strict criteria will also be accepted, along with contaminated soils. Hazardous substances such as explosives, flammable liquids (petrol, diesel etc.), infectious substances and radioactive material will not be accepted. This accords with current acceptance criteria at Redvale and as confirmed by Ms Webster, accepted landfill and Ministry for the Environment guidelines. Noting the conservative approach that has been adopted with respect to the estimates of contaminant leaching from some materials, I consider the waste acceptance assessment to be suitably robust, with the level of contaminants contained within generated leachate according with that anticipated.

I adopt the assessment of Ms Webster with respect to the need to implement detailed protocols and processes to address new / emerging contaminants, and existing contaminants that have not been recognised as toxic, persistent, or bio-accumulative, or have been poorly understood. I consider that this is necessary to ensure that the agreed acceptance criteria are reviewed and amended by persons qualified to do so in order to reflect current research findings and understanding with respect to waste contamination. Implementation of this will be achieved through the waste acceptance review condition, which will occur every five years, noting that this would also be incorporated into the overall Landfill Management Plan.

Overall, I consider that adherence to the WAC proposed by the applicant in combination with modifications as necessary to reflect future understanding of new and emerging contamination will ensure that leachate would not contain highly toxic or unacceptable levels of contaminants.

The installation of the landfill liner has been assessed in the landfill establishment section, with the conclusion being that, on the basis of the submitted evidence, it will serve as a leachate containment barrier for potentially several hundred years until the leachate strength becomes benign such that it would be ‘fit for purpose’.

The above notwithstanding, while there is very low level of risk of leachate leakage, contingency measures need to be developed to ensure that the risks associated with such events are suitably addressed.

As detailed in the assessment from Mr Pattle, the leachate drainage system will ensure that leachate is collected and discharged to an outlet sump and then pumped to storage tanks. While the system as proposed presents a risk of ponding and blockage, which increases the risk of leakage, measures could be implemented to address that, including additional conveyance pipes and pipe flushing. As per Mr Pattle’s assessment, which I adopt, the base grade of the landfill could also be increased.

As assessed by Mr Pattle, the need to minimise leachate build up at the outlet sump and the provision of on-site buffer capacity and additional leachate disposal options are also important measures to reduce the risk of leakage and ensure that contingencies are in place for those situations whereby excess leachate is generated. This may occur as a consequence of rainfall (noting the high rainfall levels associated with the area) or

unintended stormwater discharges into the working landfill. I adopt this assessment and consider that conditions could be implemented to ensure that the management and contingency measures are implemented.

Contingency measures are proposed in the instance that leachate leaks from the outlet sump into the stormwater ponds, noting that the pond would be closed and the leachate pumped out of the pond or into the storage system for future disposal. I rely on the assessment of Mr Pattle that such measures will ensure that adverse effects associated with this scenario are suitably addressed.

The provision of the proposed landfill cap and drainage system would minimise the penetration of water into the landfill upon closure, while the aftercare management requirements will ensure that the cap integrity is maintained and that the stormwater and leachate management systems remain operational. This ensures that leachate generated once the landfill is closed will be minimised, with any that is generated managed in an appropriate manner.

Accordingly, I consider that leachate will be managed in a manner the ensures that there is a very low level of risk of leachate leakage from the landfill, with any leakage from the outlet sump able to be readily addressed by proposed contingency actions.

While the risk of leachate leakage is very low, it is not a zero-risk scenario and adverse effects associated with leachate leakage from the liner need to be assessed.

As assessed by Mr Perwick, limited field investigations have been undertaken, with the result being that the flow directions and permeability within the regional aquifer and the vertical hydraulic connection with the upper (shallow) aquifer (which supports baseflows) are not understood to the level required. Investigations undertaken to date indicate that regional aquifer permeability may be higher than assessed, and that there may be a greater level of vertical connection between the two aquifer zones. That being the case, there is a greater risk of contamination of the regional aquifer from leaked leachate than assessed by the applicant.

To address the above issues, Mr Perwick has recommended conditions requiring the installation and monitoring of additional up-gradient and down-gradient boreholes to allow for early warning of potential groundwater quality effects, as well as a better understanding of aquifer connection and potential contaminant migration pathways. Monitoring and contingency planning is also recommended by Mr Perwick with respect to TB01 and the regional aquifer (within the area south through west-south-west of the proposed landfill to the Waiteraire Stream), being two receptors that are sensitive to adverse effects from leachate in groundwater, and that may be affected noting the likely migration pathways. This is in addition to the six receptors already identified for monitoring purposes by the applicant. The need for these additional receptors to be included is supported by Ms Webster, who also recommends that higher leachate leakage rates than those assumed by the applicant are assessed to ensure that potential risks to receptors are rigorously assessed so that it can be confirmed with greater certainty that concentrations of contaminants would not exceed the applicable environmental and / or human health guidelines. Mr Perwick's final condition recommendation is the provision of design details of the proposed sub-liner drainage system, along with incorporation of a continuous monitoring system for leachate leakage detection

and confirmation that that it will be in place during the operational landfill and the required aftercare period following closure.

I adopt the assessments and recommended conditions of Mr Perwick and Ms Webster, noting that they are proposed to address potential adverse effects associated with leachate leakage that have not been identified in the application material or assessed with the necessary level of rigour. I consider that these measures are required noting the potential risk of leachate entering groundwater and migrating into pathways and the need to confirm that the risk of adverse environmental and human health effects resulting would fall within acceptable levels. That is to say that water quality at the identified receptors would remain compliant with the applicable environmental guidelines. In the instance that monitoring of the aquifer confirms a greater level of connectivity than currently assessed, measures could be implemented to ensure that the risks of groundwater contamination are suitably mitigated.

Accordingly, noting the detailed assessments undertaken by Messrs Pattle and Perwick and Ms Webster, I consider that any leachate generated by the landfill will not contain highly toxic or unacceptable levels of contaminants, with the proposed landfill liner and management system ensuring that the leachate will be contained and collected for disposal with the potential for leachate leakage being very low. In the instance that leachate leakage results, measures will be implemented to ensure that adverse environmental and human health effects are suitably mitigated. These factors ensure that all adverse effects associated with leachate generated by the proposed landfill activity will be no more than minor and acceptable.

Sedimentation

Noting that effects associated with the formation of the landfill cells, which will occur in seven phases over the lifetime of the landfill, have been assessed in the 'landfill establishment' section, the primary aspects associated with the on-going operation of the landfill that may result in adverse sedimentation effects are the daily and intermediate cover operations and use of stockpile 1, the topsoil stockpile and the clay borrow area for these purposes. Application of the final cover may also result in adverse sedimentation effects. While sedimentation will result from the working areas of the landfill, these areas are included within the industrial and trade activity areas, with all sediment laden runoff directed to the stormwater ponds and wetland for treatment. This aspect of the landfill is assessed separately below.

Ms Harte has confirmed that the applicant proposes to manage sediment discharges from each of these areas with SRPs (ponds 7 and 9), which will be sized at 3% of the contributing catchment. Ms Harte has confirmed that the applicant proposes to limit exposure of stockpile 1 and the clay borrow area to five hectares, which she considers should also include the topsoil stockpile. She considers that this to be realistic as there should be no need for a greater level of exposure at any one time. Ms Harte also notes that the adaptive management regime discussed within the landfill establishment section would be applicable to the operation of the landfill, which will enable the established erosion and sediment control measures to be adjusted and amended should monitoring indicate that adverse effects are potentially resulting. It will also allow for adjustment if improved measures for erosion and sediment control are developed.

I rely on the expert assessment of Ms Harte and consider the risk of adverse sedimentation effects from the on-going operation of the landfill to be low. Sediment runoff from the soil stockpiles and clay borrow area will be reduced through limiting total exposure at any one time, with runoff from exposed areas directed to SRPs for treatment. These will be chemically treated to maximise sediment removal. Any sediment that is deposited in the transportation process between the stockpiles and the clay borrow area and its use for cover will be contained within the working landfill and will discharge to the stormwater pond and wetland system. It is anticipated that large spills will be addressed through remedial actions e.g. excavators will be used to collect the soil and reuse it as appropriate. The final cover (the landfill cap) will be stabilised and vegetated with grass (as a minimum), which will minimise sediment runoff. Furthermore, with this area draining to the stormwater pond and wetland system, which will remain operational post landfill closure, any sediment runoff generated will be contained and treated.

Accordingly, I consider that adverse sedimentation effects associated with the operation of the landfill to be no more than minor and acceptable.

Industrial and Trade Activity

The industrial and trade activity effects associated with the operation of the proposed landfill have been detailed in the submitted stormwater and industrial and trade report and associated further information responses, which have been reviewed and assessed by the Council's Specialist, Ms Arsini Hanna.

Ms Hanna, in her review dated 7 September 2020, has confirmed that landfills are listed in the AUP(OP) as high-risk industrial and trade activities, with the potential contaminants of concern being pH, heavy metals, ammonia, TSS, organic material (measured as chemical or biochemical oxygen demand (COD/BOD)), total petroleum hydrocarbon (TPH), oil and grease.

To ensure that these contaminants are managed in accordance with GD01 and AUP(OP) requirements, the following measures are proposed, with Ms Hanna confirming that their implementation will ensure that the necessary level of contamination removal is achieved and that the required monitoring and management is instigated:

- The installation of two rain gardens to treat stormwater flows from the bin exchange area, with discharges flowing to new outlet structures into the Waiteraire Stream Tributary. Flows in excess of the 5% AEP event will bypass the raingarden.
- Stormwater from the main access road will be treated via one of 12 filter strips, with water then discharging via spreader dispersal bars into the adjoining valley (and then into the Waiteraire Stream Tributary). Stormwater from all other roads will discharge to the proposed stormwater ponds (pond 3) cascading to pond 2 and then the wetland for treatment prior to discharge into the receiving environment.
- A wheel wash will be located at the top of the main access road for the cleaning of wheels of all vehicles leaving the landfill footprint. Runoff will drain to an oil and grit interceptor for treatment. Sediments from the wheel wash will be dried out and disposed of within the landfill as waste. Overflows will be diverted to a sediment pond adjacent to the wheel wash and then into the stormwater pond system.
- Runoff from the refueling area will drain to an oil–water separator for treatment and then

into the stormwater pond system.

- Stormwater runoff from the energy centre and maintenance workshop will discharge directly into the stormwater pond system.
- The leachate system will be fully bunded with no discharges of any contaminated water into the stormwater system. Any contaminated water will be pumped into the leachate system or removed for off-site disposal.
- The implementation of an environmental management plan (EMP), which includes control system procedures for hazardous wastes, site maintenance and the drainage systems, along with a list of unacceptable waste and a spill response plan. The EMP also includes staff training requirements and outlines the roles and responsibilities of employees on site.
- An emergency spill response plan is proposed to address adverse effects that may result from an unexpected spill event.
- A stormwater monitoring and maintenance plan is proposed, with the purpose being to ensure that the required site management practices are implemented and maintained in order to minimise the potential discharge of contaminants associated with the site activities.

I rely on the assessment of Ms Hanna in assessing the appropriateness of the measures proposed to address discharges from those areas of the landfill that are included within the industrial and trade activity areas.

The area around the leachate storage and evaporator will be fully bunded, noting that runoff within this area may contain high levels of contamination. All runoff from this area will effectively be treated as leachate and disposed of in the same manner. That is to say, it will not be discharged into the stormwater ponds for treatment. Noting the need to ensure that leachate is not discharged into the surrounding environment, I consider that this management approach is necessary.

Stormwater from the wheel wash and refuelling areas will potentially be contaminated with TPH, oil and grease, with the required percentage of these materials being removed by the proposed oil and grit interceptor and oil-water separator devices. The treated stormwater will then be discharged to the stormwater pond system for further treatment prior to eventual discharge from the wetland. Contaminated material removed will be disposed of within the landfill. I rely on the expertise of Ms Hanna that this is the most appropriate manner to treat runoff from these areas in order to ensure that the necessary level of contamination is removed. I further rely on her expertise that runoff from all other areas around the working landfill, including the energy centre, maintenance workshop and access roads within the working landfill could be treated by the stormwater ponds and wetland, with no need for additional levels of treatment, as is the case with the wheel wash and refuelling areas.

Stormwater from the bin exchange area and main access road will discharge to separate treatment devices, as their location in the Southern Block is such that a gravity connection to the stormwater pond and wetland system is not possible. As advised by Ms Hanna, the filter strips will accord with New Zealand Transport Agency guidance as it applies to state highway infrastructure. I rely on her expertise that this guidance is applicable, noting that this would appear to be a logical conclusion given their application to a roading environment. I further

rely on the assessment of Ms Hanna that the use of rain gardens is appropriate for the bin exchange area, but note that, as has been the case with other resource consents that I have processed, such systems are often used to treat runoff from vehicular access and parking areas. This is essentially what the bin exchange area will function as noting that all bins are sealed such that waste material will not come into contact with the ground.

Implementation of the proposed EMP and the undertaking of maintenance are key measures to ensure that the proposed treatment measures are operated and maintained by suitably trained people, which in turn will ensure that their performance, in terms of the removal of identified contaminants, is realised on an ongoing basis. This will be confirmed by monitoring, with immediate action to be undertaken to rectify any identified problems that may occur. The provision of an emergency spill response plan is an important contingency measure as it will ensure that any unexpected spills that occur are remedied in a manner than minimises potential adverse environmental effects from the discharge of contaminants.

It is noted that stormwater runoff from 5% AEP events will bypass all proposed treatment devices. Ms Hanna has advised that almost all contaminants will be contained within the 95% AEP flows, such that adverse contamination effects on the receiving environment from the bypassing of these devices will be negligible. I adopt this assessment. I do, however, note that human health risk concerns have been raised in respect of discharges from such events. This will be addressed separately within the 'Human Health Risk' section.

Ms Hanna notes that thermal effects may result from the discharge of higher temperature water. She comments that the nature of the streams that water will discharge to is such that fish and macroinvertebrate species within them are likely to be tolerant of warmer waters. She further notes that the proposed water take from the ponds for non-potable use will provide volume reduction and a larger storage buffer, which will likely reduce the temperature of discharged water to 25°C or less. Guidelines and supporting research set 25°C as the upper temperature limit for stormwater discharges and noting that the temperature of the receiving stream is likely to be less than 20°C, Ms Hanna has not raised concern in respect of adverse thermal effects. I am entirely reliant on the expertise of Ms Hanna and noting the factors she has outlined in terms of species tolerance, temperature reduction and the thermal characteristics of the receiving stream, I consider that adverse thermal effects associated with the proposed stormwater discharge will be less than minor.

Accordingly, noting the above and the assessment undertaken by Ms Hanna, I consider that the approach to managing adverse effects from the industrial and trade activity portions of the proposed landfill is appropriate, with a comprehensive array of measures proposed to ensure that contamination is removed from discharged stormwater and that thermal effects are suitably addressed. Subject to their implementation and the associated management and monitoring regimes, I consider that any associated adverse effects will be minor and acceptable.

Stormwater

Noting the inter-related nature of industrial and trade activity effects and stormwater, this component has also been reviewed by Ms Hanna, with a summary of her key comments set out as follows:

- During the initial stage 1 operation of the landfill, a stormwater pond (referred to as pond 5) will be located above the landfill and will collect all up-gradient stormwater runoff. It

will drain to a stormwater pipe located beneath the landfill which will be sized to cater for flows from a 10% AEP event. Pond 5 will be sized to contain water from a larger AEP event to ensure that flows to not overtop into the landfill. The pipe from pond 5 will discharge to pond 3, which will in turn discharge to pond 2 and then finally into the wetland. Stormwater from the areas around the landfill footprint, including the access roads (other than the main access road), will drain to pond 4 and then cascade down the ponds as noted above.

- As filling in of the landfill progresses, pond 5 and the associated stormwater pipe underneath the landfill will be decommissioned, and up-gradient stormwater will be diverted around the landfill and into pond 4. This is referred to as stage 2.
- Stage 3 involves the final stage of the landfill, with the landfill being capped and grassed and pond 4 decommissioned, leaving ponds 2 and 3 and the wetland.
- The roof areas of all buildings will be constructed from inert materials to reduce contaminants and will be discharged to the stormwater ponds for detention and preliminary treatment.
- Stormwater from all areas forming part of the industrial and trade activity will be pre-treated as necessary and discharged into the stormwater pond system. The exceptions are the bin exchange area and main access road, which will discharge to the adjoining Waiteraire Stream Tributary.
- The proposed stormwater management system has been designed to be consistent with the objectives set out in *Stormwater Management Devices in Auckland Region; Guidance Document* (GD01) by:
    - ensuring that post-development peak flow rates for the 1% AEP event are limited to pre-development levels (to prevent downstream flooding) and maintaining pre-development hydrology in greenfield catchments by ensuring that post-development peak flow rates for the 50% and 10% AEP events are limited to pre-development rates.
    - removing 75% of total suspended solids (TSS).
- Stormwater will discharge from the wetland (being the final treatment device) into the adjoining stream via an outlet with energy dissipation and erosion protection. Flows in excess of the 5% AEP event will bypass the wetland and flow directly into the stream via a lined channel.
- Any stormwater that enters the working landfill, including that from any overflows, will be treated as leachate and will not drain to the stormwater ponds or wetland.

I rely on the assessment of Ms Hanna in assessing the appropriateness of the stormwater management measures proposed.

The installation of the up-gradient systems will ensure that water is diverted under and around the landfill (thereby ensuring that is does not come into contact with landfill waste material, which would result in the generation of additional leachate) and into the proposed stormwater pond and wetland system. As noted within the 'landfill establishment' assessment, these ponds (including the wetland) and drains will also be designed to address

flooding effects, noting that the landfill footprint occupies a number of existing overland flow paths.

The proposed stormwater ponds and wetland have been designed so that they will provide attenuation and treatment of stormwater runoff, including the roof areas of buildings and water from all industrial and trade activity areas, some of which will be pre-treated to remove contaminants of concern. Filter strips and spreader dispersal bars and rain gardens with discharge outlets are proposed for the main access road and bin exchange area as they are unable to drain to the stormwater ponds and wetland. Ms Hanna has confirmed that all of these devices have been designed to accord with required standards, and as such, I consider that their installation will ensure that stormwater runoff will be suitably treated and discharged.

Initial design details that have been submitted indicate that the proposed stormwater system can provide the necessary level of attenuation and treatment. Further details confirming this would need to be submitted at engineering approval / building consent stage, with the need to do so forming a condition of consent. While I note that Mr Cavanagh has raised concern with the system in terms of capacity and some of the details submitted, I consider that those details could also be addressed at detailed design stage.

Accordingly, noting the above and the support of Ms Hanna, I consider that the stormwater management approach proposed is appropriate and that any subsequent adverse effects from the discharge of stormwater from the proposed landfill in terms of water quantity and quality will be no than minor and acceptable.

Air Discharges

The air discharge effects associated with the operation of the proposed landfill have been reviewed and assessed by Mr Crimmins as part of the same review referenced in the assessment of construction related air discharge matters.

Mr Crimmins states that the principal sources of air discharge emissions from the landfill are from the generators, flare stacks and leachate evaporator (HAPs) and the landfill tipping face, bin exchange area and leachate collection system (odour). The discharge of dust is also likely from the tipping face and vehicle movements. HAPs and odour discharges will also result from the capped landfill.

In undertaking this review, Mr Crimmins has advised (as detailed in section 7 of this report) that an assessment of the effect of discharges on climate change has not been undertaken, as section 104E of the RMA specifically prohibits such an assessment in respect of an application to discharge contaminants into air, except to the extent that the use and development of renewable energy enables a reduction in the discharge of greenhouse gases and to ensure compliance with the requirements for the control of greenhouse gas emissions at landfills under the National Environmental Standards for Air Quality (NES:AQ). Within this scope, Mr Crimmins confirms that the proposed generation of electricity from landfill gas (LFG) would enable a reduction in the discharge of greenhouse gases from electricity generation using fossil fuels and that potential discharges of LFG shall be controlled in accordance with the NES-AQ.

A summary of Mr Crimmins' assessment with respect to the various air discharge components is set out below:

Hazardous Air Pollutants (HAPs)

- It is predicted that at least 90% of generated LFG would be captured and utilised by the generators (energy facility) or flared in accordance with the requirements of the NES-AQ. This appears to be accurate based on measurements of captured methane at Redvale.
- The predicted rates of HAP discharges from the energy facility are conservative and reflective of a worst-case emissions scenario, based on an assumed LFG combustion rate that is not likely to occur for 30 years.
- The adopted background air quality values are conservative, with the actual air quality concentrations near dwellings in the surrounding area likely to be lower than those detailed in the application documents.
- The modelled increase in annual-average ambient fine particulate matter ($PM_{2.5}$) concentrations is 3% of the applicable guideline.
- Conservative modelling of nitrogen dioxide demonstrates that concentrations will not exceed NES-AQ or AUP(OP) guidelines at any point beyond the site boundaries.
- Carbon monoxide emissions would be insignificant even when added to conservative background levels.
- Sulphur dioxide emissions will comply with relevant guideline requirements and will not result in adverse human health or ecosystem effects that are more than minor.
- The assessment of non-methane organic compound discharges via the inhalation exposure pathway demonstrates that these discharges are highly unlikely to cause an unacceptable risk to human health.
- The potential trace air discharges of mercury are not likely to cause detectable health effects.

The actual and potential effects of hazardous air pollutants can be adequately avoided, remedied and mitigated by adherence to recommended conditions of consent, including the design, maintenance and monitoring of the LFG control system and landfill capping. Further measures recommended to minimise hazardous air pollutant discharges include routine point-source and ambient air quality monitoring and independent expert reviews.

Odours

- Odour is most likely to arise from the landfill tip-face and areas under daily cover.
- The energy facility will likely result in 100% odour destruction efficiency, with those portions of the landfill subject to intermediate and final cover likely to have no appreciable odour discharges.
- The separation of the bin exchange area from dwellings and the use of sealed containers will minimise odour discharges from this area to no more than minor levels.
- The limited number of sensitive receivers within 2 km of the proposed landfill combined with topographic and meteorological factors assists with reducing potential odour impacts from the main landfill area. Compliance with WAC, limiting the area of the

working face and the application of landfill cover will further minimise adverse odour effects. Further minimisation measures should include routine field odour inspections and a biennial expert review of odour records and management, which could be included as conditions of consent.

Dust

- A range of mitigation measures are proposed to minimise dust discharges, which along with separation distances, will minimise off-site dust effects to minor levels.

Unplanned Air Discharges

- Identification and remediation of fugitive LFG discharges from cracks in capped areas will adequately mitigate the risks of off-site adverse effects.
- While it is considered likely that a surface fire will occur over the lifetime of the landfill, based on fires that occurred at the Purewa (Northland) and Hampton Downs (Waikato) Landfills, such events are unlikely to cause significant off-site air quality effects provided that adequate contingency measures are in place to ensure that they are promptly extinguished. The LFG management system is such that sub-surface fires are less likely to occur. However, a range of conditions requiring constant monitoring, WAC review and the implementation of management plans, are recommended to minimise the risk of fires occurring and to remedy any adverse effects should they result.

I rely on the assessment of Mr Crimmins in assessing adverse effects as they relate to the discharge of contaminants to air from the proposed landfill activity.

The assessment undertaken with respect to the generation and discharge of HAPs has, where possible, utilised available and relevant data from other landfill operations, including the applicant's existing facility at Redvale. This, along with the conservative nature of a number of the modelled scenarios, ensures that the assessment is both accurate and reflective of a worst-case scenario. Noting this and that HAP emissions are not predicted to approach the relevant human health and ecological guidelines; I consider that the potential for associated adverse effects to result will be suitably minimised.

In respect of odour, the energy facility will ensure that all odour from collected LFG is removed. The use of intermediate and final cover will minimise the discharge of odour from those portions of the landfill that would not be used for a period of time (typically more than six months) or capped. Minimising the open area of the landfill tipping face and the placement of daily cover will also reduce odour emissions from the working landfill. Additional measures recommended by Mr Crimmins in respect of field inspections and review of odour record and management measures will further ensure that adverse odour effects are unlikely to occur.

While the bin exchange area is located relatively close to the western site boundary with State Highway 1, with the bins being sealed, the release of odour is unlikely to be detectible beyond this site boundary, particularly noting that the submitted odour assessment predicts that odour is unlikely to extend beyond 'a few tens of metres' based on the Kate Valley Landfill in Canterbury, where a similar bin exchange system operates.

Management of dust is similar to odour in that a range of mitigation measures will be implemented to minimise dust emissions. This includes the sealing of roads to ensure that notable levels of dust from traffic are not generated in the first instance and the provision of a wheel wash facility to ensure that dust from the wheels of vehicles that access the landfill tipping face is removed. Water sprays will be applied to suppress dust as necessary, with dusty loads to be buried within the tipping face to prevent windblown distribution.

Noting the above factors and the separation of the working landfill from the closest residential receivers, I consider that adverse effects associated with odour and dust will be mitigated to acceptable levels.

In terms of unexpected events, the measures proposed by the applicant to address fugitive LFG emissions will ensure that associated adverse effects could be quickly identified and remedied as necessary. Fire risk is, however, more of an issue and is not detailed as a notable risk in the submitted application documentation. Mr Crimmins has noted that a surface fire is a likely event over the lifetime of a landfill, being an assessment that is supported by documented cases of recent fires at the Purewa and Hampton Downs Landfills; I consider that it is a risk that needs to be addressed. In this respect, Mr Crimmins' assessment is that fires are unlikely to result in significant adverse effects (based on the Purewa and Hampton Downs Landfill fires) but that measures need to be implemented (which could be imposed by conditions) to minimise the risk and remedy any resultant adverse effects. I adopt this assessment and the associated recommended conditions in respect of constant monitoring, WAC review and the implementation of management plans.

In summary, HAP discharges from the operation of the landfill will not exceed relevant health-related or ecological guidelines, either in isolation or cumulatively with existing background levels. Furthermore, separation distances and the implementation of a range of management measures will minimise the risk of adverse odour and dust emissions occurring, as well as potential adverse effects associated with unplanned discharges, and particularly those related to fires. I therefore consider that any adverse effects with respect to the discharge of contaminants to air associated with the proposed landfill activity will be no more than minor and acceptable.

Human Health Risk Effects

The submitted human health risk assessment and associated further information responses have been reviewed by the Council's Environmental Health Specialist, Ms Sharon Tang.

In her technical review dated 21 September 2020, Ms Tang highlights that the fundamental objective of a human health risk assessment is to evaluate the potential impact of an identified hazard (the landfill activity in this instance) on a specified human population under a specific set of conditions and for a certain timeframe. A human health risk assessment needs to identify all likely hazards and then evaluate the risk of exposure and undertake a subsequent assessment on human health risks. The assessment should:

- Identify any chemical, physical or biological entity that induces an adverse response in a media material e.g. air, water, soil, food, consumer products etc;
- Identify exposure routes and estimate or measure the magnitude, frequency and duration of exposure;
- Identify receptor locations and pathways by which they might be exposed;

- Integrate exposure and toxicity information to evaluate cumulative effects from multiple stressors from multiple exposure pathways; and
- Evaluate the risk levels in the specific population and discuss uncertainties.

Ms Tang has reviewed the submitted human health risk assessment and all requested further information, and is generally satisfied with the level of assessment and risk evaluation that has been undertaken. However, some areas have not been addressed ti the required level of detail as set out below:

- The potential impact of extreme weather conditions, including storms with high wind and heavy rain, is not well understood due to lack of available data. However, it appears likely that a large increase in stormwater runoff during such an event would result in decreased retention times and discharges from the site without sufficient treatment. Further evaluation needs to be undertaken to determine the relationship between rainfall and stormwater discharge quality, with a contingency plan developed to mitigate any potential effects of extreme weather events that may be identified.
- The short-term effects on the regional aquifer from unplanned releases, including as a consequence of stormwater system and landfill liner failures arising from differential settlement, earthquakes, or landfill fires, is poorly understood. Contamination of the regional aquifer from such releases presents a significant human health risk. Further evaluation is required based on data available from other landfill facilities to support the preparation and development of a contingency / emergency management plan.
- Landfills are identified as possible sources of microbiological contamination, which the submitted human health risk assessment does not address. Noting that sensitive human use of both groundwater and surface water occurs within the receiving environment, it is considered necessary to include microbiological indicators into the baseline and ongoing monitoring programme. Should monitoring indicate that a risk is present, the proposed groundwater monitoring plan would need to be updated with appropriate trigger levels and contingency planning if necessary.
- Microplastic pollution is an emerging issue, with efforts being made both nationally and internationally for the reduction of plastic use. As such, microplastic should be included in the ongoing monitoring programmes with respect to leachate and stormwater discharges.
- The proposed baseline and ongoing monitoring locations do not include the Hōteo River. As the Hōteo River is utilised by the local community for food and contact recreation it should be included in this monitoring programme.

I rely on the assessment of Ms Tang in assessing the appropriateness of the proposed landfill activity with respect to potential adverse effects relating to human health risk.

In general, the submitted information provides a strong indication that the landfill would be managed in a manner that reduces risks to human health to suitably low levels. This is reflected in the associated reviews by Council specialists with respect to leachate, stormwater, industrial and trade activity and air quality, with the application proposing a range of detailed measures proposed to ensure that adverse effects relating to the discharge or contaminants to land, air and water are reduced to minor and acceptable levels. However, some of these specialist reviews do raise concern with the risk of adverse effects arising,

including potential migration of contaminants into groundwater and air discharge effects from fire, with conditions recommended to ensure that these adverse effects are suitably addressed.

Similar concerns have been raised by Ms Tang with respect to unplanned releases such as differential settlement, earthquakes, or landfill fires, noting that associated adverse effects are poorly understood. Ms Tang has also raised concern with respect to potential adverse effects from stormwater runoff triggered by extreme weather conditions. She further notes that microbiological contamination and microplastic pollution have not been assessed and with landfills being possible sources of such contaminants, this risk to human health needs to be addressed. Ms Tang also considers that monitoring of the Hōteo River is important given that it is a resource that is utilised for food and contact recreation. A range of conditions have been proposed by Ms Tang to address these residual issues.

As noted above, I rely on the expert assessment of Ms Tang and adopt her conclusions with respect to adverse effects from unplanned releases and extreme weather conditions and accept that the imposition of conditions will ensure effects from such events are better understood and that contingency measures / plans could be implemented to ensure that any adverse effects that may result are remedied or mitigated. Contingency measures could include the development and implementation of a management plan that includes alert and action triggers for responses, response procedures (including Council notification) and public risk communication / management.

I further adopt Ms Tang's assessment that monitoring of microbiological contamination is required, particularly noting the potential adverse effects if such contamination was to enter groundwater and surface water that the local human population utilises. The identification of such contamination will allow the source to be traced and measures implemented, including revision of WAC, to ensure further releases do not result.

Emerging contamination issues are addressed in the WAC review as part of the leachate assessment, which ensures that the issues identified in respect of microplastics will be addressed.

In terms of the Hōteo River, there is debate as to the effectiveness of baseline and ongoing monitoring noting its existing water quality levels. That is to say, there is uncertainty that any contamination identified within it as part of ongoing monitoring could be attributed to the landfill. In the absence of conclusive evidence either way, and noting the confirmation within submissions of the use of the Hōteo River by the local human population, I accept the assessment of Ms Tang that monitoring is necessary to address human health risks.

Accordingly, noting the detailed assessment undertaken by Ms Tang, I consider that the discharge of contaminants would or could be managed in a manner than ensures that the risk of adverse human health effects is mitigated to no more than minor and acceptable levels.

Stormwater Dams

Stormwater ponds 2, 3 and 4, while serving as ponds for stormwater management purposes, also meet the definition of dams and as they do not comply with the applicable permitted activity standards, their operation requires consent as off-stream dams.

The construction of these dams has been assessed in the 'landfill establishment' section,

whereby it was concluded that the dams will be constructed in accordance with required standards thereby ensuring that they will be capable of functioning for their designed purpose, being the impoundment of stormwater.

The operational aspects associated with these dams have been reviewed and assessed by Mr Tate (in the same review referenced within the stormwater dam section of the landfill establishment effects assessment), who notes that a dam safety management system is proposed, which will require the implementation of:

- Operation, maintenance and surveillance procedures, including the management of identified dam safety issues;
- Emergency contingencies; and
- Intermediate and comprehensive safety reviews.

Mr Tate has confirmed that these measures are compliant with the New Zealand Society of Large Dams New Zealand Dam Safety Guidelines (NZDSG).

Mr Tate further confirms that the applicant has undertaken a potential impact classification (PIC) assessment in accordance with NZDSG. A PIC assessment involves identifying the consequences of a hypothetical dam failure on the downstream environment, being people, property and the environment. A computer simulation was used to produce inundation maps of the downstream area, with the overall conclusion being that all three dams have a PIC of 'low', which means that only minor effects downstream would result with no dwellings being affected. Mr Tate agrees with this conclusion.

I am entirely reliant on the expert assessment of Mr Tate, and consider that appropriate measures will be implemented to ensure that the dams will be managed in a manner that ensures that their ongoing structural integrity is maintained and provided for. The imposition of conditions of consent would ensure that this occurs. While this will ensure that the chance of failure is very low, I consider that an appropriate level of assessment has been undertaken to assess the associated risks, noting that such an event has the potential to have significant adverse effects. In this environment, noting the isolation of the dams from surrounding sites and that no dwellings are within the potential inundation area, I consider adverse effects associated with a dam failure scenario to be minor.

Accordingly, I consider that adverse effects associated with the ongoing operation and function of the proposed dams will be minor and acceptable.

Take of Surface Water

The application proposes to take up to 150m^3 of water per day from the proposed stormwater ponds to allow for a water supply for a range on non-potable uses, including dust suppression, vehicle washing, road washing and firefighting purposes.

The aspect of the development has been reviewed and assessed by the Council's Water Allocation Specialist, Mr Stephen Crane. A summary of the key comments from his technical review, dated 4 September 2020, is set out as follows:

- The proposed take of 150 m^3 is based on current use at the applicant's Redvale facility and factors in efficiencies that the applicant will seek to achieve at the proposed landfill.

With modelled water storage of 31,000 m^3, and no shortages within the 56 years of data analysed, the take would be consistent with efficient allocation and use requirements.

- The stormwater ponds are required to have 200 m^3 of 'live storage' per hectare of catchment for sediment detention, which is above the normal 'dead storage' water level in the ponds. The water take will reduce the dead storage area, resulting in higher velocities and the potential for sediment resuspension, which may decrease water quality performance. However, the live storage area will increase, extending the residence time for water in the pond and improving the water quality performance, essentially offsetting the dead storage area reduction. Overall, the effect on the water quality performance of the ponds from the proposed water take will be low.
- The potential effects of climate change and declining flows to the ponds will not impact the proposed take noting the proposed 35-year duration.

I rely on the expert assessment of Mr Crane with respect to his technical evaluation of the proposed surface water take.

The proposed daily 150 m^3 water take represents a small portion of the modelled storage water volume and the total annual stormwater pond throughput. While a level of sediment resuspension may result from the reduction in dead storage, advice from Mr Crane is that this will be offset by the increased residence time of water due to the increased live storage capacity. I therefore consider that the proposed take will represent an efficient allocation and use of surface water while not undermining the water quality function of the subject stormwater ponds. I further consider that it would be a more efficient use than abstracting the equivalent level of water from the regional aquifer, noting its potable quality.

I adopt Mr Crane's assessment that the effects of climate change and any impact on water availability will not be an issue during the 35-year duration of the proposed surface water take.

Potential adverse effects on the downstream environment may result due to reduced flows from the stormwater wetland as a consequence of the proposed surface water take. Unfortunately, this issue was identified too late for the applicant to provide an assessment prior to completion of this report. It is understood that a further assessment on this matter will be provided prior to the hearing in order to allow for review and comment by the applicable Council specialists.

Subject to downstream flow effects being suitably addressed, I consider that any adverse effects from the proposed take of surface water for non-potable use in association with the operation of the landfill to be no more than minor and acceptable.

Landscape and Visual Effects

The landscape and visual effects associated with the operation of the proposed landfill have been detailed within the submitted assessment of landscape and visual effects, which has been reviewed and assessed by Mr Kensington as part of the same review referenced in the assessment of construction related landscape and visual matters.

A summary of his key comments is set out as follows:

- During the operation of the landfill and post-closure there will be moderate (more than minor) adverse landscape effects on the topography of the Southern Block (associated

with the main access road) and the streams within the Eastern Block (the landfill footprint) with these adverse effects reduced over time through revegetation mitigation.

- During the operation of the landfill and up to closure there is the potential for moderate (more than minor) adverse visual effects on residents adjacent to Springhill Farm and some Wellsford viewing audiences. There will also be moderate-low (minor) adverse visual effects for viewers within a limited area of Wellsford, with the distance generally greater than 4.0 km from the site being a mitigating factor.
- Post-closure adverse visual effects will be moderate-low (minor) on residents adjacent to Springhill Farm and moderate-low or less for all remaining viewing audiences.
- To avoid, remedy or mitigate these adverse effects, a number of measures are proposed, which include:
    - Avoidance of native vegetation clearance within SEA areas and Wetland Management Areas as far as practicable.
    - Avoidance of project footprint on the identified Outstanding Natural Landscape (ONL) (Area 32, Dome Forest).
    - General avoidance of encroachment into Natural Stream Management Area, with works limited to an area of approximately 80m² at the eastern extent of the overlay to allow for construction of the main access road.
    - Native planting along the cut and fill slopes, and particularly along the main access road.
    - The provision of fast-growing evergreen trees for screening purposes along ridges around the perimeter of the landfill along with the establishment of native and exotic planting on the sides of the landfill.
    - The grassing of the soil stockpile away from where current filling works are occurring.
    - Sensitive design of buildings, including the use of neutral colours (relative to the vegetated setting).
    - The use of discrete signage that set back at least 10m from the state highway.
    - Placing and directing lighting to face downwards and avoid high points that are visible outside of the site along with the use of light shields to minimise effects on the night sky.
    - Establishment of grass and / or native planting on the final cap, noting that the extent and type of planting will need to be shallow rooting so they do not pierce the cap. As a minimum, the cap will be planted with grass and not left as bare earth.
    - Existing planting and the establishment of proposed planting will mitigate potential adverse visual effects for receivers adjacent to Springhill Farm, with the operational works being gradual and temporary.

Noting these factors, Mr Kensington concludes that the proposal will result in adverse landscape and visual effects that can be effectively avoided, remedied and / or mitigated through appropriate landscape management techniques to achieve an outcome that will

progressively integrate successfully over time within the subject rural environment.

I rely on the expert assessment of Mr Kensington with respect to assessing landscape and visual effects as they relate to the operation of the proposed landfill.

Adverse landscape and visual effects as a consequence of the removal of vegetation and the reclamation of streams and wetlands essentially occur during the establishment and construction period. These adverse effects have been assessed within the 'landfill establishment' section and were concluded to be no more than minor and acceptable. Further discussion of these elements will not, therefore, occur as part of this assessment, other than to note that a level of the planting undertaken to address adverse effects at this stage will carry over into the operational stage. Indeed, by the time the landfill is commencing operation, the mitigation measures proposed, particularly the planting of the poplar trees at the site entrance and mixed native planting proposed along the length of the main accessway will be becoming established and will likely provide a notable level of screening of the site entrance and bin enclosure area. This is demonstrated in visual simulation V40 and will assist with screening of on-site activity, including vehicles accessing the site and use of the bin exchange area. This vegetation is noted as a mitigating factor by Mr Kensington, and given the notable presence of the state highway in this area with no identified areas of landscape or visual value, I consider that adverse landscape and visual effects associated with this portion of the operational landfill, including those arising from it being viewed from those immediately surrounding properties, will be minimal in extent.

The planting proposed along the perimeter and sides of the landfill will assist with both screening and softening of the working landfill. As identified by Mr Kensington, the properties adjacent to Springhill Farm and those further to the northwest, including within south and southeastern portions of Wellsford, will have a level of visibility of the landfill. As can be seen in visual simulation V27, which represents a year five scenario (essentially being commencement of landfill operation noting the five year establishment period), stockpile 1 will be largely grassed and the overall appearance of the working landfill area will not be too dissimilar from that of the existing environment and will not, in my assessment, be unexpected within a rural environment dominated by farming and forestry. The five-year scenario from Davies Road approximately 4 km to the northwest in Wellsford is similar, and while the elevation of this area allows for potential views into the landfill valley, grassing, planting and distance ensure that appropriate levels of mitigation are provided by the time the active landfill surface reaches a visible level. The same conclusions apply with diminishing levels of adverse effects from the other identified viewpoint locations due to a combination of greater levels of separation and topographical variations.

With the landfill cap to be grassed at the very minimum, and with the perimeter and surrounding landfill vegetation in place, I consider that the landscape and visual effects post-closure will be reduced even further from what they were during its operation and will not result in any discernible adverse effects.

In respect of lighting, Mr Kensington notes that lighting will be placed to avoid high points that are visible outside of the site, which along with directing lighting downwards and the use of light shields will minimise effects on the night sky. He further notes that lighting will comply with AUP(OP) standards as set out in Chapter 24 'Lighting', with the ability to do so having been verified as practical by the Council's Consultant Lighting Specialist, Mr John McKensey, who notes that the proposed conditions of consent mandate compliance. Noting these

factors, and the generally limited visibility of those parts of the site that will be lit, Mr Kensington concurs with the conclusions to the submitted assessment of landscape and visual effects that adverse night-time lighting effects will be very low. This is reinforced by observations of lighting at the applicant's Redvale facility during periods of darkness in the morning and visiting the site during periods of darkness in the evening. I adopt this assessment and consider that the low level of lighting proposed and the measures to reduce off-site visibility in terms of lighting design, including direction, placement, intensity and shielding, will ensure that adverse lighting effects are negligible.

The measures proposed within the landscape management plan will address other potential visual effects issues, such as those associated with windblown rubbish. Mr Kensington comments that these measures could be strengthened by requiring the regular collection and disposal of rubbish that accumulates within the vicinity of the site entrance in the state highway corridor. I concur with the assessment and agree that the maintenance of the site entrance is important noting that it is the only direct public interface such that a clean and tidy appearance is essential.

The one relevant issue that Mr Kensington has not commented on is cultural landscape effects, being an issue raised in submissions from Mana Whenua. Mr Kensington comments that he understands that the applicant has engaged with these submitters to better understand these specific cultural landscape effects and investigate potential mitigation measures in the form of acknowledgement, interpretation, access and plant selection and will respond to this issue through submissions and evidence. As such, at this time, an informed assessment on cultural landscapes cannot be provided, but it is anticipated that this position will change once the relevant information and assessment is presented at the hearing by the applicant and Mana Whenua as submitters. This is also a matter of relevance in respect of cultural values, which are assessed further below.

Accordingly, subject to cultural landscape effects being further assessed and explored through the presentation of evidence at the hearing and all issues being satisfactorily resolved, I consider that the landfill has been designed, and will be operated, in a manner that ensures that adverse landscape and visual effects are avoided or will be remedied or mitigated to no more than minor and acceptable levels.

Traffic

The traffic effects associated with the operation of the proposed landfill have been detailed in the submitted integrated transport assessment (ITA), which has been reviewed and assessed by Mr Black as part of the same review referenced in the assessment of construction related traffic matters.

A summary of his key comments is set out as follows:

- In total, the landfill is estimated to generate approximately 740 vehicle trips per day, comprising the inbound and outbound movements of 520 waste trucks and 220 non-waste vehicles. During the morning and evening peak hours, the estimated vehicle trip total is 55, which includes the inbound and outbound movements of 30 waste trucks and 25 non-waste vehicles. These figures are based on predicted forecasts for 2028, being the year the landfill is forecast to be fully operational and are based on an annual growth rate of 3%. During the peak hours, all waste trucks have been modelled as arriving from and departing to the south. This is reduced to 90% for non-waste vehicles, with 10%

from the north, which accounts for potential workers that may live in the Wellsford area.

- The traffic generated represents approximately 3% of traffic on State Highway 1 in the morning peak hour and 1% in the evening peak hour, with provision made to ensure vehicle trips are spread throughout the day to avoid the peak periods.
- The theoretical capacity of the Dome Valley section of State Highway 1 is calculated at approximately 1,400 vehicles per hour (v/h) northbound and 1,650 v/h southbound. With predicted traffic in 2060 being between 38% and 88% of theoretical capacity during the morning and evening peak periods, sufficient capacity will be retained at all times.
- The landfill will be accessed from State Highway 1 via a newly proposed roundabout, the design and location of which has been discussed with NZTA (who have indicated support for this component of the development within their submission). SIDRA modelling of the proposed roundabout for 2026 (opening), 2028 (full operation) and 2060 (maximum waste received) traffic scenarios indicate that it will operate at a level of service (LOS) of A. This LOS is representative of free-flowing traffic with modest / average delays. 95 percentile queues will correlate to 6-7 second average delay times for through movements.
- The addition of up to four logging truck movements per hour (being the number of trucks that would potentially use the access road to access the subject site in association with logging activity on the subject landholdings) represents less than 5% of landfill traffic and will have a less than minor effect on the roundabout performance.
- The proposed additional heavy vehicle trips to and from the landfill along State Highway 1 and through Dome Valley will not exacerbate existing road safety issues (along this section) as they will be largely mitigated by the safety improvements currently being undertaken and expected to be complete in late 2021. Additional truck movements north through Wellsford are negligible (approximately two per day) and will not exacerbate existing road safety issues.
- The are no minimum or maximum parking rates for landfills in rural zones, with parking for approximately 50 vehicles proposed in proximity to the main office and workshop buildings. Two of these spaces will be to mobility standards, which complies with required standards in instances when parking is provided. One long stay cycle parking space will also be provided along with a loading space, with the latter, like parking, not being a minimum requirement.
- All parking and loading areas and associated accessways will comply with the applicable dimension, gradient, accessibility / manoeuvring, vertical clearance and lighting requirements.

I rely on the expert assessment of Mr Black with respect to assessing technical traffic engineering matters, and particularly those detailed within the submitted integrated transport assessment and associated supplementary information.

The assessment undertaken with respect to traffic generation has modelled yearly increases in traffic along State Highway 1 at 3%, which it notes as being reflective of the most recent growth rate measurement and an accurate reflection of likely growth rates up into 2028, which is when the landfill is forecast to be running at full capacity. These forecasted levels of traffic represent between 1% and 3% of total volumes along State Highway 1 during peak

hours. These additional levels are minimal in extent on a percentage basis and I note that the theoretical capacity analysis that has been undertaken confirms available capacity at all times along the subject portion of State Highway 1. I further note that this capacity analysis is conservative as by 2060 it is likely that road improvements would have occurred and / or an alternative north / south route will be available, with the former likely to improve capacity and the latter likely to divert traffic elsewhere.

Access to the site has been carefully considered, with the proposed roundabout having been located and designed in consultation with NZTA, being the road controlling authority for all state highways. NZTA have lodged a submission that, while neutral on the application, is supportive of the proposed site access and roundabout design and confirms on-going engagement with the applicant to ensure that the site can be safely accessed. While finer design and safety audit requirements need to be finalised, this is a matter of detailed design, with a condition contained in the applicant's recommended condition set requiring this. While this is essentially a third-party approval, it is at the applicant's request and based on NZTA's submission, there is no reason to suggest that approval would not be obtained. As such, in this instance, it can be supported on an 'Augier' basis (being a condition that is willingly offered by an applicant, which might otherwise be considered *ultra vires*).

SIDRA modelling of the proposed roundabout confirms that it will operate with a LOS of 'A', with average delays for through traffic modelled at 6-7 seconds. Higher levels of delay may result for vehicles entering and exiting the site, with the worst case being right turn movements for northbound traffic (i.e. entering from the south) being up to 13 seconds during the evening peak hour. This is a LOS of 'B', but noting that it will only affect users of the site and not through traffic and that 13 seconds is still a short period of time, I consider associated adverse effects to be negligible. While it is noted that logging truck activity has not been accounted for in this modelling exercise, Mr Black has agreed with the applicant's assessment that the addition of up to four logging truck movements per hour utilising the roundabout access represents less than 5% of landfill traffic and will have a less than minor effect on roundabout performance. Noting the low levels of delay as detailed above, I adopt this assessment.

A detailed review of road safety along the stretch of State Highway 1 between Wayby Valley Road in the north to Goatley Road in the south has been undertaken. As detailed in the review from Mr Black, the submitted ITA summarises the crash history as follows:

> *Between 2014 and 2018, a total of 82 crashes occurred within the study area, of which two resulted in fatalities, 12 resulted in serious injuries, 18 resulted in minor injuries and the remaining only resulted in damage to property. Of all crashes that were reported, 53% were head-on or where the driver lost control, 19% during overtaking, and another 16% during crossing/turning. Poor observation, poor handling and failure to keep left were the three most prevalent contributing factors.*

The ITA states that NZTA has recognised these inherent safety issues and is currently undertaking a series of works along the subject stretch of State Highway 1 in order to address them. These works include the installation of flexible median safety barriers, wider road shoulders, new right turn bays and replacing north and southbound passing lanes with slow vehicle bays.

Mr Black queried if the presence of additional heavy traffic will exacerbate existing safety issues noting the high proportion of head-on, overtaking and turning crashes that occurred within the crash history study period. In response, the applicant stated that in 2028, the proportion of heavy traffic within the weekend peak four-hour period will be approximately 11% of the total peak traffic volume, representing an increase in total heavy vehicles of approximately 1%. While the presence of these vehicles may impact traffic flow and speed, the safety improvements being undertaken, including the provision of slow vehicle lanes will assist with mitigating any negative effects. Mr Black has reviewed and agrees with this assessment, confirming that the additional heavy vehicle trips will not exacerbate the existing road safety issues along the subject section of State Highway 1. Mr Black also confirmed agreement with the applicant's assessment that additional truck movements north through Wellsford will be negligible and will not exacerbate existing road safety issues.

I am very much reliant on the expertise of Mr Black in assessing and evaluating road safety and the potential effect that the additional level of traffic generated will have in this regard. Having reviewed his assessment, it is evident that the safety issues associated with the subject stretch of State Highway 1 are recognised by NZTA, with a range of improvements currently being undertaken to address them. While additional levels of traffic will be generated, as already assessed, the percentages will only be 1% to 3% of existing flows and will only result in a 1% increase of heavy vehicles. With access to the site being via a roundabout, the risk of a crash occurring as a consequence of vehicles turning into the site is significantly reduced and has not been raised as a safety concern. This leaves the only residual safety issue as being increased levels of driver frustration through following a slower moving waste truck. Noting that heavy vehicle numbers will only increase by 1% and the safety measures proposed by flexible median safety barriers, wider road shoulders and slow vehicle bays, I consider that the traffic generated by the proposed landfill will not exacerbate existing traffic safety issues. That is to say, they will not increase the likelihood of crash incidents along the subject stretch of State Highway 1 to any measurable degree. The same conclusions apply with respect to northbound traffic noting that daily waste truck numbers are estimated at a maximum of two.

In terms of other traffic matters, I note that Mr Black has confirmed that full compliance will be achieved with all car and cycle parking and loading requirements, while the main access road and all other on-site accessways will comply with the applicable width, gradient and circulation requirements. This ensures that all vehicles will be able to access, circulate within, and exit the site in a manner that does not result in any adverse traffic safety related effects.

Accordingly, the level and nature of traffic generated by the operational landfill will be within the available capacity of the subject stretch of State Highway 1 and will not exacerbate traffic safety issues, particularly noting the road safety measures that are currently being implemented. Noting these factors and the proposed roundabout access from State Highway 1, which will operate in a manner that results in minimal delay for through traffic while allowing vehicles to safety enter and exit the proposed landfill, I consider that adverse traffic congestion and safety related effects will be minor and acceptable.

Noise

The operational noise effects of the landfill have been assessed by Mr Styles as part of the same review referenced in the assessment of construction related noise matters.

Mr Styles comments that while noise emissions are generally contained within the subject site, there are locations, such as adjacent to the bin exchange area, where noise levels above the maximum permitted noise levels for the Rural – Rural Production Zone extend beyond the site boundaries. As there are no activities sensitive to noise in the area where these noise levels will result, the submitted acoustic assessment states that compliance with the permitted standards of Chapter E25 'Noise and Vibration' of the AUP(OP) will be achieved. However, Mr Styles notes that the applicant is seeking to essentially 'date stamp' this by only applying noise standard compliance to dwellings established at the date of granting consent. This approach essentially uses neighbouring land as a noise buffer. Mr Styles states within his assessment that this does not accord with best practice and is inappropriate.

Further to the above, Mr Styles states that the intensity of the landfill operation, and the associated character and duration of noise generated throughout the day- and night-time periods, is greater than what could reasonably be anticipated by activities within the Rural – Rural Production Zone. The maximum permitted noise levels for the Rural – Rural Production Zone were not prescribed to anticipate and provide for noise levels associated with a landfill that may generate noise close to or at the limits on a 24/7 basis. In this instance, Mr Styles notes that the noise level predictions for the landfill indicate that the predicted noise levels will be well below the maximum permitted noise levels within the zone (with the bin exchange area, as noted above, being an exception). However, this contrasts with the level of noise effects that the proposed conditions allow for, being noise up to the maximum permitted by the Rural – Rural Production Zone. In many cases, the margin between the predicted noise levels and those permitted by the proposed conditions is significant.

I rely on the expert assessment of Mr Styles and particularly his evaluation of the submitted acoustic assessment and the applicant's approach to assessing operational noise effects.

I concur with the approach of Mr Styles that it is not appropriate to 'date stamp' noise effects by only applying them to the notional boundaries (a line 20m from any side of a building containing an activity sensitive to noise, or the legal boundary where this is closer to the building) of existing dwellings, effectively using sites outside the application site as a noise buffer. Effects of the landfill need to be managed within the site and should not extend onto adjoining sites or affect the ability of people to be able to develop them in accordance with permitted zone requirements. In the Rural – Rural Production Zone, this includes the provision of a minimum of one dwelling per site and if a dwelling was to be constructed within any of the areas where higher noise levels are predicted to result, it would be subject to higher noise levels than would be expected in the zone. I therefore consider the condition recommended by Mr Styles to be necessary to ensure that the 'date stamping' approach proposed by the applicant does not result.

I also concur with Mr Styles that the noise levels for the Rural – Rural Production Zone were not developed to anticipate and provide for noise levels associated with activities other than those activities that are permitted. This is realised in the assessment criteria that relate to all restricted discretionary activities, with H19.12.1.(1)(b) requiring an assessment of the *effects of noise on the amenity values of the neighbourhood*. As all adverse effects can be considered for discretionary and non-complying activities, the ability to assess noise and associated effects on amenity values as they relate the particular activity proposed is also appropriate. That is to say, the effects on amenity need to be considered and not just

whether compliance with permitted zone levels will be achieved. In this instance, noting that a landfill is a non-complying activity and that the main landfill will operate up to 17 hours per day and the bin exchange area 24/7, an assessment of the character, duration and timing of noise likely to be generated is required.

In this respect, with the exception of the proposed 'date stamping' as outlined above, Mr Styles' assessment is that the level of noise will be compatible with other activities in the zone. I adopt this assessment and note that, the bin exchange area aside, the main landfill operation will be well separated from site boundaries and will be located within a valley such that most noise generated will be contained within the site boundaries and will be well below permitted zone standards. This demonstrates to me that the general landfill activity as proposed will result in noise emissions that are no more than minor and acceptable. However, that may not be the case if on-site activity and the subsequent level of noise increases, with the conditions of consent allowing this as a potential outcome, noting that the applicant's conditions set the permitted zone standards as the upper limits. In this respect, I support the conclusion of Mr Styles that the conditions of consent should be tailored to ensure that the maximum allowable noise levels represent a mix of the effects that have been assessed and presented by the applicant as part of their application and those commensurate with the effects that could reasonably be expected in the Rural – Rural Production Zone (particularly at night), including allowance for the effects of noise from State Highway 1.

Subject to the implementation of the conditions recommended by Mr Styles, I consider that adverse operational noise effects will be minor and acceptable.

Rural Character and Amenity

As a wrap-up of the various components of the operational landfill activity, an overall assessment of rural character and amenity values is required.

In this respect, I note that the purpose of the zone is to provide for the use and development of land for rural production activities and rural industries and services, while maintaining rural character and amenity values. While the proposed landfill cannot be described as a either a rural production activity or a rural service, it is listed within the sub-category of 'cleanfill, managed fill and landfill', with cleanfills and managed fills being discretionary activities (noting that the subject landfill also requires consent as a managed fill given that it will accept contaminated soils). As such, it could loosely be described as a rural industry, noting that landfills, at least on the scale proposed, are unlikely to be able to establish in any other zone (other than within a special purpose quarry zone as a remediation activity, which would still be non-complying).

Accordingly, I consider the critical issue to be the maintenance of rural character and amenity values, which is essentially a combined assessment of the effects relating to:

- Landscape and visual amenity;
- Traffic; and
- Noise, odour and dust.

Having undertaken an assessment of these matters above, I consider that they are of a nature and scale that even when their effects are combined, will not result in adverse effects

that could be considered more than minor.

The landfill has been designed to minimise its visual presence, noting the location of the working landfill well away from site boundaries and the measures proposed to screen and soften the entrance and bin exchange area with vegetation. While the soil stockpiles and clay borrow area will be visible from properties immediately to the west, this will be progressively undertaken, at distance from external viewers, with grassing also proposed to mitigated adverse effects from exposed soil, not that visibility of exposed soil is an unexpected outcome in a rural environment, particularly one in which forestry and farming dominates. Visibility of the working landfill will only be at notable distance where the site forms a small portion of the rural landscape and only once the level of the landfill reaches near final elevations. Referring specifically to rural character and amenity, I note below and adopt the assessment of Mr Kensington in respect to submissions (page 10 of his technical review):

> 46. *I do not agree with the claims made within the submission by Richard Garner, on behalf of the Federated Farmers of New Zealand (Auckland Province) Incorporated, that the application will lead to adverse effects on the rural landscape and character of the site and surrounding environment. In my opinion, as assessed in the Application ALVE, the proposal is well located within a visually discrete part of the landscape, with those visible aspects of the proposal being similar in character to other rural activities. Additionally, the magnitude of visual change in the landscape will be relatively slow, with a gradual manipulation of landform, that will eventually result in a final appearance that is consistent with the underlying land base.*
>
> 47. *The rural context of the site, with a predominance of production forestry activity, will assist in ensuring that the potential adverse landscape effects from the proposal can be visually absorbed. The applicant's proposal to rehabilitate parts of the site and to undertake and establish appropriate planting on the wider property will also assist with the remediation and mitigation of adverse landscape effects overall. In addition, the proposal will avoid adverse effects on the identified area of Outstanding Natural Landscape and ensure that an appropriate integration and buffer is established between the landfill activity and this sensitive component part of the wider landscape.*

Traffic associated with the landfill will only have a presence along State Highway 1 and will not be noticeable once it enters the site at the roundabout. While the bin exchange area is located in proximity to the state highway, it will be well screened by vegetation and its use by vehicles will not be noticeable. No other noticeable adverse effects will result with respect to traffic given the location of the main access road and the operational landfill.

There is a potential for adverse noise effects to result from the operation of the bin exchange area, but conditions of consent, as recommended by Mr Styles, will ensure that surrounding sites are not used as noise buffers and can be developed for purposes anticipated by the zone as permitted activities that are sensitive to noise. Conditions of consent are also

recommended to ensure that appropriate levels of noise are maintained noting the importance of doing so in respect of associated amenity values.

Odour will be avoided through the flaring and use of generated LFG, with the use of daily, intermediate and final cover, the sealed nature of bins within the bin exchange area and the careful management of the tipping face ensuring that odour generated from other sources will be minimal in extent. Separation distances will further mitigate adverse effects, noting that odour within a rural environment is not uncommon.

Dust generation will be minimised through the use of a wheel wash for vehicles visiting the working landfill and the construction of sealed roads, with water sprays applied to suppress dust as necessary. Noting the buffer to surrounding sites, adverse dust related effects will be suitably addressed, again noting that a level of dust generation within a rural environment dominated by farming and forestry activity can be expected.

Accordingly, I consider that the proposed landfill has been designed to ensure that it physically integrates into the subject environment in a manner that is suitably discrete, particularly for a development of the scale proposed. Establishment issues aside, the site is well suited to operate as a landfill noting its accessibility from State Highway 1 and separation from sensitive receivers. Therefore, I consider that any adverse rural character and amenity effects will be minor and acceptable.

Cultural Values

The AEE, in section 9.13, has noted that the subject landholdings fall within the rohe of Ngāti Manuhiri and that they have prepared a cultural values assessment (CVA) for the project which they have presented to the applicant.

Ngāti Manuhiri separated the potential cultural effects into seven key themes being: whenua (land), wai (water), hau (air), biodiversity, wāhi tapu and taonga, social, economic and cultural wellbeing, and future management. The applicant provided a response to these themes as summarised in Table 9.1 of the AEE, noting that Ngāti Manuhiri may have additional concerns that were not encapsulated in the CVA. The applicant also noted that similar areas of interest and concern were raised at a hui with other iwi, in particular the potential effects on water bodies such as the Hōteo and the Kaipara Harbour.

Noting the break-down provided above, the primary effects issues raised by Ngāti Manuhiri relate to:

- Natural / native habitat management;
- Archaeology assessment and accidental discovery protocol implementation;
- Overland flow path and flood plains;
- Environmental sustainability;
- Incorporation of spiritual and cultural concepts are into water management.
- Waterbody management and preservation of taonga;
- Protection and enhancement of natural waterways through:
- Erosion and sediment control including stockpile and clay borrow stabilisation;

- Leachate management;
- Litter management;
- Stormwater management;
- Construction works management;
- Odour management;
- Lighting management;
- Vegetation management;
- Pest control;
- Wetland enhancement;
- Avoidance of all known or discovered wāhi tapu and taonga sites;
- Ngāti Manuhiri enabled to effectively exercise their role as kaitiaki; and
- Meeting of costs for Ngāti Manuhiri involvement, including input in aspects of the development and on-going engagement.

All of these effects, as they are able to be assessed in terms of likely natural and physical effects, have been comprehensively assessed above. However, the avoidance of known wāhi tapu and taonga sites, or the ability for Ngāti Manuhiri to effectively exercise their role as kaitiaki, are not matters that I have the expertise or ability to assess. I further note that the Ngāti Manuhiri Settlement Trust has lodged a submission which opposes the application, raising further concerns in respect of a number of the issues raised above, along with a number of additional cultural concerns.

Further to the above, cultural values and / or landscape effects have been raised by other Mana Whenua / cultural interest groups within submissions, including: Ngā Maunga Whakahii o Kaipara Development Trust; Te Rūnanga o Ngāti Whātua; Ngāti Whātua Ōrākei; Environs Holding Limited (being the environmental arm of the Te Uri o Hau Settlement Trust); Haranui Marae Trust Board; Te Uri o Ngati Rango Kaitiaki; Tinopai Resource Management Unit; and Te Potiki National Trust. While, as with Ngāti Manuhiri, I can assess the natural and physical effects they raise, all of which are assessed above, I cannot comment on the specific cultural issues. These matters will need to be further explored and discussed at the hearing where the above Mana Whenua groups can speak to their concerns directly.

For these reasons I do not provide an effects conclusion on cultural values noting my lack of expertise to do so but hope to be in a position, once all evidence has been presented at the hearing, to be able to be able to comment further in this regard.

<u>Positive Effects</u>

The AEE, in section 9.2, notes the following positive effects:

- Provision of regionally significant infrastructure.
- Job creation.
- Energy generation.

- Recreation access.

In terms of job creation, while I agree that jobs will be created by the landfill, which will likely be beneficial for Warkworth and Wellsford, the landfill is a replacement facility for Redvale, and once closed, there will be a subsequent loss of employment at that facility. That is to say, the subject landfill is not an activity that generates additional jobs but more so transfers them from one part of Auckland to another. This is reflected in the review of the submitted economics assessment by Council Economists Messrs Shyamal Maharaj and Shane Martin, dated 1 September 2020, who also note that increased machinery automation may reduce job numbers. So, while there are positive job creation effects, there are also negative job loss effects. That's not to say that one cancels the other out; just that the creation of jobs, in my assessment, is not perhaps as significant a positive effect as has been asserted in the AEE. I do agree that jobs will be created as part of the five-year establishment works and that this a positive effect, particularly for local businesses that may contract to the landfill or obtain indirect benefits, such as accommodation, and food and beverage services.

I am also not convinced that municipal landfills are vital pieces of regional infrastructure as recognised by the AUP(OP). They are listed in the definitions section under 'infrastructure', but I cannot find reference to them being 'vital pieces of regional infrastructure'. If that were the case, they would likely be provided for within Section E26 'Infrastructure', being the section that provides a framework for the development, operation, use, maintenance, repair, upgrading and removal of infrastructure that is critical to the social, economic, and cultural well-being of people and communities and the quality of the environment.

That being said, I accept that landfills are an important component of the overall waste management system for the Auckland region. While there are zero waste initiatives, as set out in the Auckland Waste Management and Minimisation Plan (2018), they are not mandatory requirements. There are also no prohibitions on consenting landfills, nor are there requirements to consent alternative waste treatment / disposal facilities. Accordingly, I accept the assessment of the applicant that the functioning and growth of Auckland cannot be supported if there is no infrastructure in place to deal with waste generated from residential households, businesses and construction activity. Positive effects in terms of supporting the on-going function and growth will therefore be derived from the proposed landfill activity.

I agree that positive effects will be generated from the use of landfill gas for energy generation, with generation of enough power to supply 16,000 houses expected after 20-years of landfill operation. It will also be used to power the leachate evaporator, allowing for on-site treatment of leachate as opposed to off-site disposal.

I agree that the provision of walking, cycling and mountain bike tracks will result in positive effects in respect of increased recreation opportunities. However, the requirement to undertake these works is a condition of purchase set down by the Overseas Investment Office such that it is something the applicant is required to do separate to any requirement set under the RMA. Furthermore, the proposed condition of consent required to achieve these outcomes states "*subject to reaching agreement on reasonable recommendations from the Department of Conservation and Walking Access Commission, and obtaining the necessary landowner approval and any other statutory approvals, implement shall make all reasonable attempts to provide…"*. I further note there is no requirement to have the works in place prior to the landfill operation commencing or at any other time. Accordingly, there is

no guarantee that these works will be undertaken, nor is there an actual requirement to do so. As such, I do not consider that these outcomes can be considered as positive effects that will be realised should the proposed landfill be consented.

Accordingly, I agree that energy generation is a positive effect as stated in the AEE. While the level of positive effects will result with respect to the provision of infrastructure that will support the on-going function and growth of Auckland, I do not consider it to be a vital piece of regional infrastructure. I also do not consider the level of positive effects assessed in the AEE will result with respect to net job creation noting the resulting loss of jobs elsewhere in Auckland. Finally, I do not consider the recreation access improvements proposed represent positive effects given the manner in which the current condition requiring their provision is worded.

Overall Effects Summary and Conclusion

In respect of actual and potential effects on the environment, in most respects, they indicate that the subject site is well suited for the development of a landfill.

The location of the landfill along State Highway 1 ensures that it will be readily accessible, while the level of traffic generated and the design of the roundabout access into the site along with the upgrades being undertaken along the state highway will ensure that traffic safety is not compromised.

The location of the working landfill centrally within the site is such that it will be suitably separated from sensitive receivers, with associated adverse landscape and visual amenity and operational effects, including noise and air discharges, able to be internalised or addressed through the mitigation measures proposed.

Adverse construction related effects in respect of landscape, visual and general amenity values and traffic safety, will be able to address through the implementation of, and compliance with, detailed management plans and the undertaking of landscape mitigation.

The construction of a quality landfill liner and a leachate collection and disposal system will ensure that generated leachate will be highly unlikely to leak into the surrounding environment, with rigorous monitoring proposed to ensure that any leaks that do result can be identified and remediated. While the liner is key leachate control mechanism, the site's geology will assist with assimilating the small amounts of leachate leakage predicted to occur over the lifetime of the landfill without resulting in groundwater contamination that would result in adverse environmental or human health effects, although further testing is required to confirm this (which can be achieved by condition).

Other adverse effects from sedimentation and stormwater runoff and air discharges will be addressed by the control and treatment measures proposed, which in combination with the measures proposed to manage leachate and air discharges, ensures that the risk of adverse human health and environment effects will be suitably addressed.

However, in order to establish the landfill, approximately 14 km of streams will be reclaimed. Notwithstanding the requirement to avoid such activity in the first instance, the ecological effects management package proposed will not be sufficient to achieve a no net loss of ecological values outcome and residual adverse effects are likely to remain. Furthermore, there is uncertainty that some of the compensation measures detailed within the effects management package will achieve the ecological benefits proposed, such

that the true extent of unaddressed residual adverse effects will be unlikely to be known. This is not acceptable in respect of freshwater ecology outcomes, particularly in circumstances where the ecological values of the streams being reclaimed are 'very high'. These works and the proposed vegetation removal and wetland reclamation works will also result in adverse effects with respect to Hochstetter's frogs, fernbird, spotless crake and Australasian bittern that cannot be reduced to levels that are minor or less.

There are also cultural values effects to consider, an evaluation of which can only be undertaken once these matters have been presented by Mana Whenua to the commissioners at the hearing and discussed further in the necessary level of detail.

I therefore consider that adverse ecological effects will be more than minor and unacceptable. The appropriateness of the landfill in all other aspects does not, in my assessment, reduce the scale of the effects to a minor level or allow for them to be considered acceptable, nor do the likely positive effects.

9. Relevant statutory documents - s104(1)(b)

The relevant statutory documents and other matters are considered below.

Resource Management (National Environmental Standards for Freshwater) Regulations 2020 (NES-FW 2020) – s104(1)(b)(i)

The NES-FW 2020 came into force on 3 September 2020 and requirements for carrying out certain activities that pose risks to freshwater and freshwater ecosystems.

The parts of the NES-FW 2020 that are relevant to the subject consent are:

53 Prohibited activities

(1) Earthworks within a natural wetland is a prohibited activity if it—

(a) results, or is likely to result, in the complete or partial drainage of all or part of a natural wetland; and

(b) does not have another status under any of regulations 38 to 51.

(2) The taking, use, damming, diversion, or discharge of water within a natural wetland is a prohibited activity if it—

(a) results, or is likely to result, in the complete or partial drainage of all or part of a natural wetland; and

(b) does not have another status under any of regulations 38 to 51.

57 Discretionary activities

Reclamation of the bed of any river is a discretionary activity.

Accordingly, under the NES-FW 2020, the proposed wetland reclamations would be prohibited activities, while the stream reclamations would be discretionary. The latter is not critical in terms of application status as the landfill would still be non-complying in terms of air discharge and zone consenting requirements with all consents being bundled. The former,

though, is critical, as there would be no ability to bundle in a wetland reclamation given its prohibited status. The only solution would be to remove this from the application as s87A(6) of the RMA provides that no application can be made for a resource consent for a prohibited activity.

However, section 43B(7) of the RMA states that *''a consent prevails over a national environmental standard if the application giving rise to the consent was the subject of a decision on whether to notify it before the date on which the standard is notified in the Gazette".* As this consent was notified on 26 March 2020, which was before 5 August 2020, being the date of notification of the NES-FM 2020 in the Gazette, the consent prevails. Accordingly, in this instance, the NES-FW 2020 and its associated consenting requirements are not of relevance.

Resource Management (National Environmental Standards for Air Quality) Regulations 2004 (amended 2011) (NES-AQ) – s104(1)(b)(i)

The NES-AQ came into force on 8 October 2004 and was amended on 1 June 2011. It sets out air discharge prohibitions and restrictions on certain activities along with ambient air contaminant requirements and a range of other matters that need to be considered as part of the resource consent process where applicable.

The relevant regulations within the NES-AQ have been reviewed by Mr Crimmins, who notes the following:

- Compliance with Regulation 6 will be achieved as the applicant has confirmed that the lighting of fires and the burning of waste will not occur.
- Discharges will be unlikely to exceed the ambient air quality standards defined in Schedule 1 as directed by Regulations 13, 14, 17, 20 and 21. Noting that compliance with Regulations 20 and 21 will likely be achieved, consent does not need to be declined under these regulations.
- Compliance with Regulations 26 and 27 in respect of the control and flaring of gas may be challenging during the early stages of the landfill. However, this could be monitored and evidence submitted of compliance during these early stages.

Given the highly technical nature of the assessment in respect of NES-AQ requirements, I am entirely reliant on the review of Mr Crimmins. Adopting his assessment and the need to impose conditions to ensure that compliance with Regulations 26 and 27 is achieved, I consider that all discharges from the landfill will comply with the NES-AQ. Whilst not required, as they have no statutory effect, Mr Crimmins has also assessed the landfill in respect of the proposed 2020 amendments to the NES-AQ and has confirmed that these changes would be unlikely to affect compliance.

Other National Environmental Standards – s104(1)(b)(i)

The AEE has detailed other National Environmental Standards that have been considered, including:

- Resource Management (National Environmental Standards for Electricity Transmission Activities) Regulations 2009 (NES-ET).

- Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NES-CS).
- Resource Management (National Environmental Standards for Plantation Forestry) Regulations 2017 (NES-PF).

The applicability of these standards has been detailed in the submitted AEE in sections 13.4.2.4 to 13.4.2.6.

I agree that the NES-ET is not relevant to transmission line activity associated with the proposed energy centre, as Regulation 4 states that they only apply to an activity that relates to the operation, maintenance, upgrading, relocation, or removal of an existing transmission line.

The NES-CS is not relevant as the site has not been subject to previous activities listed within the Hazardous Activities and Industries List and it is not likely that any such activity has occurred in the past.

The applicant has confirmed that all forestry clearance works are being undertaken separately to this application and do not form part of it. All future forestry works will also be undertaken separately, with both to comply with the applicable requirements of the NES-PF. I accept this assessment and that they are separate consenting matters, noting that some measures will likely be required with respect to fauna management within the pine plantations affected by the proposed landfill.

Other regulations – s104(1)(b)(ii)

Resource Management (Measurement and Reporting of Water Takes) Regulations 2010 – s104(1)(b)(ii)

The water takes will result in a combined take of 2.4 L/s, which is less than the minimum take requirement of 5 L/s that applies under these regulations. Accordingly, they are not applicable.

Wildlife Act 1953

The Wildlife Act protects all wildlife unless otherwise specified in the schedules 1 to 5. Mr Chapman has advised that all indigenous bats, birds, lizards and some invertebrates (namely all Paryphanta - Kauri snails) are fully protected under this Act and that it is an offence to disturb, harm, or remove them without a permit from the Minister of Conservation. This includes the deliberate disturbance of potential habitat even if the presence of native species has not been specifically surveyed.

Notwithstanding the requirements of this consent, a permit will be required from the Minister of Conservation to address the management of wildlife under the Wildlife Act. This is a separate process and does not require further consideration as part of the assessment of this application, noting that there may well be overlaps with fauna management measures likely required to address adverse effects associated with the proposed landfill.

National Policy Statement for Freshwater Management 2020 (NPSFW 2020) – s104(1)(b)(iii)

The NPSFM 2020 came in force on 3 September 2020, being an updated version of NPSFM 2014 (amended 2017).

The key requirements of the NPSFM 2020 as they relate to the subject consent are set out as follows:

- Management of freshwater in a manner the gives effect' to Te Mana o te Wai, being a concept that refers to the fundamental importance of water and recognises that protecting the health of freshwater protects the health and well-being of the wider environment and the mauri of water (wai). Te Mana o te Wai is also about restoring and preserving the balance between the water, the wider environment, and the community. The importance of Tangata Whenua in identifying the approach to giving effect to Te Mana o te Wai is also noted.
- Requiring Councils to develop plan objectives that describe the environmental outcomes sought for freshwater management as outlined above and as set out in the NPSFM 2020.

Particular objectives and policies that are relevant to the proposed landfill are:

2.1 Objective

(1) The objective of this National Policy Statement is to ensure that natural and physical resources are managed in a way that prioritises:

(a) first, the health and well-being of water bodies and freshwater ecosystems

(b) second, the health needs of people (such as drinking water)

(c) third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.

2.2 Policies

Policy 1: Freshwater is managed in a way that gives effect to Te Mana o te Wai.

Policy 2: Tangata whenua are actively involved in freshwater management (including decision-making processes), and Māori freshwater values are identified and provided for.

Policy 3: Freshwater is managed in an integrated way that considers the effects of the use and development of land on a whole-of-catchment basis, including the effects on receiving environments.

Policy 4: Freshwater is managed as part of New Zealand's integrated response to climate change.

Policy 6: There is no further loss of extent of natural inland wetlands, their values are protected, and their restoration is promoted.

Policy 7: The loss of river extent and values is avoided to the extent practicable.

Policy 9: The habitats of indigenous freshwater species are protected.

Policy 11: Freshwater is allocated and used efficiently, all existing over-allocation is phased out, and future over-allocation is avoided.

Policy 13: The condition of water bodies and freshwater ecosystems is systematically monitored over time, and action is taken where freshwater is degraded, and to reverse deteriorating trends.

The AUP(OP) gives direct effect to the NPSFM, with this document referenced on numerous occasions within the lower order objectives and policies, noting that it was, at the time, the previous 2014 (amended 2017) version.

As directed by section 1.7 of the NPSFW 2020, changes to the regional policy statement and regional plan portions of the AUP(OP) that address natural inland wetlands, rivers and fish passage need to be made without going through a schedule 1 process. Until such time that this is undertaken, a review of the development as it relates to the NPSFW 2020 is required.

Assessment

In terms of fundamental issues, the objectives have been reduced, with the previous five within the NPSFW 2014 replaced by one. This objective sets out a clear hierarchy, with the first priority being the health and well-being of water bodies and freshwater ecosystems; the second priority being the health of people; and the third the ability of people and communities to provide for their social, economic, and cultural well-being. I therefore consider that the NPSFW 2020 intends that the health and well-being of freshwater resources takes priority over the need for people to provide for their social, economic, and cultural well-being. This in of itself is reflective of Te Mana o te Wai and the philosophy that protecting the health of freshwater products will in turn protect the health of the wider community. That is to say that by protecting freshwater ecosystems (the first priority) the health needs of people (the second priority) and their social, economic, and cultural well-being (the third priority) will be provided for.

In respect of policy matters, there is now a requirement (policy 1) to give effect to Te Mana o te Wai whereas the direction in the previous NPSFW 2014 was the lesser requirement of considering and recognising Te Mana o te Wai in the management of freshwater.

There is also the need, as set out in policy 2, for the active engagement with Tangata Whenua in respect of freshwater management and the identification and provision of Māori freshwater values. Previous Tangata Whenua engagement requirements were less tangible and did not directly address Māori freshwater values.

Policy 3 requires an integrated, catchment-wide approach to freshwater management in respect of use and development, particularly with respect to effects on the receiving environment.

Policies 6 and 7 essentially work in conjunction with the requirements of the NES-FW, with wetland loss protected by applying prohibited activity status to reclamation works and stream reclamation becoming discretionary. These specific directions were not included in the NPSFW 2014, nor was an equivalent to policy 9, which requires the habitats of indigenous freshwater species to be protected.

Policy 11 requires freshwater to be allocated and utilised in an efficient manner with over-allocation issues addressed, being similar to those included within the NPSFW 2014.

Policy 13 requires the monitoring of water bodies and freshwater ecosystems with action required where degradation is identified. This strengthens previous requirements that referred to the need to improve water quality in degraded environments but without the monitoring loop.

I consider that consistency will be achieved with respect to the efficient allocation of water in terms of the use of groundwater for potable supply and surface water for non-potable supply. I further consider that the water quality treatment measures proposed, and the management and control of leachate (subject to detailed conditions requiring further testing, monitoring and contingency actions) will ensure that water quality will be maintained. This ensures that effects on the receiving environment in terms of environmental contamination and human health will be suitably addressed.

While there will be further wetland loss, there is a level of conflict with the applicable planning provisions, with the NES-FW, being the national environmental standard that prohibits this activity from occurring, not prevailing over the AUP(OP), which allows for such works to occur subject to obtaining consent for a non-complying activity. This notwithstanding, the proposed wetland offsetting works are unlikely to be sufficient to offset adverse habitat loss effects for wetland birds.

There will also be a level of inconsistency with the hierarchy detailed in the objective, which prioritises the health and well-being of water bodies and freshwater ecosystems over the ability of people to provide for their social, economic, and cultural well-being. The health and well-being of water bodies and freshwater ecosystems will be affected given that the works will result in a net loss of ecological values, the full extent of which is unknown due to the uncertainties with the level of ecological benefit some of the proposed compensation measures will deliver. I have not been provided with any compelling evidence that the need for a landfill in the location proposed is such that the objective hierarchy should be reversed, and an outcome that does not prioritise the health and well-being of water bodies and freshwater ecosystems is appropriate. Furthermore, such an outcome would not be consistent with Te Mana o te Wai, which seeks to preserve the balance between the water, the wider environment, and the community. Finally, the works would not result in the protection of habitats for indigenous freshwater species, with Mr Lowe identifying the presence of several ‘at risk’ freshwater species, including longfin eel, kākahi and inanga.

Accordingly, while I consider that consistency with some of the NPSFM policies will be achieved, there will also be a notable level of inconsistency with other policies, and most importantly, the overall objective.

National Policy Statement for Renewable Electricity Generation 2011 (NPSRE) – s104(1)(b)(iii)

This national policy statement seeks to enable the sustainable management of renewable electricity generation by ensuring that decision makers exercising functions and powers under the RMA recognise and provide for renewable electricity generation activities. This includes renewable electricity generation from biomass activity such as landfills, with the NPSRE directing their enablement in regional policy statements and regional and district plans via objectives, policies and methods (including rules).

As the AUP(OP) has incorporated objectives, policies and rules to give effect to the NPSRE,

further assessment is not necessary (as this will be undertaken as part of the AUP(OP) assessment).

New Zealand Coastal Policy Statement – s104(1)(b)(iv)

The development is sufficiently separated from the coastal environment such that consideration of the New Zealand Coastal Policy Statement is not required. While I accept that the Hoteo River discharges into the Kaipara Harbour, this is some distance from the subject site. I further note that Mr Kensington has confirmed his agreement with the applicant that the site is not within the coastal environment (page 10 of his technical review).

Auckland Unitary Plan (Operative in Part) - s104(1)(b)(v) and (vi)

Chapter B Regional Policy Statement (RPS)

Chapter B of the AUP(OP) sets out the applicability of the RPS in respect of managing the use, development and protection of the natural and physical resources of the Auckland region and provides a RMA framework for the identified issues of significance and resultant priorities and outcomes sought. These align with the direction contained in the Auckland Plan.

The primary regional issues of relevance to this application as detailed in the RPS are as detailed and assessed as follows:

B3.2. Infrastructure

B3.2.1. Objectives

(1) Infrastructure is resilient, efficient and effective.

(2) The benefits of infrastructure are recognised, including:

- *(a) providing essential services for the functioning of communities, businesses and industries within and beyond Auckland;*
- *(b) enabling economic growth;*
- *(c) contributing to the economy of Auckland and New Zealand;*

(3) Development, operation, maintenance, and upgrading of infrastructure is enabled, while managing adverse effects on:

- *(a) the quality of the environment and, in particular, natural and physical resources that have been scheduled in the Unitary Plan in relation to natural heritage, Mana Whenua, natural resources, coastal environment, historic heritage and special character;*
- *(b) the health and safety of communities and amenity values*

(4) The functional and operational needs of infrastructure are recognised.

(5) Infrastructure planning and land use planning are integrated to service growth efficiently.

(6) Infrastructure is protected from reverse sensitivity effects caused by incompatible subdivision, use and development.

(8) The adverse effects of infrastructure are avoided, remedied or mitigated.

B3.2.2. Policies

Provision of infrastructure

(1) Enable the efficient development, operation, maintenance and upgrading of infrastructure.

(3) Provide for the locational requirements of infrastructure by recognising that it can have a functional or operational need to be located in areas with natural and physical resources that have been scheduled in the Unitary Plan in relation to natural heritage, Mana Whenua, natural resources, coastal environment, historic heritage and special character.

Reverse sensitivity

(4) Avoid where practicable, or otherwise remedy or mitigate, adverse effects of subdivision, use and development on infrastructure.

(5) Ensure subdivision, use and development do not occur in a location or form that constrains the development, operation, maintenance and upgrading of existing and planned infrastructure.

Managing adverse effects

(6) Enable the development, operation, maintenance and upgrading of infrastructure in areas with natural and physical resources that have been scheduled in the Unitary Plan in relation to natural heritage, Mana Whenua, natural resources, coastal environment, historic heritage and special character while ensuring that the adverse effects on the values of such areas are avoided where practicable or otherwise remedied or mitigated.

(8) Avoid, remedy or mitigate the adverse effects from the construction, operation, maintenance or repair of infrastructure.

Natural hazards

(9) Ensure where there is a functional or operational need for infrastructure to locate in areas subject to natural hazards:

(a) that buildings accommodating people are located and/or designed to minimise risk from natural hazards; and

(b) that risk that cannot be avoided by location or design should be mitigated to the extent practicable.

Assessment

Having reviewed these objectives and policies in detail, the following assessment is provided noting that additional assessment is provided below within the lower order objectives and policies contained in Chapter E3. Infrastructure:

- Actual and potential effects, as detailed in section 8, will be managed to an extent that adverse effects can be considered minor and acceptable, with the exception of those relating to freshwater and terrestrial ecology. I consider that adverse effects with respect to these matters will be more than minor, such that consenting the landfill will be to the detriment of the quality of the environment, particularly as it relates to natural resources.

I accept that, as directed by objective B3.2.1.(2), there are economic and social benefits associated with the landfill in that it will provide a service that assists with the on-going functioning of communities, businesses and industries within the Auckland region (and potentially beyond). I further accept that the operational requirements of the landfill need to be recognised (objective B3.2.1.(4)), and particularly, the large site area requirements and the fact that avoiding streams is likely to be very difficult, if not impossible, noting the functional need to locate within valleys to maximise storage capacity. However, noting the net loss of ecological function and reduction in ecological values that will result, having considered the applicant's evidence and reasoning, I do not consider this to be an acceptable outcome, noting the requirement of objective B3.2.1.(8) to ensure that the adverse effects of infrastructure are avoided, remedied or mitigated. I consider that a net loss of ecological values does not represent a situation whereby resulting adverse effects are remedied or mitigated to acceptable levels. While I accept that infrastructure needs to be enabled, I have not been provided with any compelling evidence that the benefits, and functional and operational requirements of the landfill, are such that it should be allowed to establish without suitably remedying or mitigating resulting adverse effects. As previously assessed, ecological values are very high, with an appropriate outcome (accepting that avoidance is not practical) being a net gain in ecological and biodiversity values, not a net loss.

- As detailed in submissions, there is also uncertainty that the landfill will suitably manage adverse effects on Mana Whenua.

Accordingly, while the landfill will be consistent with most of the overarching RPS objectives and policies, it will be inconsistent with those requiring the managing of adverse effects on the quality of the environment.

B3.4. Energy

B3.4.1. Objectives

(1) Existing and new renewable electricity generation is provided for.

(2) Energy efficiency and conservation is promoted.

B3.4.2. Policies

(1) Recognise the national, regional and local benefits to be derived from maintaining or increasing the level of electricity generated from renewable energy sources.

(2) Provide for renewable electricity generation activities to occur at different scales and from different sources to reduce reliance on non-renewable energy sources.

(4) Provide for the development, operation and maintenance of small-scale renewable electricity generation, provided that adverse effects on the environment are avoided, remedied or mitigated.

Assessment

The use of landfill gas to generate electricity is entirely consistent with these objectives and policies, noting the assessment of Mr Crimmins that adverse effects from the associated air discharges will be suitably mitigated. The alternative option would result in all landfill gas being flared, being an outcome that would be inconsistent with these objectives and policies.

B6.2. Recognition of Treaty of Waitangi/Te Tiriti o Waitangi partnerships and participation

B6.2.1. Objectives

(1) The principles of the Treaty of Waitangi/Te Tiriti o Waitangi are recognised and provided for in the sustainable management of natural and physical resources including ancestral lands, water, air, coastal sites, wāhi tapu and other taonga.

(2) The principles of the Treaty of Waitangi/Te Tiriti o Waitangi are recognised through Mana Whenua participation in resource management processes.

B6.2.2. Policies

(1) Provide opportunities for Mana Whenua to actively participate in the sustainable management of natural and physical resources including ancestral lands, water, sites, wāhi tapu and other taonga in a way that does all of the following:

(a) recognises the role of Mana Whenua as kaitiaki and provides for the practical expression of kaitiakitanga;

(b) builds and maintains partnerships and relationships with iwi authorities;

(c) provides for timely, effective and meaningful engagement with Mana Whenua at appropriate stages in the resource management process, including development of resource management policies and plans;

(d) recognises the role of kaumātua and pūkenga;

(e) recognises Mana Whenua as specialists in the tikanga of their hapū or iwi and as being best placed to convey their relationship with their ancestral lands, water, sites, wāhi tapu and other taonga;

(f) acknowledges historical circumstances and impacts on resource needs;

(g) recognises and provides for mātauranga and tikanga; and

(h) recognises the role and rights of whānau and hapū to speak and act on matters that affect them.

B6.3. Recognising Mana Whenua values

B6.3.1. Objectives

(1) Mana Whenua values, mātauranga and tikanga are properly reflected and accorded sufficient weight in resource management decision-making.

(2) The mauri of, and the relationship of Mana Whenua with, natural and physical resources including freshwater, geothermal resources, land, air and coastal resources are enhanced overall.

(3) The relationship of Mana Whenua and their customs and traditions with natural and physical resources that have been scheduled in the Unitary Plan in relation to natural

heritage, natural resources or historic heritage values is recognised and provided for.

B6.3.2. Policies

(1) Enable Mana Whenua to identify their values associated with all of the following:

(a) ancestral lands, water, air, sites, wāhi tapu, and other taonga;

(b) freshwater, including rivers, streams, aquifers, lakes, wetlands, and associated values;

(c) biodiversity;

(d) historic heritage places and areas; and

(e) air, geothermal and coastal resources.

(2) Integrate Mana Whenua values, mātauranga and tikanga:

(a) in the management of natural and physical resources within the ancestral rohe of Mana Whenua, including:

(i) ancestral lands, water, sites, wāhi tapu and other taonga;

(ii) biodiversity; and

(iii) historic heritage places and areas.

(b) in the management of freshwater and coastal resources, such as the use of rāhui to enhance ecosystem health;

(c) in the development of innovative solutions to remedy the long-term adverse effects on historical, cultural and spiritual values from discharges to freshwater and coastal water; and

(d) in resource management processes and decisions relating to freshwater, geothermal, land, air and coastal resources.

(3) Ensure that any assessment of environmental effects for an activity that may affect Mana Whenua values includes an appropriate assessment of adverse effects on those values.

(4) Provide opportunities for Mana Whenua to be involved in the integrated management of natural and physical resources in ways that do all of the following:

(a) recognise the holistic nature of the Mana Whenua world view;

(c) restore or enhance the mauri of freshwater and coastal ecosystems.

(5) Integrate Mana Whenua values, mātauranga and tikanga when giving effect to the National Policy Statement on Freshwater Management 2014 in establishing all of the following:

(a) water quality limits for freshwater, including groundwater;

(b) the allocation and use of freshwater resources, including groundwater; and

(c) *integrated management of the effects of the use and development of land and freshwater on coastal water and the coastal environment.*

(6) *Require resource management decisions to have particular regard to potential impacts on all of the following:*

(a) *the holistic nature of the Mana Whenua world view;*

(b) *the exercise of kaitiakitanga;*

(c) *mauri, particularly in relation to freshwater and coastal resources;*

(d) *customary activities, including mahinga kai;*

(e) *sites and areas with significant spiritual or cultural heritage value to Mana Whenua;*

B6.5. Protection of Mana Whenua cultural heritage

B6.5.1. Objectives

(1) *The tangible and intangible values of Mana Whenua cultural heritage are identified, protected and enhanced.*

(2) *The relationship of Mana Whenua with their cultural heritage is provided for.*

(3) *The association of Mana Whenua cultural, spiritual and historical values with local history and whakapapa is recognised, protected and enhanced.*

(4) *The knowledge base of Mana Whenua cultural heritage in Auckland continues to be developed, primarily through partnerships between Mana Whenua and the Auckland Council, giving priority to areas where there is a higher level of threat to the loss or degradation of Mana Whenua cultural heritage.*

(5) *Mana Whenua cultural heritage and related sensitive information and resource management approaches are recognised and provided for in resource management processes.*

B6.5.2. Policies

(6) *Protect Mana Whenua cultural heritage that is uncovered during subdivision, use and development by all of the following:*

(a) *requiring a protocol to be followed in the event of accidental discovery of kōiwi, archaeology or artefacts of Māori origin;*

(b) *undertaking appropriate actions in accordance with mātauranga and tikanga Māori; and*

(c) *requiring appropriate measures to avoid, remedy or mitigate further adverse effects.*

(8) *Encourage appropriate design, materials and techniques for infrastructure in areas of known historic settlement and occupation by the tūpuna of Mana Whenua.*

Assessment

Consistency with these detailed objectives and policies can only be assessed once all evidence has been presented at the hearing, which will allow for the issues of importance to

Mana Whenua to be fully understood, appreciated and considered.

B7.3. Freshwater systems

B7.3.1. Objectives

(1) Degraded freshwater systems are enhanced.

(2) Loss of freshwater systems is minimised.

(3) The adverse effects of changes in land use on freshwater are avoided, remedied or mitigated.

B7.3.2. Policies

Integrated management of land use and freshwater systems

(1) Integrate the management of subdivision, use and development and freshwater systems by undertaking all of the following:

(c) controlling the use of land and discharges to minimise the adverse effects of runoff on freshwater systems and progressively reduce existing adverse effects where those systems or water are degraded; and

(d) avoiding development where it will significantly increase adverse effects on freshwater systems, unless these adverse effects can be adequately mitigated.

Management of freshwater systems

(4) Avoid the permanent loss and significant modification or diversion of lakes, rivers, streams (excluding ephemeral streams), and wetlands and their margins, unless all of the following apply:

(a) it is necessary to provide for:

(i) the health and safety of communities; or

(ii) the enhancement and restoration of freshwater systems and values; or

(iii) the sustainable use of land and resources to provide for growth and development; or

(iv) infrastructure;

(b) no practicable alternative exists;

(c) mitigation measures are implemented to address the adverse effects arising from the loss in freshwater system functions and values; and

(d) where adverse effects cannot be adequately mitigated, environmental benefits including on-site or off-site works are provided.

(5) Manage subdivision, use, development, including discharges and activities in the beds of lakes, rivers, streams, and in wetlands, to do all of the following:

(a) protect identified Natural Lake Management Areas, Natural Stream Management Areas, and Wetland Management Areas;

(b) *minimise erosion and modification of beds and banks of lakes, rivers, streams and wetlands;*

(c) *limit the establishment of structures within the beds of lakes, rivers and streams and in wetlands to those that have a functional need or operational requirement to be located there; and*

(d) *maintain or where appropriate enhance:*

(i) freshwater systems not protected under Policy B7.3.2(5)(a);

(iii) existing riparian vegetation located on the margins of lakes, rivers, streams and wetlands; and

(iv) areas of significant indigenous biodiversity.

Assessment

Having reviewed these objectives and policies in detail, the following assessment is provided, noting that additional assessment is provided below within the lower order objectives and policies contained in Chapter E3. Lakes, Rivers, Streams and Wetlands:

- The offset and compensation package proposed by the applicant has been assessed as being insufficient to address the residual adverse effects that will result if this proposal is consented as currently proposed. While policy B7.3.2.(d) allows for adverse effects that cannot be adequately mitigated to be compensated by environmental benefits, given that a net loss of ecological values will result, I consider that the level of environmental benefit achieved will not result in an acceptable overall ecological outcome.
- The provision of a culvert that extends into the NSMA will not protect this identified area, particularly noting that the reviews from Messrs Lowe, Chapman and Cavanagh, and Ms Harte, indicate that a bridge would be a superior environmental outcome.

Accordingly, I consider that the proposed landfill will be inconsistent with the key requirements of these RPS objectives and policies.

B7.4. Coastal water, freshwater and geothermal water

B7.4.1. Objectives

(1) Coastal water, freshwater and geothermal water are used within identified limits while safeguarding the life-supporting capacity and the natural, social and cultural values of the waters.

(2) The quality of freshwater and coastal water is maintained where it is excellent or good and progressively improved over time where it is degraded.

(3) Freshwater and geothermal water is allocated efficiently to provide for social, economic and cultural purposes.

(4) The adverse effects of point and non-point discharges, in particular stormwater runoff and wastewater discharges, on coastal waters, freshwater and geothermal water are minimised and existing adverse effects are progressively reduced.

(5) The adverse effects from changes in or intensification of land use on coastal water and freshwater quality are avoided, remedied or mitigated.

(6) Mana Whenua values, mātauranga and tikanga associated with coastal water, freshwater and geothermal water are recognised and provided for, including their traditional and cultural uses and values.

B7.4.2. Policies

Integrated management

(1) Integrate the management of subdivision, use, development and coastal water and freshwater, by:

(c) controlling the use of land and discharges to minimise the adverse effects of runoff on water and progressively reduce existing adverse effects where those water are degraded; and

(d) avoiding development where it will significantly increase adverse effects on water, unless these adverse effects can be adequately mitigated.

National Policy Statement for Freshwater Management

(2) Give effect to the National Policy Statement for Freshwater Management 2014 by establishing all of the following:

(a) freshwater objectives;

(b) freshwater management units and, for each unit:

(i) values;

(ii) water quality limits;

(iii) environmental flows and/or levels; and

(c) targets and implementation methods where freshwater units do not meet freshwater objectives.

(3) Integrate Mana Whenua values, mātauranga and tikanga when giving effect to the National Policy Statement for Freshwater Management 2014 in establishing all of the following:

(a) water quality limits for freshwater, including groundwater;

(b) the allocation and use of freshwater resources, including groundwater; and

(c) measures to improve the integrated management of the effects of the use and development of land and freshwater on coastal water and the coastal environment.

Water quality

(7) Manage the discharges of contaminants into water from subdivision, use and development to avoid where practicable, and otherwise minimise, all of the following:

(a) significant bacterial contamination of freshwater and coastal water;

(b) adverse effects on the quality of freshwater and coastal water;

(c) adverse effects from contaminants, including nutrients generated on or applied to land, and the potential for these to enter freshwater and coastal water from both

point and non-point sources;

(d) adverse effects on Mana Whenua values associated with coastal water, freshwater and geothermal water, including wāhi tapu, wāhi taonga and mahinga kai; and

(e) adverse effects on the water quality of catchments and aquifers that provide water for domestic and municipal supply.

Sediment runoff

(8) Minimise the loss of sediment from subdivision, use and development, and manage the discharge of sediment into freshwater and coastal water, by:

(a) promoting the use of soil conservation and management measures to retain soil and sediment on land; and

(b) requiring land disturbing activities to use industry best practice and standards appropriate to the nature and scale of the land disturbing activity and the sensitivity of the receiving environment.

Stormwater management

(9) Manage stormwater by all of the following:

(a) requiring subdivision, use and development to:

(i) minimise the generation and discharge of contaminants; and

(ii) minimise adverse effects on freshwater and coastal water and the capacity of the stormwater network;

(b) adopting the best practicable option for every stormwater diversion and discharge; and

(c) controlling the diversion and discharge of stormwater outside of areas serviced by a public stormwater network.

Freshwater and geothermal water quantity, allocation and use

(12) Promote the efficient use of freshwater and geothermal water.

13) Promote the taking of groundwater rather than the taking of water from rivers and streams in areas where groundwater is available for allocation.

Assessment

Actual and potential effects in respect of the proposed groundwater take and the discharge of sediment, leachate and stormwater, including from those portions of the landfill defined as an industrial and trade activity, as detailed in section 8, will be managed to an extent that adverse effects can be considered minor and acceptable. However, it is noted that Mana Whenua values need to be further assessed and evaluated at the hearing to determine if consistency with objective B7.4.1.(6) and policies B7.4.3. and B74.3.(7)(d) is achieved. In my assessment, consistency with all other objectives and policies will be achieved as water will be allocated efficiently and sustainably while the adverse effects of point and non-point discharges on freshwater will be minimised.

B7.5. Air

B7.5.1. Objectives

(1) The discharge of contaminants to air from use and development is managed to improve region-wide air quality, enhance amenity values in urban areas and to maintain air quality at appropriate levels in rural and coastal areas.

(3) Avoid, remedy or mitigate adverse effects from discharges of contaminants to air for the purpose of protecting human health, property and the environment.

B7.5.2. Policies

(1) Manage discharge of contaminants to air from use and development to:

(a) avoid significant adverse effects on human health and reduce exposure to adverse air discharges;

(b) control activities that use or discharge noxious or dangerous substances;

(c) minimise reverse sensitivity effects by avoiding or mitigating potential land use conflict between activities that discharge to air and activities that are sensitive to air discharges;

(d) protect activities that are sensitive to the adverse effects of air discharges;

(e) protect flora and fauna from the adverse effects of air discharges;

(f) enable the operation and development of infrastructure, industrial activities and rural production activities that discharge contaminants into air, by providing for low air quality amenity in appropriate locations;

Assessment

As assessed in section 8, adverse effects from all proposed air discharges will be avoided, remedied or mitigated to minor and acceptable levels. This is due to a combination of minimising the discharge of HAPs to levels well below required standards and guidelines, separating activities with the highest potential for odour generation, such as the landfill tipping face, from sensitive receivers, and avoidance and mitigation measures in respect of dust generation. Contingency measures will also be implemented to address unplanned discharges such as those that might arise from fires.

Accordingly, air discharges will maintain an appropriate level of air quality in the subject rural environment with adverse effects on human health, property and the environment appropriately avoided, remedied or mitigated. This ensures that consistency with these RPS objectives and policies will be achieved.

B9.2. Rural activities

B9.2.1. Objectives

(3) Rural production and other activities that support rural communities are enabled while the character, amenity, landscape and biodiversity values of rural areas, including within the coastal environment, are maintained.

B9.2.2. Policies

(1) Enable a diverse range of activities while avoiding significant adverse effects on and urbanisation of rural areas, including within the coastal environment, and avoiding, remedying, or mitigating other adverse effects on rural character, amenity, landscape and biodiversity values.

Assessment

Having reviewed these objectives and policies in detail, the following assessment is provided:

- As assessed in section 8, adverse effects on rural character and amenity values will be minor and acceptable. This is due to a combination of locating the working landfill centrally within the subject landholdings, which along with the landscaping and lighting design measures proposed, will minimise its visibility and overall presence within the rural landscape at all times of the day.
- Conditions could be imposed to control noise, dust and odour to appropriate levels, while the level of traffic generated will not result in any associated character effects given the nature of traffic that already utilises State Highway 1.
- Biodiversity values will not be suitably mitigated noting the assessment in respect of ecological matters.

Accordingly, while adverse effects on rural character, amenity and landscape values will be suitably mitigated, those in respect of biodiversity values will not. As such, consistency with all RPS objectives and policies relating to rural environment will not be achieved.

B10.2. Natural hazards and climate change

B10.2.1. Objectives

(5) The functions of natural systems, including floodplains, are protected from inappropriate subdivision, use and development.

(6) The conveyance function of overland flow paths is maintained.

B10.2.2. Policies

Identification and risk assessment

(4) Assess natural hazard risks:

(a) using the best available and up-to-date hazard information; and

(b) across a range of probabilities of occurrence appropriate to the hazard, including, at least, a 100-year timeframe for evaluating flooding and coastal hazards.

(5) Manage subdivision, use and development of land subject to natural hazards based on all of the following:

(a) the type and severity of potential events, including the occurrence natural hazard events in combination;

(b) the vulnerability of the activity to adverse effects, including the health and safety of

people and communities, the resilience of property to damage and the effects on the environment; and

(c) the cumulative effects of locating activities on land subject to natural hazards and the effects on other activities and resources.

Management approaches

(8) Manage the location and scale of activities that are vulnerable to the adverse effects of natural hazards so that the risks of natural hazards to people and property are not increased.

Assessment

As assessed in section 8, the proposed development will, or can be, designed to ensure that the conveyance of overland flow paths is maintained, while the flood plain will be managed to ensure that adverse flooding effects are not exacerbated beyond the subject landholdings. This has been confirmed by Mr Cavanagh, noting that conditions of consent could be imposed to confirm the detailed design of the proposed stormwater system. Mr Tate has also confirmed that the stormwater dams will operate as required and designed during design flooding events.

Accordingly, adverse effects with respect to natural hazards will be addressed to ensure that adverse effects from flooding, being the only identified natural hazard risk, will not adversely affect people and property. This ensures that consistency with these RPS objectives and policies will be achieved.

Chapter D Overlays

Chapter D of the AUP(OP) sets out the provisions to manage the protection, maintenance or enhancement of particular values associated with an area or resource within an identified overlay. Overlays can apply across zones and precincts and do not follow zone or precinct boundaries.

The relevant overlay objectives and policies within this chapter are assessed below:

D4. Natural Stream Management Areas Overlay

D4.2. Objective

(1) Rivers and streams identified as natural stream management areas with high natural character and high ecological values are protected.

D4.3. Policies

(1) Protect the in-stream values and riparian margins of natural stream management areas.

(2) Allow water takes and contaminant discharges only where they are of a scale and type that protects the in-stream values of these rivers and streams.

(3) Maintain and where possible enhance fish passage between the coastal marine area and the upstream extent of natural stream management areas.

(4) Avoid structures and activities in natural stream management areas that disturb, damage, remove or replace the natural bed and course of the river or stream and its

associated indigenous riparian vegetation.

(5) Provide for infrastructure in natural stream management areas where there is a functional or operational need to be in that location or traverse the area and there is no practicable alternative.

Assessment

Having reviewed these objectives and policies in detail, the following assessment is provided:

- The provision of a culvert within this management overlay is inconsistent with both the overarching objective and policy D4.3.(1), which require streams and riparian margins within this overlay that have high natural character and high ecological values to be protected.
- Policy D4.3.(4) directs the need to *'avoid structures and activities in natural stream management areas that disturb, damage, remove or replace the natural bed and course of the river or stream and its associated indigenous riparian vegetation'.* Messrs Lowe and Chapman have both queried this component of the development, with Mr Lowe confirming the very high values of the affected stream and that a bridge would result in a lower magnitude of effect. Mr Chapman confirms that the subject area is a 'hotspot' for Hochstetter's frogs, and that the proposed culvert does not demonstrate avoidance of effects. This leads into policy D4.3.(5), which allows for infrastructure in natural stream management areas where there is a functional or operational need and there is no practicable alternative. Having reviewed the options assessment in section 10.5.4 of the AEE, I am satisfied that there is a functional need for the road (which results in the proposed culvert), but consider that there are practicable alternatives that would likely result in lower levels of environmental effects, being a bridge. This view is also supported by Mr Cavanagh.
- The proposed water take is well removed from the stream within the overlay, while the discharges into it from the road will be treated by filter strips which ensures that in-stream values will be protected.
- The provision of fish passage will accord with policy D4.3.(3).

Accordingly, while I consider that consistency with some of these policies will be achieved, there will also be a notable level of inconsistency with other policies, and most importantly, the overall objective.

Chapter E Auckland-wide Provisions

Chapter E of the AUP(OP) sets out the provisions that apply Auckland-wide to the use and development of natural and physical resources regardless of the zone in which they are located.

The matters that these provisions cover relevant to the subject development include natural resources, Mana Whenua, infrastructure and environmental risk.

The relevant overlay objectives and policies within this chapter are assessed below:

E1. Water Quality and Integrated Management

E1.2. Objectives

(1) Freshwater and sediment quality is maintained where it is excellent or good and progressively improved over time in degraded areas.

(2) The mauri of freshwater is maintained or progressively improved over time to enable traditional and cultural use of this resource by Mana Whenua.

(3) Stormwater and wastewater networks are managed to protect public health and safety and to prevent or minimise adverse effects of contaminants on freshwater and coastal water quality.

E1.3. Policies

(1) Manage discharges, until such time as objectives and limits are established in accordance with Policy E1.3 (7), having regard to:

(a) the National Policy Statement for Freshwater Management National Bottom Lines;

(b) the Macroinvertebrate Community Index as a guideline for freshwater ecosystem health associated with different land uses within catchments in accordance with Policy E1.3(2); or

(c) other indicators of water quality and ecosystem health.

(2) Manage discharges, subdivision, use, and development that affect freshwater systems to:

(a) maintain or enhance water quality, flows, stream channels and their margins and other freshwater values, where the current condition is above National Policy Statement for Freshwater Management National Bottom Lines and the relevant Macroinvertebrate Community Index guideline in Table E1.3.1 below; or

(b) enhance water quality, flows, stream channels and their margins and other freshwater values where the current condition is below national bottom lines or the relevant Macroinvertebrate Community Index guideline in Table E1.3.1 below.

Table E1.3.1 Macroinvertebrate Community Index guideline for Auckland rivers and streams

Land use	*Macroinvertebrate Community Index guideline*
Native forest	*123*
Exotic forest	*111*
Rural areas	*94*
Urban areas	*68*

National Policy Statement on Freshwater Management

The National Policy Statement on Freshwater Management requires that Policies E1.3(4) to (7) below are included in the Plan.

(4) When considering any application for a discharge, the Council must have regard to the following matters:

(a) *the extent to which the discharge would avoid contamination that will have an adverse effect on the life-supporting capacity of freshwater including on any ecosystem associated with freshwater; and*

(b) *the extent to which it is feasible and dependable that any more than a minor adverse effect on freshwater, and on any ecosystem associated with freshwater, resulting from the discharge would be avoided.*

(5) When considering any application for a discharge the Council must have regard to the following matters:

(a) *the extent to which the discharge would avoid contamination that will have an adverse effect on the health of people and communities as affected by their secondary contact with fresh water; and*

(b) *the extent to which it is feasible and dependable that any more than minor adverse effect on the health of people and communities as affected by their secondary contact with fresh water resulting from the discharge would be avoided.*

(7) Develop Freshwater Management Unit specific objectives and limits for freshwater with Mana Whenua, through community engagement, scientific research and mātauranga Māori, to replace the Macroinvertebrate Community Index interim guideline and to give full effect to the National Policy Statement for Freshwater Management.

Stormwater management

(8) Avoid as far as practicable, or otherwise minimise or mitigate, adverse effects of stormwater runoff from greenfield development on freshwater systems, freshwater and coastal water by:

(a) *taking an integrated stormwater management approach (refer to Policy E1.3.10);*

(b) *minimising the generation and discharge of contaminants, particularly from high contaminant generating car parks and high use roads and into sensitive receiving environments;*

(c) *minimising or mitigating changes in hydrology, including loss of infiltration, to:*

(i) *minimise erosion and associated effects on stream health and values;*

(ii) *maintain stream baseflows; and*

(iii) *support groundwater recharge;*

(d) *where practicable, minimising or mitigating the effects on freshwater systems arising from changes in water temperature caused by stormwater discharges; and*

(e) *providing for the management of gross stormwater pollutants, such as litter, in areas where the generation of these may be an issue.*

(10) In taking an integrated stormwater management approach have regard to all of the following:

(a) *the nature and scale of the development and practical and cost considerations, recognising:*

(i) *greenfield and comprehensive brownfield development generally offer greater opportunity than intensification and small-scale redevelopment of existing areas;*

(ii) *intensive land uses such as high-intensity residential, business, industrial and roads generally have greater constraints; and*

(iii) *site operational and use requirements may preclude the use of an integrated stormwater management approach.*

(b) *the location, design, capacity, intensity and integration of sites/development and infrastructure, including roads and reserves, to protect significant site features and hydrology and minimise adverse effects on receiving environments;*

(c) *the nature and sensitivity of receiving environments to the adverse effects of development, including fragmentation and loss of connectivity of rivers and streams, hydrological effects and contaminant discharges and how these can be minimised and mitigated, including opportunities to enhance degraded environments;*

(d) *reducing stormwater flows and contaminants at source prior to the consideration of mitigation measures and the optimisation of on-site and larger communal devices where these are required; and*

(e) *the use and enhancement of natural hydrological features and green infrastructure for stormwater management where practicable.*

(11) Avoid as far as practicable, or otherwise minimise or mitigate adverse effects of stormwater diversions and discharges, having particular regard to:

(a) *the nature, quality, volume and peak flow of the stormwater runoff;*

(b) *the sensitivity of freshwater systems and coastal waters, including the Hauraki Gulf Marine Park;*

(c) *the potential for the diversion and discharge to create or exacerbate flood risks;*

(d) *options to manage stormwater on-site or the use of communal stormwater management measures;*

(e) *practical limitations in respect of the measures that can be applied; and*

(f) *the current state of receiving environments.*

(12) Manage contaminants in stormwater runoff from high contaminant generating car parks and high use roads to minimise new adverse effects and progressively reduce existing adverse effects on water and sediment quality in freshwater systems, freshwater and coastal waters.

(13) Require stormwater quality or flow management to be achieved on-site unless there is a downstream communal device or facility designed to cater for the site's stormwater runoff.

Assessment

Having reviewed these objectives and policies in detail, the following assessment is provided:

- The comprehensive measures proposed by the applicant to address sedimentation during both the construction and operational phases of the landfill, will ensure that freshwater quality is maintained with respect to the discharge of sediment. Adaptive management measures are proposed to ensure that this occurs over the lifetime of the landfill, with constant refinement to the control and treatment measures to be undertaken to ensure this occurs.

- The same applies with respect to stormwater, with stormwater quality treatment proposed through a range of pre-treatment devices where necessary (oil and water separator, oil and grit interceptor etc.) and then through a series of stormwater ponds, with final treatment provided by the wetland. Stormwater from the main access road and the bin exchange area will be treated by filter strips and rain gardens respectively. These measures ensure that stormwater discharged from the landfill will accord with applicable AUP(OP) and technical guidance requirements, and that it will not adversely affect the life-supporting capacity of freshwater or the health of people and the local community. They will also address effects in terms of peak flow runoff and will ensure that flood risk is not exacerbated.

- The other potential discharge effect relates to leachate and noting the detailed assessment undertaken in section 8 of this report, I consider that generated by the landfill will not contain highly toxic or unacceptable levels of contaminants, with the proposed landfill liner and management system ensuring that leachate will be contained and collected for disposal / treatment with the potential for leachate leakage being very low. In the instance that leachate leakage results, measures will be implemented to ensure that discharges are addressed and remedied such that adverse water quality effects will not result.

- Noting the above assessment, I consider it likely that the mauri of freshwater will be maintained, but note that this will likely be the subject of further assessment and discussion at the hearing following input from Mana Whenua.

- As recommended by Mr Perwick, baseline and additional monitoring needs to be undertaken to assess actual changes to stream baseflows, as the submitted information is insufficient to confirm potential adverse effects in this regard. If changes result, contingency measures will need to be implemented, although as concluded in section 8 of this report (groundwater and water take effects), such measures may require further resource consent. Further input from the applicant is required to confirm the viability of contingency measures, being that the ability to maintain stream baseflows has not been confirmed to Mr Perwick's satisfaction.

- While the works will result in a reduction in groundwater recharge, it will not be of a scale that will affect the sustainability and on-going function of the regional aquifer.

Subject to confirmation that measures can be implemented to maintain stream baseflows, consistency with these objectives and policies will be achieved. A discussion on the mauri of freshwater will, however, be required at the hearing to fully assess this matter.

E2. Water Quantity, Allocation and Use

E2.2. Objectives

(1) Water in surface rivers and groundwater aquifers is available for use provided the natural values of water are maintained and established limits are not exceeded.

(2) Water resources are managed within limits to meet current and future water needs for social, cultural and economic purposes.

(4) Water resources are managed to maximise the efficient allocation and efficient use of available water.

(5) Mana Whenua values including the mauri of water, are acknowledged in the allocation and use of water.

E2.3. Policies

Priority of water use

(1) Manage the allocation of fresh water within the guidelines provided by Appendix 2 River and stream minimum flow and availability and Appendix 3 Aquifer water availabilities and levels and give priority to making freshwater available for the following uses (in descending order of priority):

(a) existing and reasonably foreseeable domestic and municipal water supply and animal drinking water requirements;

(b) existing lawfully established water users;

(c) uses of water for which alternative water sources are unavailable or unsuitable; and

(d) all other uses.

(2) Ensure allocations support the outcomes sought by relevant objectives and policies in B7.3 Freshwater systems.

Efficient allocation and use

(4) Promote the efficient allocation and use of freshwater and geothermal water by:

(a) requiring the amount of water taken and used to be reasonable and justifiable with regard to the intended use, and where appropriate:

(i) municipal water supplies are supported by a water management plan;

(ii) industrial and irrigation supplies implement best practice, in respect of the efficient use of water for that particular activity or industry; or

(iii) all takes (other than municipal water supplies from a dam) are limited to a maximum annual allocation based on estimated water requirements;

(b) requiring consideration of water conservation and thermal efficiency methods;

(e) providing for storage and harvesting of fresh water.

Water allocation and availability guidelines

(5) Manage the taking and use of surface water from rivers, streams and springs and taking

and use of groundwater from aquifers to meet all of the following except where water allocation exceeds or is close to exceeding the guidelines (refer to Policy E2.3(10)):

(a) the minimum flow and availability guidelines in Table 1 River and stream minimum flow and availability in Appendix 2 River and stream minimum flow and availability are not exceeded; and

(b) the aquifer availability and groundwater levels in Table 1 Aquifer water availabilities and Table 2 Interim aquifer groundwater levels in Appendix 3 Aquifer water availabilities and levels are not exceeded.

Take and use of water

(6) Require proposals to take and use water from lakes, rivers, streams, springs or wetlands to demonstrate all of the following:

(a) the taking of surface water from any river or stream is within the guideline in Table 1 River and stream minimum flow and availability in Appendix 2 River and stream minimum flow and availability, except in accordance with Policy E2.3(11);

(b) appropriate water levels and downstream flow regimes will be maintained, including:

(i) low flows in rivers and streams to protect in-stream values;

(ii) flow variability in rivers, streams and springs;

(iii) water levels and flows in wetlands ensure vegetation and habitat values of the wetland are protected throughout the year;

(iv) water levels in lakes maintain the ecological values and water quality of the lake and its shoreline stability, and enable recreational use; and

(v) existing lawfully established taking of water is not adversely affected;

(c) the taking of water will be at times of the day or year that will safeguard the identified freshwater values of the water body;

(d) intake structures will be designed, constructed, operated and maintained to avoid adverse effects on biota, including the entrainment and impingement of fish; and

(e) there are options for implementing water conservation measures in times of water shortage.

(7) Require all proposals to take and use groundwater from any aquifer to demonstrate that:

(a) the taking is within the water availabilities and levels for the aquifer in Table 1 Aquifer water availabilities and Table 2 Interim aquifer groundwater levels in Appendix 3 Aquifer water availabilities and levels, except in accordance with Policy E2.3(11), and meeting all of the following:

(i) recharge to other aquifers is maintained; and

(ii) aquifer consolidation and surface subsidence is avoided.

(b) the taking will avoid, remedy or mitigate adverse effects on surface water flows, including the following:

(i) *base flow of rivers, streams and springs; and*

(ii) *any river or stream flow requirements and in particular the minimum stream flow and availability in Appendix 2 River and stream minimum flow and availability.*

(c) *the taking will avoid, remedy or mitigate adverse effects on terrestrial and freshwater ecosystem habitat;*

(d) *the taking will not cause saltwater intrusion or any other contamination;*

(e) *the taking will not cause adverse interference effects on neighbouring bores to the extent their owners are prevented from exercising their lawfully established water takes;*

(f) *Policy E2.3(7)(e) above will not apply in the following circumstances:*

(i) *where it is practicably possible to locate the pump intake at a greater depth within the affected bore; or*

(ii) *where it can be demonstrated that the affected bore accesses, or could access, groundwater at a deeper level within the same aquifer, if drilled or cased to a greater depth.*

(g) *the proposed bore is capable of extracting the quantity of groundwater applied for; and*

(h) *the proposal avoids, remedies or mitigates any ground settlement that may cause distress, including reducing the ability of an existing building or structure to meet the relevant requirements of the Building Act 2004 or the New Zealand Building Code, to any existing:*

(i) *buildings;*

(ii) *structures; or*

(iii) *services including roads, pavements, power, gas, electricity, water and wastewater networks and fibre-optic cables.*

(8) *Consider mitigation options, where there are significant adverse effects on the matters identified in policies E2.3(6) and (7) above, including any of the following:*

(a) *consideration of alternative locations, rates and timing of takes for both surface water and groundwater;*

(b) *use of alternative water supplies;*

(c) *use of water conservation methods when water shortage conditions apply;*

(d) *provision for fish passage in rivers and streams;*

(e) *wetland creation or enhancement of existing wetlands;*

(f) *riparian planting; or*

(g) *consideration of alternative designs for groundwater dewatering proposals.*

(9) *Require proposals to take and use surface water and groundwater to monitor the effects of the take on the quality and quantity of the water resource and to:*

(a) *measure and record water use and rate of take;*

(b) *measure and record water flows and levels;*

(c) *sample and assess water quality and freshwater ecology;*

(d) *measure and record the movement of ground, buildings and other structures; and*

(e) *monitoring should be of a type and scale appropriate for the activity.*

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(13) When considering any application the Council must have regard to the following matters:

(a) *the extent to which the change would adversely affect safeguarding the life-supporting capacity of fresh water and of any associated ecosystem; and*

(b) *the extent to which it is feasible and dependable that any adverse effect on the life-supporting capacity of freshwater and of any associated ecosystem resulting from the change would be avoided.*

Comprehensive reviews of consents

(17) Require resource consents granted to take, use or dam water and to discharge contaminants to land or freshwater to be for a duration and to include a condition setting the review date(s) of the consent, that will enable the concurrent processing or review of all consents/replacement applications, as a basis for a comprehensive and integrated assessment of water quality and water quantity issues in a specific catchment and/or aquifer system.

Damming of surface water

(18) Encourage the off-stream damming of water in preference to the damming of rivers or streams.

(21) Require proposals for new, change or replacement applications to dam a river or stream or dam water with an off-stream dam to undertake monitoring of a type and scale appropriate for the activity and its effects, including:

(a) *inspection of dam embankments and spillways;*

(b) *measurement and recording of embankment internal water levels and pressures;*

(c) *sampling and assessment of water quality and freshwater biota in on-stream dams; and*

(d) *variable flows below on-stream dams where required.*

(23) Require proposals to divert groundwater, in addition to the matters addressed in Policy E2.3(6) and (7) above, to ensure that:

(a) *The proposal avoids, remedies or mitigates any adverse effects on:*

(i) *Scheduled historic heritage places and scheduled sites and places of significance to Mana Whenua; and*

(ii) *People and communities.*

(b) The groundwater diversion does not cause or exacerbate any flooding;

(c) Monitoring has been incorporated where appropriate, including:

(i) Measurement and recording of water levels and pressures; and

(ii) Measurement and recording of the movement of ground, buildings and other structures.

(d) Mitigation has been incorporated where appropriate including:

(i) Minimising the period where the excavation is open/unsealed;

(ii) Use of low permeability perimeter walls and floors;

(iii) Use of temporary and permanent systems to retain the excavation; or

(iv) Re-injection of water to maintain groundwater pressures.

Drilling holes and bores

(24) Require proposals to drill holes or bores to demonstrate that the location, design and construction:

(a) complies with the New Zealand Standard on the Environmental Standard for Drilling of Soil and Rock (NZS 4411:2001);

(b) prevents contaminants from entering an aquifer;

(c) prevents cross-contamination between aquifers with different pressure, water quality or temperature;

(d) prevents leakage of groundwater to waste;

(e) avoids the destruction, damage or modification of any scheduled historic heritage place or scheduled sites and places of significance to Mana Whenua; and

(f) avoids disturbance of wetlands and significant ecological areas where practicable.

Assessment

Having reviewed these objectives and policies in detail, the following assessment is provided:

- The proposed groundwater take for potable supply combined with the reduced level of recharge will be 1.8 L/s, approximately 156 m^3/day, and approximately 56,765 m^3/year. Mr Perwick has confirmed that this will not adversely affect the sustainability and on-going function of the aquifer, and with 3,892,016m^3 of the 5,558,000m^3 of water available within the aquifer (approximately 70%) remaining available for abstraction, the ability for others to make use of this resource will not be affected.
- There are no other water takes within a 2 km radius (other than the applicant's own boreholes), which ensures that the proposed take will not cause adverse interference effects on neighbouring bores in terms of preventing them from exercising their lawfully established water takes.
- There is no evidence to suggest that the proposed groundwater take will result in aquifer contamination.

- The surface water take from the proposed stormwater ponds represents a small percentage of stored water and while increased turbulence will increase sediment mixing, this will be offset by increased residence time such that adverse water quality effects will not result.
- Potential adverse effects on the downstream environment may result due to reduced flows from the stormwater wetland as a consequence of the proposed surface water take. Unfortunately, this issue was not addressed in the application, and it was identified too late by Council for the applicant to provide an assessment prior to completion of this report. It is understood that a further assessment on this matter will be provided prior to the hearing in order to allow for review and comment by the applicable Council Specialists.
- The proposed off-stream dams will be constructed in a manner that ensures that they are structurally sound and can support the level of water they have been designed to impound. The risk of dam failure has been assessed as low, with no properties or persons located within the predicted downstream inundation zone.
- The proposed groundwater diversion and dewatering is isolated from all surrounding property and will not result in any subsequent adverse effects on scheduled historic heritage places, scheduled sites and scheduled / identified places of significance to Mana Whenua, people or communities. Adverse effects arising from exacerbated flooding will also not result.

Accordingly, subject to downstream flow effects being suitably addressed, I consider that consistency with these objectives and policies will be achieved.

E3. Lakes, Rivers, Streams and Wetlands

E3.2. Objectives

(1) Auckland's lakes, rivers, streams and wetlands with high natural values are protected from degradation and permanent loss.

(2) Auckland's lakes, rivers, streams and wetlands are restored, maintained or enhanced.

(3) Significant residual adverse effects on lakes, rivers, streams or wetlands that cannot be avoided, remedied or mitigated are offset where this will promote the purpose of the Resource Management Act 1991.

(5) Activities in, on, under or over the bed of a lake, river, stream and wetland are managed to minimise adverse effects on the lake, river, stream or wetland.

(6) Reclamation and drainage of the bed of a lake, river, stream and wetland is avoided, unless there is no practicable alternative.

E3.3. Policies

General

(1) Avoid significant adverse effects, and avoid where practicable or otherwise remedy or mitigate other adverse effects of activities in, on, under or over the beds of lakes, rivers, streams or wetlands within the following overlays:

(a) D4 Natural Stream Management Areas Overlay;

(b) D5 Natural Lake Management Areas Overlay;

(c) D6 Urban Lake Management Areas Overlay;

(d) D9 Significant Ecological Areas Overlay; and

(e) D8 Wetland Management Areas Overlay.

(2) Manage the effects of activities in, on, under or over the beds of lakes, rivers, streams or wetlands outside the overlays identified in Policy E3.3(1) by:

(a) avoiding where practicable or otherwise remedying or mitigating any adverse effects on lakes, rivers, streams or wetlands; and

(b) where appropriate, restoring and enhancing the lake, river, stream or wetland.

(3) Enable the enhancement, maintenance and restoration of lakes, rivers, streams or wetlands.

(4) Restoration and enhancement actions, which may form part of an offsetting proposal, for a specific activity should:

(a) be located as close as possible to the subject site;

(b) be 'like-for-like' in terms of the type of freshwater system affected;

(c) preferably achieve no net loss or a net gain in the natural values including ecological function of lakes, rivers, streams or wetlands; and

(d) consider the use of biodiversity offsetting as outlined in Appendix 8 Biodiversity offsetting.

(5) Avoid significant adverse effects, and avoid, remedy or mitigate other adverse effects of activities in, on, under or over the beds of lakes, rivers, streams or wetlands on:

(a) the mauri of the freshwater environment; and

(b) Mana Whenua values in relation to the freshwater environment.

(6) Manage the adverse effects on Mana Whenua cultural heritage that is identified prior to, or discovered during, subdivision, use and development by:

(a) complying with the protocol for the accidental discovery of kōiwi, archaeology and artefacts of Māori origin;

(b) undertaking appropriate actions in accordance with mātauranga and tikanga Māori; and

(c) undertaking appropriate measures to avoid adverse effects, or where adverse effects cannot be avoided, effects are remedied or mitigated.

Structures and the diversion of surface water

(7) Provide for the operation, use, maintenance, repair, erection, reconstruction, placement, alteration or extension, of any structure or part of any structure in, on, under, or over the bed of a lake, river, stream or wetland, and any associated diversion of water, where the structure complies with all of the following:

(a) there is no practicable alternative method or location for undertaking the activity outside the bed of the lake, river, stream or wetland;

(b) the structure is designed to be the minimum size necessary for its purpose to minimise modification to the bed of a lake, river, stream or wetland;

(c) the structure is designed to avoid creating or increasing a hazard;

(d) the structure is for any of the following:

(i) required as part of an activity designed to restore or enhance the natural values of any lakes, rivers, streams or wetlands and their margins, or any adjacent area of indigenous vegetation or habitat of indigenous fauna;

(ii) designed to maintain and/or enhance public access to, over and along any lake, river, stream or wetland and their margins;

(iii) necessary to provide access across a lake, river, stream or wetland;

(iv) associated with infrastructure;

(v) necessary for flood protection and the safeguarding of public health and safety; or

(vi) required for the reasonable use of production land.

(e) the structure avoids significant adverse effects and avoids, remedies or mitigates other adverse effects on Mana Whenua values associated with freshwater resources, including wāhi tapu, wāhi taonga and mahinga kai.

(8) Enable the removal or demolition of any structure or part of any structure in, on, under, or over the bed of a lake, river, stream or wetland, and any associated diversion of water, provided adverse effects are avoided, remedied or mitigated.

Disturbance and depositing of any substance

(9) Provide for the excavation, drilling, tunnelling, thrusting or boring or other disturbance, and the depositing of any substance in, on or under the bed of a lake, river, stream or wetland, where it complies with all of the following:

(a) there is no practicable alternative method or location for undertaking the activity outside the lake, river, stream or wetland;

(b) the activity is required for any of the following:

(i) as part of an activity designed to restore or enhance the natural values of any lake, river, stream or wetland, or any adjacent area of indigenous vegetation or habitat of indigenous fauna;

(ii) to maintain and/or enhance public access to, over and along any lake, river, stream or wetland and associated margins;

(iii) to provide access across a lake, river, stream or wetland;

(iv) for the operation, use, maintenance, repair, development or upgrade of infrastructure;

(v) to restore, maintain or improve access to wharves and jetties or mooring areas, or to maintain the navigation and safety of existing channels;

(vi) to reduce the risk of occurrence or the potential adverse effects of flooding, erosion, scour or sediment depositing;

(vii) for the reasonable use of production land; or

(viii) to undertake mineral extraction activities and mitigation and following that, offsetting can be practicably implemented.

(c) the disturbance avoids significant adverse effects and avoids, remedies or mitigates other adverse effects on Mana Whenua values associated with freshwater resources, including wāhi tapu, wāhi taonga and mahinga kai.

Planting of plants

(10) Enable the planting of any plant, excluding pest species, in, on, or under the bed of a lake, river, stream or wetland where it is suitable for habitat establishment, restoration or enhancement, the maintenance and enhancement of amenity values, flood or erosion protection or stormwater runoff control provided it does not create or exacerbate flooding.

(11) Encourage the planting of plants that are native to the area.

(12) Encourage the incorporation of Mana Whenua mātauranga, values and tikanga in any planting in, on, or under the bed of a lake, river, stream or wetland.

Reclamation and drainage

(13) Avoid the reclamation and drainage of the bed of lakes, rivers, streams and wetlands, including any extension to existing reclamations or drained areas unless all of the following apply:

(a) there is no practicable alternative method for undertaking the activity outside the lake, river, stream or wetland;

(b) for lakes, permanent rivers and streams, and wetlands the activity is required for any of the following:

(i) as part of an activity designed to restore or enhance the natural values of any lake, river, stream or wetland, any adjacent area of indigenous vegetation or habitats of indigenous fauna;

(ii) for the operation, use, maintenance, repair, development or upgrade of infrastructure; or

(iii) to undertake mineral extraction activities; and

(c) the activity avoids significant adverse effects and avoids, remedies or mitigates other adverse effects on Mana Whenua values associated with freshwater resources, including wāhi tapu, wāhi taonga and mahinga kai.

Riparian margins

(15) Protect the riparian margins of lakes, rivers, streams, and wetlands from inappropriate use and development and promote their enhancement to through all of the following:

(a) safeguard habitats for fish, plant and other aquatic species, particularly in rivers and streams with high ecological values;

(b) safeguard their aesthetic, landscape and natural character values;

(c) safeguard the contribution of natural freshwater systems to the biodiversity, resilience and integrity of ecosystems; and

(d) avoid or mitigate the effects of flooding, surface erosion, stormwater contamination, bank erosion and increased surface water temperature.

Assessment

The application proposes:

- The reclamation of 13,915 m of streams and the installation of a 105m culvert, being a total of 14,020 m.
- The reclamation of approximately 1.37 hectares of wetland.

While some adverse effects can be mitigated through the implementation of management measures (e.g. sedimentation, fish relocation etc.), others, such as the loss of freshwater ecological function and habitat area, cannot. To address this, an effects management package is proposed to offset and compensate the significant residual adverse effects that will result.

In respect of streamworks, the proposed offsetting works will address 2,130 m of the reclamation proposed, being 15.2%, with the remaining 11,890 m, being 84.8%, to be addressed by way of compensation. These offsetting and compensation works include a mixture of enhancement and protection actions along approximately 15 km of identified streams within and outside the applicant's landholdings, and within a further 30 km of streams that are yet to be identified.

In respect of wetlands, the proposed offsetting works, being the planting and protection of existing on-site wetlands, the provision of planted buffers and the covenanting of all on-site wetlands, will address all residual adverse freshwater ecology effects from the reclamation works proposed.

Noting the above, the following assessment of the relevant objectives and policies is provided:

- Objective E3.2.(6) and policy E3.3.(13) requires the avoidance of reclamation of streams and wetlands unless there is no alternative method for undertaking the activity outside of the streams and wetlands. In the context of the subject site and noting the operational requirements of the landfill, I am satisfied that an alternative method is not available for undertaking the proposed activity (within the subject site). I further note that as the subject landfill meets the definition of municipal landfills, the development is classified as infrastructure. As such, in order to meet the requirements of policy E3.3.(13), the reclamations need to avoid significant adverse effects and avoid, remedy or mitigate adverse effects on Mana Whenua values associated with freshwater resources, including wāhi tapu, wāhi taonga and mahinga kai.

  As set out in my assessment in section 8, even upon full implementation of the proposed effects management package (on the assumption that all of the proposed outcomes can

be achieved), a net loss of ecological values will result and residual adverse effects are likely to remain. Considering that the reclamation and culverting works result in the loss of over 14 km of stream, I consider that a net loss of ecological values represents a significant adverse effect, which is inconsistent with this policy, notwithstanding the need to also consider Mana Whenua values, which will be further assessed at the hearing. This includes those matters also outlined in policies E3.3.(5) and (6).

- The proposed culverting works within the NSMA will result in potentially significant adverse ecological effects that will not be suitably remedied or mitigated. It is particularly so noting that the area where the culverting works are proposed has been identified as a hotspot for Hochstetter's frogs. This is inconsistent with policy E3.3.(1).
- For the reasons outlined above, the proposal will be inconsistent with policies E3.3.(2) and E3.3.(15)(c) which require the avoidance of adverse effects where practicable and the remedying and mitigating of adverse effects that cannot practically be avoided, and safeguarding the contribution of natural freshwater systems to the biodiversity, resilience and integrity of ecosystems.
- Policy E3.3.(4) allows for restoration and enhancement actions to form part of an offsetting proposal. As outlined in detail in my assessment in section 8, the like for like principal is arguably not achieved, while some of the actions proposed are unlikely to achieve the ecological outcomes sought. As noted in the first bullet point assessment above, the result is a net loss of ecological values, with residual adverse effects likely to remain i.e. the net loss of ecological values is likely to be greater than that assessed by the applicant. While I note that subsection (c) of this policy states only a preference for a no net loss or a net gain in natural values (including ecological function of streams), I have not been presented with an assessment or evidence that demonstrates that a net loss scenario, as proposed by the applicant, is either acceptable or consistent with this policy. That includes evidence that the proposed landfill is such a vital piece of infrastructure that its location as proposed should be considered in favour of achieving an acceptable ecological outcome. Such an outcome is certainly not consistent with the applicable EIANZ guidance which states that a net gain in ecological values would be appropriate in those instances where very high levels of adverse ecological effects cannot be avoided. Accordingly, the proposed works will be inconsistent with policy E3.3.(4) and associated objective E3.2.(3), which require significant residual adverse effects on streams that cannot be avoided, remedied or mitigated to be offset where this will promote the purpose of the RMA. As detailed in my Part 2 assessment below, I consider that the proposed landfill development as currently proposed, including the associated offsetting and compensation measures, will not achieve the purpose of the RMA.
- The works management and planting measures proposed will ensure that consistency with all other objectives and policies within this Chapter will be achieved. This includes the stream diversion and native fish relocation works and the proposed wetland reclamations (in terms of freshwater ecology matters).

Accordingly, while I consider that consistency with some of these objectives and policies will be achieved, there will also be a notable level of inconsistency.

E11. Land disturbance – Regional

E11.2. Objectives

(1) Land disturbance is undertaken in a manner that protects the safety of people and avoids, remedies and mitigates adverse effects on the environment.

(2) Sediment generation from land disturbance is minimised.

(3) Land disturbance is controlled to achieve soil conservation.

E11.3 Policies

(2) Manage land disturbance to:

(a) retain soil and sediment on the land by the use of best practicable options for sediment and erosion control appropriate to the nature and scale of the activity;

(b) manage the amount of land being disturbed at any one time, particularly where the soil type, topography and location is likely to result in increased sediment runoff or discharge;

(c) avoid, remedy and mitigate adverse effects on accidentally discovered sensitive material; and

(d) maintain the cultural and spiritual values of Mana Whenua in terms of land and water quality, preservation of wāhi tapu, and kaimoana gathering.

(4) Enable land disturbance necessary for a range of activities undertaken to provide for people and communities social, economic and cultural well-being, and their health and safety.

(5) Design and implement earthworks with recognition of existing environmental site constraints and opportunities, specific engineering requirements, and implementation of integrated water principles.

(6) Require that earthworks are designed and undertaken in a manner that ensures the stability and safety of surrounding land, buildings and structures.

E12. Land Disturbance – District

E12.2. Objective

(1) Land disturbance is undertaken in a manner that protects the safety of people and avoids, remedies and mitigates adverse effects on the environment.

E12.3. Policies

(1) Avoid where practicable, and otherwise, mitigate, or where appropriate, remedy adverse effects of land disturbance on areas where there are natural and physical resources that have been scheduled in the Plan in relation to natural heritage, Mana Whenua, natural resources, coastal environment, historic heritage and special character.

(2) Manage the amount of land being disturbed at any one time, to:

(a) avoid, remedy or mitigate adverse construction noise, vibration, odour, dust,

lighting and traffic effects;

(b) avoid, remedy and mitigate adverse effects on accidentally discovered sensitive material; and

(c) maintain the cultural and spiritual values of Mana Whenua in terms of land and water quality, preservation of wāhi tapu, and kaimoana gathering.

(3) Enable land disturbance necessary for a range of activities undertaken to provide for people and communities social, economic and cultural well-being, and their health and safety.

(4) Manage the impact on Mana Whenua cultural heritage that is discovered undertaking land disturbance by:

(a) requiring a protocol for the accidental discovery of kōiwi, archaeology and artefacts of Māori origin;

(b) undertaking appropriate actions in accordance with mātauranga and tikanga Māori; and

(c) undertaking appropriate measures to avoid adverse effects, or where adverse effects cannot be avoided, effects are remedied or mitigated.

(5) Design and implement earthworks with recognition of existing environmental site constraints and opportunities, specific engineering requirements, and implementation of integrated water principles.

(6) Require that earthworks are designed and undertaken in a manner that ensures the stability and safety of surrounding land, buildings and structures.

Assessment

Having reviewed these objectives and policies in detail, the following assessment is provided:

- Erosion and sediment control measures of a suitable scale and design will be implemented throughout the landfill establishment and operation periods, which along with the adaptive management measures proposed, will limit the potential for erosion to occur (and therefore the level of sediment generated) and suitably control and contain any sediment runoff that is unavoidable.
- Earthworks will be undertaken in accordance with specific and detailed geotechnical engineering requirements, which will minimise the potential for adverse land stability issues to result during the landfill establishment and operation periods.
- Accidental discovery protocols will be implemented when earthworks occur to ensure that any items of historic or cultural interest that may be uncovered are suitably protected and preserved. This ensures that cultural heritage values will be recognised and provided for in so far as the potential discovery of culturally significant items during the undertaking of the proposed earthworks.
- Any resulting noise and nuisance effects during earthworks activity will be suitably managed through the implementation of a variety of suitably detailed construction, traffic and noise and vibration management plans.

- The earthworks are necessary for the implementation of the proposed landfill, noting the need to provide access to it and ensure that it is of sufficient capacity. The earthworks will also allow for the installation of the liner and the provision of soil stockpiles, both of which are integral to its design, function and on-going operation. The final earthworks will allow for the provision of the landfill cap, which ensures that all waste material will be encapsulated once the landfill is closed.

Accordingly, I consider that consistency with these objectives and policies will be achieved.

E13. Cleanfills, Managed Fills and Landfills

E13.2. Objectives

(1) Cleanfills, managed fills and landfills are sited, designed and operated so that adverse effects on the environment, are avoided, remedied or mitigated.

(2) Human health is protected from the adverse effects of operational or closed cleanfills, managed fills and landfills.

E13.3. Policies

(1) Avoid significant adverse effects and remedy or mitigate other adverse effects of cleanfills, managed fills and landfills on lakes, rivers, streams, wetlands, groundwater and the coastal marine area.

(2) Require cleanfills, managed fills and landfills to be sited, and where appropriate, designed and constructed, to avoid the risk of land instability.

(3) Require cleanfills, managed fills and landfills to be designed and operated in accordance with relevant industry best practice.

(4) Avoid adverse effects from new landfills.

(5) Manage closed managed fills and landfills (including the closure of) to:

(a) protect the integrity of the site including the containment of contaminants; and

(b) require aftercare that is appropriate to the nature and requirements of the site including the type of material that was deposited during its operative period.

Assessment

Having reviewed these objectives and policies in detail, the following assessment is provided:

- Measures are proposed to ensure that the landfill is designed and constructed to avoid the risks associated with land instability.
- All of the submitted evidence and its subsequent review by Council specialists confirm that the landfill will be designed and operated in accordance with industry best practise, particularly with respect to the management of leachate and the discharge of all associated contaminants to air, land and water. This includes management post closure, with a management plan proposed to ensure that the necessary aftercare measures are implemented.
- The implementation of the proposed management measures with respect to the discharge of contaminants from the landfill, during both the operational and closed

phases, will ensure that human health is protected.

- Policy E13.3.(4) requires avoidance of adverse effects from new landfills, which somewhat conflicts with objective E13.2.(1), which also provides mitigation and remediation options, and policy E13.3.(1), which only requires significant adverse effects to be avoided. However, noting the significant adverse ecological effects that will result from the culverting and reclamation of streams, consistency would not be achieved with this objective or the two policies, noting the absolute wording of policy E13.3.(4) and that offsetting and compensation are not options for addressing adverse effects.

Accordingly, while I consider that consistency with some of these objectives and policies will be achieved, there will also be a level of inconsistency.

E14. Air Quality

E14.2. Objectives

(2) Human health, property and the environment are protected from significant adverse effects from the discharge of contaminants to air.

(3) Incompatible uses and development are separated to manage adverse effects on air quality from discharges of contaminants into air and avoid or mitigate reverse sensitivity effects.

E14.3. Policies

(1) Manage the discharge of contaminants to air, including by having regard to the Auckland Ambient Air Quality Targets in Table E14.3.1, so that significant adverse effects on human health, including cumulative adverse effects, are avoided, and all other adverse effects are remedied or mitigated.

(3) In the Rural – Rural Production Zone, Rural – Mixed Rural Zone, Rural – Rural Coastal Zone, Future Urban Zone, Auckland Council District Plan - Hauraki Gulf Islands Rural 1-3 and Landform 1-7:

(a) recognise that rural air quality is generally a result of dust and odours, and other emissions generated by rural production activities;

(b) avoid, remedy or mitigate adverse effects of dust and odour discharges;

(c) provide for minor and localised elevation of dust and odour levels where the air discharge is from:

(i) rural production activities or rural industry; or

(ii) the operation of infrastructure or location specific industry; or

(iii) mineral extraction activities; or

(iv) activities undertaken by the New Zealand Defence Force for training and munitions testing; or

(v) for emergency services training;

(d) require adequate separation between use and development which discharge dust and odour and activities that are sensitive to these adverse effects.

(6) Avoid the discharge of contaminants to air from industrial activities in rural zones and the coastal marine area except where the activity is:

(a) location specific, such as mineral extraction activities and mineral processing, wastewater treatment facilities, marine and port activities,

(b) undertaken by the New Zealand Defence Force for training and munitions testing, or for emergency services training;

(c) infrastructure requiring large separation distances that cannot be provided for within urban areas; or

(d) a rural industry.

(8) Avoid, remedy or mitigate the adverse effects on air quality from discharges of contaminants into air by:

(a) using the best practicable option for emission control and management practices that are appropriate to the scale of the discharge and potential adverse effects; or

(b) adopting a precautionary approach, where there is uncertainty and a risk of significant adverse effects or irreversible harm to the environment from air discharges.

(9) Avoid, remedy or mitigate the adverse effects on air quality beyond the boundary of the premises where the discharge of contaminants to air is occurring, in relation to:

(a) noxious or dangerous effects on human health, property or the environment from hazardous air pollutants; or

(b) overspray effects on human health, property or the environment.

Assessment

Having reviewed these objectives and policies in detail, the following assessment is provided:

- As assessed in detail in section 8 of this report, air discharges from the landfill will not cause significant adverse effects to human health, with the air quality modelling demonstrating that air pollutants are highly unlikely to exceed the Auckland Ambient Air Quality Targets detailed in Table E14.3.1.
- Notwithstanding that policy E14.3.(1)(c)(ii) provides for minor and localised elevations of dust and odour levels in association with the operation of infrastructure, odour and dust will be controlled and mitigated by management measures and separation distances to sensitive receptors, which ensures that offensive or objectionable effects are unlikely to arise.
- Noting the need for the proposed landfill to achieve large separation distances to minimise adverse effects associated with its operation, avoiding the discharge of contaminants to air from industrial activities in rural zones is not necessary, as directed by policy E14.3.(6)(c).
- The landfill's design and air discharge controls generally comply with the best practicable option, as confirmed in the specialist review from Mr Crimmins. Further measures and periodic reviews of these controls could be included as conditions of consent.

- While not a common activity within a rural environment, the proposed landfill would unlikely be suitable in any other environment. Separation distances and the measures proposed to address rural character and amenity effects are such that the landfill land use will be compatible with its surroundings and reverse sensitivity effects associated with air quality from the discharge of contaminants to air will not result.

Accordingly, I consider that consistency with these objectives and policies will be achieved.

E15. Vegetation Management and Biodiversity

E15.2. Objectives

(1) Ecosystem services and indigenous biological diversity values, particularly in sensitive environments, and areas of contiguous indigenous vegetation cover, are maintained or enhanced while providing for appropriate subdivision, use and development.

(2) Indigenous biodiversity is restored and enhanced in areas where ecological values are degraded, or where development is occurring.

E15.3 Policies

(1) Protect areas of contiguous indigenous vegetation cover and vegetation in sensitive environments including the coastal environment, riparian margins, wetlands, and areas prone to natural hazards.

(2) Manage the effects of activities to avoid significant adverse effects on biodiversity values as far as practicable, minimise significant adverse effects where avoidance is not practicable, and avoid, remedy or mitigate any other adverse effects on indigenous biological diversity and ecosystem services, including soil conservation, water quality and quantity management, and the mitigation of natural hazards.

(3) Encourage the offsetting of any significant residual adverse effects on indigenous vegetation and biodiversity values that cannot be avoided, remedied or mitigated, through protection, restoration and enhancement measures, having regard to Policy E15.3(4) below and Appendix 8 Biodiversity offsetting.

(4) Protect, restore, and enhance biodiversity when undertaking new use and development through any of the following:

(b) requiring legal protection, ecological restoration and active management techniques in areas set aside for the purposes of mitigating or offsetting adverse effects on indigenous biodiversity;

(5) Enable activities which enhance the ecological integrity and functioning of areas of vegetation, including for biosecurity, safety and pest management and to control kauri dieback.

(7) Manage any adverse effects from the use, maintenance, upgrading and development of infrastructure in accordance with the policies in E15.3, recognising that it is not always practicable to locate or design infrastructure to avoid areas with indigenous biodiversity values.

Assessment

In respect of vegetation management and associated biodiversity issues, the application proposes:

- The reclamation of approximately 1.37 hectares of wetland.
- The removal of approximately 86.88 hectares of plantation forestry, approximately 9.11 hectares of wattle forest, approximately 4.83 hectares of indigenous regenerating forest, approximately 0.67 hectares of indigenous mature forest and 17.3 hectares of pasture.

While some adverse effects can be mitigated through the implementation of management measures (e.g. sedimentation, replanting, fauna and pest management etc.), others, such as the loss of terrestrial ecological function and habitat area, cannot. To address this, an effects management package is proposed to offset and compensate for the significant residual adverse effects that will remain.

In respect of wetlands, the proposed offsetting works involve the planting and protection of existing on-site wetlands, the provision of planted buffers and the covenanting of all on-site wetlands.

In respect of the proposed vegetation removal works, offsetting and compensation, in addition to the mitigation measures proposed, will be achieved by way of pest management and vegetation covenants.

In respect of the proposed mitigation, offsetting and compensation measures, the following points are noted:

- Adverse effects resulting from the loss of indigenous vegetation will generally be addressed through the proposed restoration and covenanting of 9.9 hectares of native terrestrial vegetation and the associated pest management and the covenanting of 111.9 hectares of indigenous forest areas. Further measures, as recommended by Mr Chapman in respect of seedling translocation for the regionally rare species of kawaka and koromiko and to address edge effects, could be included within the ecological and landscape enhancement and restoration plan.
- The range of management plans proposed with respect to the management of fauna, including lizards, long-tailed bats, invertebrates and most birds, will ensure that adverse effects are suitably mitigated, either through rescue and relocation or preserving habitats as necessary during construction. A level of modification to these plans will likely be required, which could be achieved through certification of final plans prior to works commencing. Confirmation would also be required that the management plans extend into the wattle and pine plantations.
- The management plan proposed in respect of Hochstetter's frogs does not provide the necessary level of certainty to ensure that adverse effects as a consequence of their loss of habitat will be appropriately managed. Furthermore, the management of Hochstetter's frogs is experimental and there is the potential for their translocation to be unsuccessful. With the frog population estimated as being 'in the late hundreds to early thousands', it is of high ecological significance, with the loss of all frogs, which is an outcome that cannot be discounted, resulting in a loss of biodiversity. This could potentially be addressed by way of an adaptive management plan that includes appropriate contingency and

remedial actions.

- The proposed culvert along the main access road will be located within a Hochstetter's frog hotspot. This is a significant adverse effect due to direct injury / mortality impacts, habitat loss, and severance of habitat connectivity.
- A detailed and comprehensive pest management plan is required to confirm that the measures proposed will achieve the assessed levels of offsetting and compensation in respect of adverse terrestrial ecology effects.
- The wetland reclamations proposed will reduce the habitat provided for fernbird, spotless crake and Australasian bittern. While wetland restoration, including buffer planting, and covenanting is proposed along with pest control, Mr Chapman has advised that sufficient evidence has not been provided to confirm that these offsetting works will address all adverse effects with respect to habitat loss for the aforementioned birds.

The effects management package proposed will, in general, ensure that the significant residual adverse effects that result in respect of indigenous fauna and vegetation and biodiversity values are suitably addressed. This includes covenanting measures to ensure that large areas of contiguous vegetation are protected, and the undertaking of pest management over a notable area of land. Management plans will also generally ensure that adverse effects with respect to fauna will be remedied and mitigated, noting that most need to be amended to include works within the wattle and pine plantations, and an adaptive management plan with contingency and remedial action is required with respect to Hochstetter's frogs. These matters could all be addressed through conditions of consent.

However, the proposed access road culvert will result in adverse effects, particularly with respect to Hochstetter's frogs, with the subject area being a known hotspot for frog activity. This is inconsistent with policy E15.3.(2), which requires activities to manage effects so that significant adverse effects on biodiversity values are avoided far as practicable. Noting that a bridge has been suggested by a number of Council specialists as a viable alternative that is likely to result in significantly less adverse effects, I consider that significant adverse effects have not been avoided to the extent practicable. The same holds true with respect to fernbird, spotless crake and Australasian bittern, noting that the wetland management measures proposed are unlikely to address the residual adverse effects that result from a loss of habitat. Accordingly, even when the offsetting and compensation measures are taken into consideration, ecosystem services and indigenous biological diversity values will not be maintained or enhanced. While a balance needs to be struck between enabling appropriate use, infrastructure and development, I have not been provided with any compelling evidence that this is a situation whereby biodiversity values should be compromised in favour of enabling development of the proposed landfill.

Accordingly, while there is a level of consistency with some of these policies, the development will be inconsistent with the relevant objectives as well as a number of the supporting policies.

E24. Lighting

E24.2. Objectives

(1) Artificial lighting enables outdoor activities and the security and safety of people and property.

(2) The adverse effects of outdoor lighting on the environment and safety of road users are limited.

E24.3. Policies

(1) Provide for appropriate levels of artificial lighting to enable the safe and efficient undertaking of outdoor activities, including night time working, recreation and entertainment.

(2) Control the intensity, location and direction of artificial lighting to avoid significant glare and light spill onto adjacent sites, maintain safety for road users and minimise the loss of night sky viewing.

Assessment

Having reviewed these objectives and policies in detail, the following assessment is provided:

- Lighting is proposed around the site entrance, the bin exchange area, the site office and car park and the landfill tipping face. This will allow for the safe undertaking of outdoor activities, including the night-time operation of the landfill.
- All lighting will comply with AUP(OP) standards as set out in Chapter 24 and will be placed to avoid high points, will be directed downwards and shielded as necessary. This ensures that the intensity, location and direction of the proposed lighting will avoid significant glare and light spill, maintaining safety for road users and minimising effects on the night sky.

Accordingly, consistency with these objectives and policies will be achieved.

E25. Noise and Vibration

E25.2. Objectives

(1) People are protected from unreasonable levels of noise and vibration.

(2) The amenity values of residential zones are protected from unreasonable noise and vibration, particularly at night.

(4) Construction activities that cannot meet noise and vibration standards are enabled while controlling duration, frequency and timing to manage adverse effects.

E25.3. Policies

(1) Set appropriate noise and vibration standards to reflect each zone's function and permitted activities, while ensuring that the potential adverse effects of noise and vibration are avoided, remedied or mitigated.

(2) Minimise, where practicable, noise and vibration at its source or on the site from which it is generated to mitigate adverse effects on adjacent sites.

(3) Encourage activities to locate in zones where the noise generated is compatible with other activities and, where practicable, adjacent zones.

(10) Avoid, remedy or mitigate the adverse effects of noise and vibration from construction, maintenance and demolition activities while having regard to:

(a) the sensitivity of the receiving environment; and

(b) the proposed duration and hours of operation of the activity; and

(c) the practicability of complying with permitted noise and vibration standards.

Assessment

Having reviewed these objectives and policies in detail, the following assessment is provided:

- While there is a potential for adverse noise effects to result from the operation of the bin exchange area, the imposition of conditions of consent would ensure that this does not occur. This is required to ensure that surrounding sites are not used as noise buffers and that uses anticipated within the zone as permitted activities that are sensitive to noise can reasonably establish.
- The main landfill operation will be well separated from site boundaries and will be located within a valley such that most noise generated will accord with that anticipated in the zone. To ensure that this is maintained, conditions of consent could be tailored to ensure that the maximum allowable noise levels generated by the landfill represent a mix of the noise emissions that have been assessed and presented by the applicant as part of their application and those commensurate with the effects that could reasonably be expected in the Rural – Rural Production Zone (particularly at night), including allowance for the effects of noise from State Highway 1.
- The imposition of conditions securing the above will ensure that on-site noise levels are minimised and are compatible with other activities in the zone. This will mitigate adverse effects on adjacent sites and protect people from unreasonable levels of noise, particularly at night.
- Compliance with the requirements of a detailed construction noise and vibration management plan will ensure that management measures are implemented and adverse effects during construction are suitably mitigated, noting that compliance with permitted AUP(OP) requirements will be achieved.

Accordingly, consistency with these objectives and policies will be achieved.

E26. Infrastructure

E26.2.1. Objectives

(1) The benefits of infrastructure are recognised.

(2) The value of investment in infrastructure is recognised.

(4) Development, operation, maintenance, repair, replacement, renewal, upgrading and removal of infrastructure is enabled.

(6) Infrastructure is appropriately protected from incompatible subdivision, use and development, and reverse sensitivity effects.

(8) The use and development of renewable electricity generation is enabled.

(9) The adverse effects of infrastructure are avoided, remedied or mitigated.

E26.2.2. Policies

(1) Recognise the social, economic, cultural and environmental benefits that infrastructure

provides, including:

(a) enabling enhancement of the quality of life and standard of living for people and communities;

(b) providing for public health and safety;

(c) enabling the functioning of businesses;

(d) enabling economic growth;

(e) enabling growth and development;

(f) protecting and enhancing the environment;

(g) enabling the transportation of freight, goods, people; and

(h) enabling interaction and communication.

(2) Provide for the development, operation, maintenance, repair, upgrade and removal of infrastructure throughout Auckland by recognising:

(a) functional and operational needs;

(b) location, route and design needs and constraints;

(c) the complexity and interconnectedness of infrastructure services;

(d) the benefits of infrastructure to communities with in Auckland and beyond;

(e) the need to quickly restore disrupted services; and

(f) its role in servicing existing, consented and planned development.

Adverse effects of infrastructure

(4) Require the development, operation, maintenance, repair, upgrading and removal of infrastructure to avoid, remedy or mitigate adverse effects, including, on the:

(a) health, well-being and safety of people and communities, including nuisance from noise, vibration, dust and odour emissions and light spill;

(b) safe and efficient operation of other infrastructure;

(c) amenity values of the streetscape and adjoining properties;

(d) environment from temporary and ongoing discharges; and

(e) values for which a site has been scheduled or incorporated in an overlay.

(5) Consider the following matters when assessing the effects of infrastructure:

(a) the degree to which the environment has already been modified;

(b) the nature, duration, timing and frequency of the adverse effects;

(c) the impact on the network and levels of service if the work is not undertaken;

(d) the need for the infrastructure in the context of the wider network; and

(e) the benefits provided by the infrastructure to the communities within Auckland and beyond.

(6) Consider the following matters where new infrastructure or major upgrades to infrastructure are proposed within areas that have been scheduled in the Plan in relation to natural heritage, Mana Whenua, natural resources, coastal environment, historic heritage and special character:

(a) the economic, cultural and social benefits derived from infrastructure and the adverse effects of not providing the infrastructure;

(b) whether the infrastructure has a functional or operational need to be located in or traverse the proposed location;

(c) the need for utility connections across or through such areas to enable an effective and efficient network;

(d) whether there are any practicable alternative locations, routes or designs, which would avoid, or reduce adverse effects on the values of those places, while having regard to E26.2.2(6)(a) - (c);

(e) the extent of existing adverse effects and potential cumulative adverse effects;

(f) how the proposed infrastructure contributes to the strategic form or function, or enables the planned growth and intensification, of Auckland;

(g) the type, scale and extent of adverse effects on the identified values of the area or feature, taking into account:

(i) scheduled sites and places of significance and value to Mana Whenua;

(ii) significant public open space areas, including harbours;

(iii) hilltops and high points that are publicly accessible scenic lookouts;

(iv) high-use recreation areas;

(v) natural ecosystems and habitats; and

(vi) the extent to which the proposed infrastructure or upgrade can avoid adverse effects on the values of the area, and where these adverse effects cannot practicably be avoided, then the extent to which adverse effects on the values of the area can be appropriately remedied or mitigated.

(h) whether adverse effects on the identified values of the area or feature must be avoided pursuant to any national policy statement, national environmental standard, or regional policy statement.

New technologies

(11) Provide flexibility for infrastructure operators to use new technological advances that:

(a) improve access to, and efficient use of services;

(b) allow for the re-use of redundant services and structures where appropriate;

(c) result in environmental benefits and enhancements; and

(d) utilise renewable sources.

Renewable electricity generation

(12) Provide for renewable electricity generation activities to occur at different scales and from different sources, including small and community-scale renewable electricity generation activities.

Assessment

It is noted that while municipal landfills are defined as infrastructure, they are not actually provided for within chapter E26, with only the electricity generation component via landfill gas being addressed within the provisions of this chapter. Nevertheless, an assessment of the landfill activity will also be undertaken.

Having reviewed these objectives and policies in detail, the following assessment is provided:

- The benefits of the proposed landfill are acknowledged and recognised, noting that landfills are necessary, at least in respect of current waste management practices, and they support the on-going function and development of Auckland by providing a required service. The use of landfill gas to enable electricity generation is also noted.
- While the benefits of the landfill and electricity generation are recognised, adverse effects need to be avoided, remedied or mitigated. This will occur with respect to most of the adverse effects that are likely to occur, with the location and design of the landfill and the implementation of numerous measures and management plans ensuring the adverse effects during the landfill establishment and operation period will be avoided, remedied or mitigated. However, as previously assessed, the proposed loss of streams from reclamation and culverting will result in a net loss of ecological values, with the precise extent of the net loss being unknown due to several uncertainties with respect to the outcomes that will be achieved by the offsetting and compensation measures proposed. Further to this is the reduction in biodiversity values that will result as a consequence of the vegetation clearance and wetland reclamation works due to the loss of habitat for Hochstetter's frogs, fernbird, spotless crake and Australasian bittern. While I accept that there are economic and social benefits associated with the landfill and that there is a functional need to locate them within valley systems (where streams will almost always be located), the applicant's evidence and reasoning has not persuaded me that the resulting net loss of ecological function and reduction in biodiversity is an acceptable consequential outcome. Instead, it would appear that the applicant has considered that more weight should be assigned to the fact that the landfill is vital infrastructure and its provision should be favoured over the resulting adverse ecological and biodiversity effects. Noting that the AUP(OP) does not appear to provide for landfills as vital infrastructure, I consider that the need for the landfill is not as significant as the application suggests and that a net loss of ecological and biodiversity values does not represent an appropriate trade off.
- Therefore, while the benefit of the landfill is acknowledged along with the associated use of landfill gas for renewable electricity generation, all resulting adverse effects will not be avoided, remedied or mitigated to the level required.

Accordingly, while I consider that consistency with some of these objectives and policies will be achieved, there will also be a level of inconsistency.

E27. Transport

E27.2. Objectives

(1) Land use and all modes of transport are integrated in a manner that enables:

(a) the benefits of an integrated transport network to be realised; and

(b) the adverse effects of traffic generation on the transport network to be managed.

(4) The provision of safe and efficient parking, loading and access is commensurate with the character, scale and intensity of the zone.

E27.3. Policies

(1) Require subdivision, use and development which:

(a) generate trips resulting in potentially more than minor adverse effects on the safe, efficient and effective operation of the transport network;

(b) are proposed outside of the following zones:

(i) the Business – City Centre Zone, Business – Metropolitan Centre Zone, Business – Town Centre Zone;

(ii) Residential – Terrace Housing and Apartment Buildings Zone;

(iii) the Centre Fringe Office Control as shown on the planning maps; or

(c) do not already require an integrated transport assessment or have been approved based on an integrated transport assessment to manage adverse effects on and integrate with the transport network by measures such as travel planning, providing alternatives to private vehicle trips, staging development or undertaking improvements to the local transport network.

(2) Require major proposals for discretionary consent to prepare an integrated transport assessment including provision for pedestrians, cyclists, public transport users, freight and motorists.

(3) Manage the number, location and type of parking and loading spaces, including bicycle parking and associated end-of-trip facilities to support all of the following:

(a) the safe, efficient and effective operation of the transport network;

(b) the use of more sustainable transport options including public transport, cycling and walking;

(c) the functional and operational requirements of activities;

(d) the efficient use of land;

(e) the recognition of different activities having different trip characteristics; and

(f) the efficient use of on-street parking.

Loading

(15) Require access to loading facilities to support activities and minimise disruption on the adjacent transport network.

(17) Require parking and loading areas to be designed and located to:

(a) avoid or mitigate adverse effects on the amenity of the streetscape and adjacent sites;

(b) provide safe access and egress for vehicles, pedestrians and cyclists;

(c) avoid or mitigate potential conflicts between vehicles, pedestrians and cyclists; and

(d) in loading areas, provide for the separation of service and other vehicles where practicable having regard to the functional and operational requirements of activities.

(18) Require parking and loading areas to be designed so that reverse manoeuvring of vehicles onto or off the road does not occur in situations which will compromise:

(a) the effective, efficient and safe operation of roads, in particular arterial roads;

(b) pedestrian safety and amenity, particularly within the centre zones and Business – Mixed Use Zone; and

(c) safe and functional access taking into consideration the number of parking spaces served by the access, the length of the driveway and whether the access is subject to a vehicle access restriction.

Access

(20) Require vehicle crossings and associated access to be designed and located to provide for safe, effective and efficient movement to and from sites and minimise potential conflicts between vehicles, pedestrians, and cyclists on the adjacent road network.

(21) Restrict or manage vehicle access to and from sites adjacent to intersections, adjacent motorway interchanges, and on arterial roads, so that:

(a) the location, number, and design of vehicle crossings and associated access provides for the efficient movement of people and goods on the road network; and

(b) any adverse effect on the effective, efficient and safe operation of the motorway interchange and adjacent arterial roads arising from vehicle access adjacent to a motorway interchange is avoided, remedied or mitigated.

Assessment

Having reviewed these objectives and policies in detail, the following assessment is provided:

- The level of traffic generated by the proposed landfill represents a very small portion of existing traffic levels along State Highway 1, with this road, as confirmed by network capacity calculations, being capable of sustaining it in a manner that will not compromise its on-going operation. Road improvement works and the nature of the traffic generated will also ensure that existing road safety issues are not exacerbated.
- The level of construction traffic generated will be a low overall percentage of the total traffic volume along State Highway 1, with Crowther Road able to be safely utilised for construction traffic access purposes. The implementation of a traffic management plan, which includes the potential requirement for a right turn bay, the timing of traffic to avoid conflict with school bus movements and the potential need for any additional traffic

control measures to manage flows along State Highway 1, will ensure that this occurs.

- The proposed roundabout access will allow vehicles to safety enter and exit the operational landfill without unduly disrupting the free flow of traffic along State Highway 1.
- The proposed on-site parking and loading arrangements will provide for the functional and operational needs of the development, noting that landfills in rural environments do not have minimum or maximum parking or loading requirements.
- Staff cycle parking will be provided for on-site.
- The provision of access roads of appropriate width and gradient ensures that vehicles will be able to access, circulate within, and exit the site in a manner that will not adversely affect traffic safety, either on-site or along State Highway 1.

Accordingly, consistency with these objectives and policies will be achieved.

E33. Industrial and trade activities

E33.2. Objective

(1) Industrial and trade activities are managed to avoid adverse effects on land and water from environmentally hazardous substances and discharge of contaminants, or to minimise adverse effects where it is not reasonably practicable to avoid them.

E33.3. Policies

(1) Manage the use of land for industrial or trade activities to prevent or minimise any adverse effects of storage, use or disposal of environmentally hazardous substances.

(2) Require industrial or trade activities to have, where reasonably practicable, onsite management systems, processes, containment, treatment, or disposal by lawful means.

(3) Require measures to be implemented, where contaminants cannot be disposed as trade waste to the wastewater network or contained on site, to minimise adverse effects on land and water including:

(a) reducing contaminant volumes and concentrations as far as practicable; and

(b) applying measures, including treatment, management procedures, monitoring, controls, or offsite disposal, having regard to the nature of the discharge and the sensitivity of the receiving environment.

Assessment

Having reviewed these objectives and policies in detail, the following assessment is provided:

- All areas containing hazardous substances will either be fully bunded our located within buildings that will be designed with systems to allow for the containment of any leaks or spills. An emergency spill response plan is also proposed, with the implementation of the contingency measures it contains ensuring that any spills that result will be remedied in a manner than minimises potential adverse environmental effects from the discharge of contaminants.
- Other than the fully bunded and contained areas detailed above, all areas of the working

landfill that form part of the industrial and trade activity area will be pre-treated where required via oil and grit interceptor and oil-water separator devices, with all runoff then discharging to the ponds and wetlands for stormwater quality treatment. This ensures that the on-site management system will contain, treat and dispose of contaminants generated by the operation of the landfill.

- All contaminants that cannot be treated as trade waste will be contained on-site and disposed of off-site as necessary.

Accordingly, consistency with these objectives and policies will be achieved.

E36. Natural Hazards and Flooding

E36.2. Objectives

(1) Subdivision, use and development outside urban areas does not occur unless the risk of adverse effects to people, property, infrastructure and the environment from natural hazards has been assessed and significant adverse effects are avoided, taking into account the likely long-term effects of climate change.

(4) Where infrastructure has a functional or operational need to locate in a natural hazard area, the risk of adverse effects to other people, property, and the environment shall be assessed and significant adverse effects are sought first to be avoided or, if avoidance is not able to be totally achieved, the residual effects are otherwise mitigated to the extent practicable.

(5) Subdivision, use and development including redevelopment, is managed to safely maintain the conveyance function of floodplains and overland flow paths.

E36.3. Policies

General

(1) Identify land that may be subject to natural hazards, taking into account the likely effects of climate change, including all of the following:

(a) coastal hazards (including coastal erosion and coastal storm inundation, excluding tsunami);

(b) flood hazards;

(c) land instability; and

(d) wildfires.

(2) Investigate other natural hazards to assess whether risks to people, property or the environment should be managed through the Plan or otherwise.

(3) Consider all of the following, as part of a risk assessment of proposals to subdivide, use or develop land that is subject to natural hazards:

(a) the type, frequency and scale of the natural hazard and whether adverse effects on the development will be temporary or permanent;

(b) the type of activity being undertaken and its vulnerability to natural hazard events;

(c) the consequences of a natural hazard event in relation to the proposed activity;

(d) the potential effects on public safety and other property;

(e) any exacerbation of an existing natural hazard risk or the emergence of natural hazard risks that previously were not present at the location;

(h) the design and construction of buildings and structures to mitigate the effects of natural hazards;

(i) the effect of structures used to mitigate hazards on landscape values and public access;

(j) site layout and management to avoid or mitigate the adverse effects of natural hazards, including access and exit during a natural hazard event; and

(k) the duration of consent and how this may limit the exposure for more or less vulnerable activities to the effects of natural hazards including the likely effects of climate change.

(4) Control subdivision, use and development of land that is subject to natural hazards so that the proposed activity does not increase, and where practicable reduces, risk associated with all of the following adverse effects:

(a) accelerating or exacerbating the natural hazard and/or its potential impacts;

(b) exposing vulnerable activities to the adverse effects of natural hazards;

(c) creating a risk to human life; and

(d) increasing the natural hazard risk to neighbouring properties or infrastructure.

Floodplains in rural areas

(16) In rural areas, avoid where practicable locating buildings accommodating more vulnerable activities in the 1 per cent annual exceedance probability (AEP) floodplain and manage other buildings and structures so that flood hazards are not exacerbated.

(17) On greenfield land outside of existing urban areas, avoid locating buildings in the 1 per cent annual exceedance probability (AEP) floodplain.

(20) Require earthworks within the 1 per cent annual exceedance probability (AEP) floodplain to do all of the following:

(a) remedy or mitigate where practicable or contribute to remedying or mitigating flood hazards in the floodplain;

(b) not exacerbate flooding experienced by other sites upstream or downstream of the works; and

(c) not permanently reduce the conveyance function of the floodplain.

Floodplains - general

(21) Ensure all development in the 1 per cent annual exceedance probability (AEP) floodplain does not increase adverse effects from flood hazards or increased flood depths and velocities, to other properties upstream or downstream of the site.

Overland flow paths

(29) Maintain the function of overland flow paths to convey stormwater runoff safely from a site to the receiving environment.

(30) Require changes to overland flow paths to retain their capacity to pass stormwater flows safely without causing damage to property or the environment.

Land instability

(31) Identify land that may be subject to land instability taking into account all of the following features:

(a) proximity to cliffs;

(b) steepness of land;

(c) geological characteristics; and

(d) uncontrolled fill.

(32) Require risk assessment prior to subdivision, use and development of land subject to instability.

(33) Locate and design subdivision, use and development first to avoid potential adverse effects arising from risks due to land instability hazards, and, if avoidance is not practicably able to be totally achieved, otherwise to remedy or mitigate residual risks and effects to people, property and the environment resulting from those hazards.

Infrastructure in areas subject to natural hazards

(35) Allow for the operation, maintenance, upgrading and construction of infrastructure, in areas subject to natural hazards when:

(a) infrastructure is functionally or operationally required to locate in hazard areas or it is not reasonably practicable that it be located elsewhere;

(c) in all flood hazard areas risks to people, property and the environment are mitigated to the extent practicable.

Assessment

Having reviewed these objectives and policies in detail, the following assessment is provided:

- All stormwater systems will be designed to accommodate flows from a 1% AEP event, with all intercepted water to discharge to the stormwater pond / wetland system for the working landfill, spreader bars for the main access road and rain gardens for the bin exchange area. The exception is flows from a 5% AEP event, which will bypass these systems and discharge directly to the outlets, noting that erosion protection will be provided. The implementation of this system will ensure that:
    - The function of all overland flow paths affected by the landfill to safely convey stormwater from the site to the receiving environment will be maintained.
    - The capacity of all overland flow paths affected by the landfill will be retained.
    - The conveyance function of the subject flood plain is not reduced and that flood

hazards as a consequence of increased flood depth and velocity will not result, all of which ensures that flood risk will not be exacerbated for properties upstream or downstream of the proposed landfill.

- On-site buildings will not be located within 1% AEP flood plains or overland flow paths.

- The proposed works will remedy all areas of instability as they relate to the proposed landfill which along with compliance with geotechnical recommendations will ensure that residual instability risks are suitably mitigated.
- Given the nature and function of the proposed landfill, there is a functional need to locate it within those areas of the site subject to flooding and stability risk and it is not reasonably practical to locate it elsewhere in terms of those potential hazards.
- There is little evidence that the site is susceptible to any other natural hazard risks, with the level of earthquake risk being assessed as 'low.'

Accordingly, consistency with these objectives and policies will be achieved.

Chapter H Zones

Chapter H of the AUP(OP) sets out the various zones within the Auckland region. Zones manage the way in which areas of land and the coastal marine area are to be used, developed or protected.

The subject site is within the Rural – Rural Production Zone, with the relevant objectives and policies set out and assessed below:

H19. Rural Zones

H19.2.1. Objectives – general rural

(1) Rural areas are where people work, live and recreate and where a range of activities and services are enabled to support these functions.

H19.2.2. Policies – general rural

(1) Enable activities based on use of the land resource and recognise them as a primary function of rural areas.

(2) Require rural production activities to contain and manage their adverse environmental effects on-site to the fullest extent practicable.

(4) Enable and maintain the productive potential of land that is not elite or prime soil but which has productive potential for rural production purposes, and avoid its use for other activities including rural lifestyle living except where these are provided for or enabled by Policy H19.2.2(5).

(5) Enable a range of rural production activities and a limited range of other activities in rural areas by:

(a) separating potentially incompatible activities such as rural production and rural lifestyle living into different zones;

(c) managing the effects of activities in rural areas so that;

(i) *essential infrastructure can be funded, coordinated and provided in a timely, integrated, efficient and appropriate manner; and*

(ii) *reverse sensitivity effects do not constrain rural production activities.*

(d) *acknowledging that, in some circumstances, the effective operation, maintenance, upgrading and development of infrastructure may place constraints on productive land and other rural activities; or*

(e) *providing for tourism and activities related to the rural environment*

H19.2.3. Objectives – rural character, amenity and biodiversity values

(1) The character, amenity values and biodiversity values of rural areas are maintained or enhanced while accommodating the localised character of different parts of these areas and the dynamic nature of rural production activities.

(2) Areas of significant indigenous biodiversity are protected and enhanced.

H19.2.4. Policies – rural character, amenity and biodiversity values

(1) Manage the effects of rural activities to achieve a character, scale, intensity and location that is in keeping with rural character, amenity and biodiversity values, including recognising the following characteristics:

(a) *a predominantly working rural environment;*

(b) *fewer buildings of an urban scale, nature and design, other than residential buildings and buildings accessory to farming; and*

(c) *a general absence of infrastructure which is of an urban type and scale.*

(2) Recognise the following are typical features of the Rural – Rural Production Zone, Rural – Mixed Rural Zone and Rural – Rural Coastal Zone and will generally not give rise to issues of reverse sensitivity in these zones:

(a) *the presence of large numbers of farmed animals and extensive areas of plant, vine or fruit crops, plantation forests and farm forests;*

(b) *noise, odour, dust, traffic and visual effects associated with use of the land for farming, horticulture, forestry, mineral extraction and cleanfills;*

(c) *the presence of existing mineral extraction activities on sites zoned as Special Purpose – Quarry Zone;*

(d) *accessory buildings dot the landscape, particularly where farming activities are the dominant activity; and*

(e) *activities which provide for the relationship of Mana Whenua to their ancestral land and taonga.*

(3) Enable opportunities to protect existing Significant Ecological Areas or provide opportunities to enhance or restore areas to areas meeting criteria of Significant Ecological Areas.

H19.2.5. Objectives – rural industries, rural commercial services and non-residential activities

(1) Rural production activities are supported by appropriate rural industries and services.

(2) The character, intensity and scale of rural industries and services are in keeping with the character of the relevant rural zone.

(3) The rural economy and the well-being of people and local communities are maintained or enhanced by social, cultural and economic non-residential activities, while the area's rural character and amenity is maintained or enhanced.

(4) Industries, services and non-residential activities of an urban type and scale unrelated to rural production activities are not located in rural zones.

H19.2.6. Policies – rural industries, rural commercial services and non-residential activities

(1) Enable rural industries and rural commercial services only where they have a direct connection with the resources, amenities, characteristics and communities of rural areas.

(2) Manage rural industries, rural commercial services and other non-residential activities to:

(a) avoid creating reverse sensitivity effects;

(b) contain and manage adverse effects on-site; and

(c) avoid, remedy or mitigate adverse effects on traffic movement and the road network.

H19.3.2. Objectives

(1) A range of rural production, rural industries, and rural commercial activities take place in the zone.

(2) The productive capability of the land is maintained and protected from inappropriate subdivision, use and development.

H19.3.3. Policies

(1) Provide for a range of existing and new rural production, rural industry and rural commercial activities and recognise their role in determining the zone's rural character and amenity values.

Assessment

Having reviewed these objectives and policies in detail, the following assessment is provided:

- The proposed landfill, while not a rural activity, is unlikely to be a suitable land use in any other zone as a consequence of its nature and scale. As such, while it is not an activity or service that supports the function of rural areas for people to work, live and recreate, I consider that it falls within the limited range of other activities that could establish in rural areas as set out in policy H19.2.2.(5). In this instance, I consider the proposed landfill to be an appropriate activity within the subject rural environment for the following reasons:
    - The working landfill will be well separated from all surrounding sites, which provides a buffer in respect of the generation of adverse effects, particularly noise, dust and odour. Conditions of consent could be imposed to ensure that all adverse effects in respect of these matters are suitably controlled, which includes the need to address noise so that the noise environment for any future sensitive activities on adjoining

sites is not compromised by the operation of the bin exchange area. This is important in terms of ensuring that reverse sensitivity effects do not result.

- The location of the working landfill and the proposed landscaping works, which includes grassing of soil stockpiles and extensive planting, will suitably mitigate any adverse landscape and visual effects from both the State Highway and the surrounding rural environment. While the working landfill will have a level of visibility from the closest portions of Wellsford, they will be at distance (approximately 4 km) and will only be a small portion of the overall rural landscape. Furthermore, any visible activity will be consistent with that anticipated within a rural environment dominated by forestry and farming activity.
- The proposed buildings will be small in scale and will be coloured so that they are neutral relative to their vegetated setting.
- The landfill will not be of an urban type or scale that is inconsistent with other rural production activities or rural industries that could reasonably establish within the zone.

For the above reasons, the character and amenity values of the subject rural environment will be maintained to an acceptable degree.

- Areas of significant ecological biodiversity values, and particularly where located within SEAs, will be protected and enhanced. However, biodiversity values in other areas will be adversely affected, with the measures proposed not achieving the necessary level of effects management to achieve the overall maintenance of biodiversity values.

Accordingly, while consistency with the objectives and policies relating to rural character and amenity values will be achieved, the proposed landfill will be inconsistent with those relating to maintenance of biodiversity values.

Conclusion

For the reasons outlined above, the development will be consistent with a number of the provisions within the applicable planning documents. However, it will be inconsistent with (but not contrary to) those relating to the protection of significant indigenous biodiversity and ecological values within terrestrial and freshwater systems, and the rural environment from adverse effects of development. It may also be inconsistent with those that relate to the interests, values and customary rights of Mana Whenua and ensuring that they are recognised in the sustainable management of natural and physical resources, noting that freshwater management and biodiversity are recurring themes within the objectives and policies of importance to Mana Whenua.

10. Any other matters - s104(1)(c)

Section 104(1)(c) requires that any other matter the consent authority considers relevant and reasonably necessary to determine the application be considered. In this case the following matters are considered relevant; or have been assessed to consider whether they are relevant:

Submissions

The submissions received have been summarised in section 6 of this report. The key matters raised and addressed within the submissions relate to:

- Transport;
- General amenity;
- General environmental effects;
- Freshwater and coastal water quality;
- Contamination of the environment;
- Groundwater / land stability;
- Legislation / plan integrity;
- Mana Whenua;
- Economic matters; and
- Non-RMA / other, including the consideration of alternative waste disposal methods.

I have taken all the matters submitters have raised into consideration when assessing the application in terms of actual and potential adverse effects and consistency with the relevant planning documents, including Part 2 matters, as will be addressed further below.

No other matters have been raised that require separate comment or evaluation.

Local Board comments

The proposal was sent to the Rodney Local Board, who provided feedback on the application as set out in their correspondence dated 29 April 2020. This is included within Attachment 5.

The Rodney Local Board raised 24 individual points in respect of the application, which are summarised as follows:

- More work is required to minimise the generation of waste. The applicant should initiate waste sorting and recycling initiatives to address this, which could be achieved through the development and implementation of a waste minimisation plan.
- The development and implementation of a groundwater quality and quantity management plan is supported.
- Surface runoff should be reduced to pre-development levels to minimise stream bank erosion and water quality impacts within the Hōteo River. The development and implementation of a surface water quality and quantity management plan is supported to assist with addressing this.
- Legal protection of all on-site wetlands is supported.
- The development and implementation of a wheel wash facility is supported.
- The development and implementation of a noise management plan is supported.
- The development and implementation of a dust management plan is supported.

- The development and implementation of a leachate management plan is supported.
- The development and implementation of a landfill gas management plan is supported.
- The development and implementation of a wastewater management plan is supported.
- The development and implementation of an infrastructure management plan is supported.
- The development and implementation of an earthworks management plan is supported.
- The development of a cultural values management plan is supported.
- The creation of a community liaison group is supported.
- Significant adverse traffic effects on the local network which cannot be mitigated will result.
- Avoidance of all adverse environmental effects should be achieved in the first instance, with mitigation of effects as a first choice of action not being supported. This is particularly so where any areas of works are known to adversely affect threatened species within the site. In this respect, the development and implementation of a threatened species management plan is supported.
- Avoidance of stream loss is supported where possible along with on-site mitigation and enhancement options. Offsite mitigation for stream habitat loss is not supported.

The Rodney Local Board seek that their feedback is considered along with conditions of consent (to reflect their feedback) in the instance that consent is granted. They have requested the opportunity to speak at the hearing.

All of these matters have been addressed within the foregoing assessment, other than those relating to waste minimisation. While the implementation of a waste minimisation plan is not considered necessary, as set out in section 1.2.1 of the AEE, the applicant already operates recovery, recycling and sustainable waste management solutions, which ensures that the outcomes sought by this management plan will generally be achieved.

Financial and development contributions

In this instance, the payment of a financial contribution is not applicable.

If development contributions are payable, they will be assessed by the Council's Development Contribution team. Any contributions required will be payable at Building Consent stage and are not linked to the consideration of this resource consent application.

Other relevant legislation

Purchase of the subject site by the applicant was authorised by the Overseas Investment Office subject to a number of conditions. All conditions that relate to the subject resource consent have been considered and factored into the assessments undertaken by the various specialists, and particularly that of Mr Chapman given the terrestrial ecology implications.

Alternatives

Schedule 4 of the RMA sets out the information the applicant is required to include as part of a resource consent application. Information required for all applications is included in section 2, with one of those requirements being the provision of an assessment of the activity's effects on the environment. Section 6(1)(a) states that if it is likely that the activity will result in significant adverse effects on the environment, a description of any possible alternative locations or methods for undertaking the activity must be provided.

The applicant has provided a detailed assessment of these matters in sections 3.5 and 10 of the submitted AEE. This assessment includes: the site selection process (and why the subject site was chosen as the preferred location); the design of the landfill within the subject site; and alternative waste management options.

In respect of the site selection process, the AEE, in section 10.4, states that the following were the key attributes used by the applicant in identifying a suitable site:

- Size, in that it needs to be large enough to accommodate a regional scale facility as proposed;
- Accessibility from the State Highway network;
- Buffer distances to neighbouring properties;
- Suitable geology and topography;
- Lack of identified areas of cultural significance and other zone or overlay restrictions; and
- Land ownership and title encumbrance issues in respect of ease of acquisition.

These key attributes were then ranked and weighted in terms of importance. Access was considered the primary constraint, with a site having to be within 5 km of a state highway north or north-west of Auckland. Secondary constraints were site size, buffer distances, Proposal Auckland Unitary Plan (PAUP) restrictions (which was the relevant plan in place when the site selection process was occurring) and ownership, which were rated from 3 to 5. Geology, topography, engineering and general planning constraints were identified as tertiary constraints, being rated from 1 to 2.

Having identified a number of potential sites, the subject site has been identified as the preferred site due to its proximity to State Highway 1, the size of the site and subsequent buffers to sensitive receivers, avoidance of identified PAUP restrictions, ownership issues and underlying geology. No details of the alternative sites that were considered have been provided.

In terms of landfill design options, the AEE, in section 10.5, sets out alternative design or project layouts that were considered in respect to the design of the proposed landfill, which included: the overall layout (including the bin exchange and soil stockpile and clay borrow areas); the choice of the landfill valley; landfill phasing; and the design of the main access road.

Alternative methods to landfills are detailed in section 3.5 of the AEE and include: mechanical biological treatment; mechanical heat treatment; waste to energy / incineration; and advanced thermal treatment. The AEE concludes that due to a combination of cost, waste

volume requirements and legislative differences, these alternative methods are not currently used as municipal waste solutions in New Zealand. For similar reasons, they are not considered suitable as future municipal waste solutions.

In reviewing this assessment, I consider that sufficient information has been submitted in terms of possible alternative locations or methods for undertaking the activity. While specific alternative locations have not been provided (due to commercial sensitives and community considerations), it is evident that the applicant has undertaken an extensive site selection process and has considered a number of alternative locations. Although some of the weighting applied to the various key attributes is questioned, as is the reliance on a desktop review of zone and overlay restrictions, the selection criteria reflect the key requirements to enable the development of a municipal landfill. Noting the operational requirements of a landfill as set out within the list of key attributes, I consider that it is unlikely that a site could be located where significant adverse effects would not result. The appropriateness of the activity can only be evaluated by assessing all relevant matters at resource consent stage, noting that this should be assisted through a robust site selection process. In this respect, other than the identified ecological issues (which could be addressed by way of improvements to the effects management package) and potentially those associated with Mana Whenua values, I consider the site to be suitable for development as a landfill. This confirms that a suitably robust process has been followed with respect to the identification of possible alternative locations and conversely, the identification of the subject site as a potentially suitable location.

Dovetailing into the assessment of alternatives and noting that the AEE has referred to alternative site layouts and the design of the main access road, I consider that there are alternative design options to reduce levels of adverse effects, namely removal of the proposed culvert and replacement with a bridge. This would not lessen adverse effects to an acceptable level, but it would be an alternative design method that would assist with reducing the overall level of adverse effects that do result. In this respect, I note that removal of stockpile 2 has achieved a reduction in adverse effects by avoiding the need to reclaim approximately 1.3 km of streams, as well as impacting a Hochstetter's frog 'hot spot.'

In terms of alternative methods, I adopt the assessment within the AEE that municipal landfills are the only currently viable method for disposing of municipal waste within the New Zealand context. I further note the commentary from Mr Crimmins in his technical review on page 58:

> *I agree with the AEE's assessment of the comparative unsuitability of alternative waste treatment systems such as 'waste to energy', 'incineration' or 'pyrolysis/gasification' plants presented in section 3.5 of the AEE. I consider they are flawed in a New Zealand context, particularly as they do not encourage the upper tiers of the waste hierarchy (Reduce, Re-use, Recycle). The significant capital costs of incinerators need to be offset by generating electricity by incinerating a set quantity of refuse into the future, thereby negating the imperative to Reduce waste. While the Landfill also has significant capital costs, I note that the rate of filling can be varied without impacting the pay-back to the same degree (i.e. the tipping price could be increased, or a longer pay-back period accepted). The discharges of HAPs (and CO_2)*

from these incinerators also represent a significant risk to the environment.

In comparison to incinerator technologies, I consider that the proposed Solid-Waste Landfill and LFG extraction/control technology is better suited for the Auckland and New Zealand context. The Landfill technology proposed by WMNZ is known, better enabling the control of HAPs and odour through design and conditions of consent.

Accordingly, I consider that alternative methods for undertaking the activity have been appropriately considered.

11. Other relevant RMA provisions

Determination of applications for discretionary or non-complying activities – s104B

In considering an application for a resource consent for a non-complying activity, the Council:

(a) may grant or refuse the application; and

(b) if it grants the application, may impose conditions under s108.

The recommendation on whether the subject non-complying resource consent application should be granted or refused is contained in section 14 below.

Commentary on potential conditions is provided further below.

Applications relating to the discharge of greenhouse gases

Section 104E states that when considering an application for a discharge permit where the proposal would otherwise contravene s15 (or ss15A or 15B) relating to the discharge into air of greenhouse gases, the Council must not have regard to the effects of such a discharge on climate change, except to the extent that the use and development of renewable energy enables a reduction in the discharge into air of greenhouse gases.

In this respect, the proposed generation of electricity from landfill gas will enable a reduction in the discharge of greenhouse gases from electricity generation. This is consistent with the requirements of s104E.

Matters relevant to discharge and coastal permits – s105

The proposal requires a consent to discharge contaminants under s15. Under s105, the Council must have regard to additional matters for any application for a discharge permit or a coastal permit that would contravene s15 or s15B of the RMA. These matters are:

- the nature of the discharge and the sensitivity of the receiving environment to adverse effects;
- the applicant's reasons for making the choice; and

- the possible alternative methods of discharge, including discharge into another receiving environment.

The applicant has clearly detailed their reasons for making their choice to discharge contaminants under s15 of the RMA. As assessed within sections 8 and 9, the detailed management and treatment measures proposed will ensure that the receiving environment will not be adversely affected in an unacceptable manner by any resulting discharges from the proposed landfill activity. This is important given the sensitivity of the receiving environment to such discharges in terms of environmental and human health effects.

Whilst I acknowledge the assessment of Mr Crimmins that extending the operational consent at Redvale may present a superior alternative to establishing the proposed landfill, evidence from the applicant is that this landfill will be at capacity prior to its consent expiry date of 31 December 2028. In any case, extending the date beyond 2028 would require an additional consent such that I do not consider it to be a viable alternative methodology.

Mr Crimmins has also noted, as detailed in a number of submissions, that use of the railway to transport waste to the landfill is an alternative option that would reduce overall air discharges. However, I note that emissions from vehicles on roads is a permitted activity and that such emissions would not be controlled or addressed through the subject air discharge consent. I further note that use of rail would require a distribution network within Auckland and a collection system from Wellsford, all of which would result in additional logistical issues to address. Accordingly, on the basis of the evidence before me, I do not consider the use of rail for waste collection / delivery purposes to be a viable, practical or necessary alternative air discharge method.

As assessed above, Mr Crimmins has advised that HAP discharges from incinerators is likely to represent a significant risk.

Noting the above, and that no other specialist advisors have detailed any possible alternative discharge methods, including into another receiving environment, and notwithstanding the strong support for alternatives to the landfilling of waste from many submitters, I consider that the provisions of s105 have been met.

Restrictions on discharge permits – s107

Under s107, the Council must not grant a discharge permit that may result in contaminants entering water, if after reasonable mixing, the contaminant discharged (either by itself or in combination with the same, similar, or other contaminants or water) is likely to give rise to all or any of the following effects in the receiving waters:

- The production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials.
- Any conspicuous change in the colour or visual clarity.
- Any emission of objectionable odour.
- The rendering of fresh water unsuitable for consumption by farm animals.
- Any significant adverse effects on aquatic life.

For reasons previously detailed, I consider that the proposal satisfies the provisions of s107

because, after reasonable mixing, discharges from the landfill are unlikely to give rise to any of the effects on receiving waters listed above. Detailed management and monitoring measures are proposed by the applicant to ensure that this occurs, with contingencies able to be implemented to remedy such effects in the instance that they do result.

Conditions of resource consents – s108

A list of potential conditions has been submitted by the applicant as part of their application, some which have been reviewed and refined by the Council's specialists. These are included in attachment 6 for the hearing commissioners' consideration should they chose to grant consent, noting that they are still in the process of being refined, both in consultation with Council specialists and the applicant.

Duration of resource consents – s123

The applicant has requested the maximum 35-year duration for all discharge consents. This term is supported by all specialists other than Mr Crimmins in respect of the air discharge consent.

Mr Crimmins states that air discharge consents in Auckland are typically granted for 10 to 15-year durations in order to allow for a thorough reassessment of discharge control measures to reflect advances in control technology, and the understanding of adverse air quality effects and amenity expectations over a shorter period of time.

In respect of the subject consent, Mr Crimmins considers that the uncertainty and risk of adverse air discharges resulting increases over time because greater volumes of landfill gas are generated resulting in additional emissions of HAPs and odour. In this respect, Mr Crimmins notes the following as set out on page 63 of his review:

> *A consent application for air discharge consent lodged near 2050 to authorise further air discharges from the Landfill would draw on real-world air quality experience and monitoring data from the Landfill's first 25 years of operation. This 'mid-point review' mechanism would provide neighbours to provide feedback on air quality matters, account for changes to air quality standards, and provide WMNZ an opportunity to include changes to the proposed later-operations of the Landfill that are not foreseeable at present (such as a longer filling duration or additional LFG generators) and would not be possible under the framework provided by s128 of the RMA. Such an application would be subject to s124 and s104(2A) of the RMA.*
>
> *I consider having an expiry date for the air discharge consent after 25 years of operation better complies with the need for a precautionary approach and minimises actual and potential effects on the environment. Compared to a 35-year duration (with review clauses), I consider a 25-year duration better avoids, remedies and mitigates adverse air quality effects while still providing the applicant an adequate degree of future operating certainty.*

I adopt the assessment of Mr Crimmins and consider a 25-year period for the air discharge consent to be appropriate, noting that adverse effects will potentially increase as the volume of waste material within the landfill increases. Noting that Mr Crimmins has advised that most air discharge consents have 10 to 15-year durations, in the instance that the air discharge consent is granted, I consider that the 25-years recommended would provide the applicant with the necessary level of operational certainty, while ensuring that adverse effects could be better avoided, remedied or mitigated in the future.

Noting that no other experts have recommended anything less than the maximum 35-year duration period applied for, that associated adverse effects are unlikely to change and that other mechanisms are available to suitably avoid, remedy or mitigate associated adverse effects, I consider that all other discharge consents could be subject to a 35-year duration period if granted.

Lapsing of resource consents – s125

Under s125, if a resource consent is not given effect to within five years of the date of the commencement (or any other time as specified) it lapses automatically, unless the Council has granted an extension.

In this case, the applicant has indicated in section 1.7 of the submitted AEE that a five-year lapse period is sought. Should the hearing commissioners determine to grant consent, it is recommended that the standard five-year lapse period is applied.

Monitoring – s35

The proposed conditions of consent will require extensive monitoring, the payment of which could be recovered under section 36(1)(c) and made explicit through conditions of consent.

12. Particular restrictions for non-complying activities – s104D

Under s104D, a non-complying activity must pass at least one of the tests of either s104D(1)(a) or s104D(1)(b) before a decision can be made to grant or decline a resource consent application under s104B. If an application fails both tests of s104D, then it must be declined.

As concluded in section 8, the proposed development will result in adverse ecological effects that are more than minor in scale, such that it would not satisfy section 104D(1)(a).

As concluded in section 9, the development would be inconsistent with a number of the objectives and policies within the AUP(OP) as they relate to streamworks and terrestrial ecological values. I note, however, that ‘contrary to’ is a higher threshold than ‘inconsistent’. Case law has determined that ‘contrary to’ has the same meaning as ‘repugnant to’ or ‘opposed to in nature’. In my opinion, this terminology could be used to describe development that is clearly against what the Plan is trying to achieve, such as the development of industrial activity in a clearly defined residential area or the provision of a multi-storey apartment tower in a rural environment. Therefore, while the proposed development will not be consistent with some of the objectives and policies as assessed in section 9, it is not, in my opinion, of a nature and scale that would classify it as being considered ‘contrary to’.

The caveat to this is the evaluation in respect of objectives and policies that relate to Mana Whenua values, which can only be determined once all evidence has been presented at the hearing and considered accordingly. A possible determination is that the proposed landfill will be contrary to some, or all, of the objectives and policies relating to Mana Whenua values. If that is the case, then the application could not be granted and would need to be refused.

Section 104D conclusion

I therefore consider, with the caveat on Mana Whenua values aside, that the application meets one of the tests of s104D in that it will not be contrary to the applicable objectives and policies of the AUP(OP). Accordingly, it can be assessed against the provisions of s104B of the RMA and a substantive decision made.

13. Consideration of Part 2 (Purpose and Principles)

Purpose

Section 5 identifies the purpose of the RMA as the sustainable management of natural and physical resources. Sustainable management is defined as the use, development and protection of natural and physical resources in a way that enables people and communities to provide for their social, cultural and economic well-being and their health and safety while sustaining those resources to meet the reasonably foreseeable needs of future generations, safe-guarding the life supporting capacity of air, water, soil and ecosystems, and avoiding, remedying or mitigating any adverse effects on the environment.

Principles

In achieving the purpose of the RMA as set out in s5, s6 sets out a number of matters of "national importance" that need to be recognised and provided for when considering an application for resource consent.

The relevant s6 matters with respect to the subject development are:

(a) The preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development.

(c) The protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna.

(e) The relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga.

(g) The protection of protected customary rights.

(h) The management of significant risks from natural hazards.

Section 7 identifies a number of "other matters" that shall be given particular regard to when considering an application for resource consent.

The relevant s7 matters with respect to the subject development are:

(a) Kaitiakitanga

(aa) The ethic of stewardship.

(b) The efficient use and development of natural and physical resources.

(c) The maintenance and enhancement of amenity values.

(d) Intrinsic values of ecosystems.

(f) Maintenance and enhancement of the quality of the environment.

(g) Any finite characteristics of natural and physical resources.

(i) The effects of climate change

(j) The benefits to be derived from the use and development of renewable energy.

Section 8 requires the principles of the Treaty of Waitangi to be taken into account when considering an application for resource consent.

Assessment

Any consideration of an application under s104(1) of the RMA is subject to Part 2. The Court of Appeal in *R J Davidson Family Trust v Marlborough District Council* [2018] NZCA 316 has held that, in considering a resource consent application, the statutory language in section 104 plainly contemplates direct consideration of Part 2 matters, when it is appropriate to do so. Further, the Court considered that where a plan has been competently prepared under the RMA, it may be that in many cases there will be no need for the Council to refer to Part 2. However, if there is doubt that a plan has been "competently prepared" under the RMA, then it will be appropriate and necessary to have regard to Part 2. That is the implication of the words "subject to Part 2" in s104(1) of the RMA.

In the context of this non-complying activity application for district and regional land use, streamworks, discharge and water resource consents, where the objectives and policies of the AUP (OP) were prepared having regard to the relevant statutory documents, with the exception of the NPSFM 2020, and Part 2 of the RMA, they capture all relevant planning considerations and contain a coherent set of policies designed to achieve clear environmental outcomes. They also provide a clear framework for assessing all relevant potential effects, and I consider that there is no need to go beyond the provisions of these documents and look to Part 2 in making this decision, as an assessment against Part 2 would not add anything to the evaluative exercise.

With respect to the NPSFW 2020, a clear management hierarchy is detailed within its only objective, with the first priority being the health and well-being of water bodies and freshwater ecosystems; the second priority being the health of people; and the third the ability of people and communities to provide for their social, economic, and cultural well-being. The associated policies also require freshwater to be managed in a manner that: gives effect to Te Mana o te Wai, which seeks to preserve the balance between the water, the wider environment, and the community; and protects the habitats of indigenous freshwater species. These are clear objective and policy requirements and as they serve to reinforce and strengthen the associated objectives and policies contained within the AUP(OP), there is no need to undertake a further assessment against Part 2 to address any inconsistencies.

14. Conclusion

I consider that the proposed development will result in adverse effects in relation to sedimentation, land stability, historic heritage, natural hazards, construction nuisances, leachate generation, water take, damming or surface water, discharges to land, water and air, human health risk, traffic safety, landscape and visual and rural character and amenity that are no more than minor and acceptable.

However, in order to establish the landfill, extensive stream and wetland reclamation and culverting works are proposed. Notwithstanding the requirement to avoid such activity in the first instance, I consider that the ecological effects management package proposed will not be sufficient to achieve a no net loss of ecological values outcome and residual adverse effects are likely to remain. Furthermore, there is uncertainty that some of the offsetting and compensation measures detailed within the effects management package will achieve the ecological benefits proposed, such that the true extent of unaddressed residual adverse effects will unlikely be known. This is not acceptable in respect of the freshwater and terrestrial ecology outcomes anticipated, particularly in circumstances where the ecological values of the habitats being lost is very high.

There are also cultural values effects to consider, an evaluation of which can only be undertaken once Mana Whenua have presented their evidence at the hearing, and the commissioners have considered this.

I therefore conclude that adverse ecological effects will be more than minor and unacceptable. The appropriateness of the landfill in all other respects and the likely positive effects do not reduce the scale of the effects to a minor level or allow for them to be considered acceptable.

The proposed development will be inconsistent with some or all of the objectives and policies in chapters B3.2. Infrastructure, B7.3. Freshwater Systems, B9.2. Rural Activities, D4. Natural Stream Management Areas Overlay, E1. Water Quality and Integrated Management, E3. Lakes, Rivers, Streams and Wetlands, E13. Cleanfills, Managed Fills and Landfills, E15. Vegetation Management and Biodiversity, E26. Infrastructure and H19. Rural Zones of the AUP(OP). This is because a net loss of ecological values will result as a consequence of the proposed reclamation and culverting works, which is inconsistent with the objectives and policies within these chapters that enable development subject to: adverse effects on natural resources being avoided where practicable or otherwise remedied or mitigated; and ecosystem services and indigenous biological diversity values being maintained or enhanced. There is also uncertainty that the proposed development avoids, remedies or mitigates adverse effects on Mana Whenua values, particularly those associated with freshwater resources, including wāhi tapu, wāhi taonga and mahinga kai.

There will also be a level of inconsistency with the hierarchy detailed in objective 2.1 of the NPSFW 2020, which prioritises the health and well-being of water bodies and freshwater ecosystems over the ability of people to provide for their social, economic, and cultural well-being. Furthermore, it will not give effect to Te Mana o te Wai, which seeks to preserve the balance between the water, the wider environment, and the community, nor will it result in the protection of habitats for indigenous freshwater species.

I consider that the proposed landfill will be consistent with, and not contrary to, the relevant objectives and policies within chapters B3.4. Energy, B7.5. Air, B10.2. Natural Hazards and

Climate Change, E2. Water Quantity, Allocation and Use, E11. Land Disturbance – Regional, E12. Land Disturbance – District, E14. Air Quality, E24. Lighting, E25. Noise and Vibration, E27. Transport, E33. Industrial and trade activities and E36. Natural Hazards and Flooding of the AUP(OP) as well as some of the policies within NPSFW 2020. Consistency will also be achieved with the requirements of the NES-AQ and the NPSRE. However, such consistency is not sufficient to outweigh the assessed inconsistencies, with no evidence having been presented that the importance of the proposed landfill is such that its provision should be favoured in place of an acceptable environmental outcome.

Overall, I consider that the proposal meets the relevant statutory test of s104D as a result of the finding that it will not being contrary to the objectives and policies of the AUP(OP). However, having undertaken an assessment of the proposal in terms of s104(1)(a) and (ab), I consider the adverse effects resulting with respect to freshwater and terrestrial ecology matters will be more than minor and of an unacceptable level.

I therefore consider that the proposed development does not met the statutory tests required to gain approval and I therefore recommend under s104B that consent be **REFUSED**.

It should be noted that this recommendation is made on the basis of the more than minor adverse freshwater and terrestrial ecology effects that will result, which in turn results in inconsistencies with objectives and policies within the NPSFW 2020 and AUP(OP). If the applicant were to develop and present an improved offsetting and compensation package that addresses the issues identified, my position on the application and recommendation that consent be refused may change. This would, of course, be subject to all issues with respect to cultural values being satisfactorily addressed, an evaluation of which can only be undertaken once these matters have been presented by Mana Whenua to the commissioners at the hearing, and discussed further in the necessary level of detail.

15. Recommendation on application BUN60339589

Subject to new or contrary evidence being presented at the hearing, I recommend that under sections 104 and 104B of the RMA, consent be **REFUSED** to the non-complying activity application BUN60339589 by Waste Management NZ Limited at 1232B State Highway 1, Wayby Valley, for district and regional land use, streamworks, discharge and water resource consents associated with the construction and operation of a landfill.

The reasons for this recommendation are:

1. In accordance with an assessment under s104(1)(a) of the RMA, the resulting adverse ecological effects will be more than minor and unacceptable. The appropriateness of the landfill in all other aspects, and the likely positive effects do not reduce the scale of the effects to a minor level or allow for them to be considered acceptable.

2. In accordance with an assessment under s104(1)(b) of the RMA, the proposal is inconsistent with some or all of the objectives and policies in chapters B3.2. Infrastructure, B7.3. Freshwater Systems, B9.2. Rural Activities, D4. Natural Stream Management Areas Overlay, E1. Water Quality and Integrated Management, E3. Lakes, Rivers, Streams and Wetlands, E13. Cleanfills, Managed Fills and Landfills, E15. Vegetation Management and Biodiversity, E26. Infrastructure and H19. Rural Zones of

the AUP(OP). This is because a net loss of ecological and biodiversity values will result as a consequence of the proposed reclamation and culverting works, which is inconsistent with the objectives and policies within these chapters that enable development subject to: adverse effects on natural resources being avoided where practicable or otherwise remedied or mitigated; and ecosystem services and indigenous biological diversity values being maintained or enhanced.

There will also be a level of inconsistency with the hierarchy detailed in objective 2.1 of the NPSFW 2020, which prioritises the health and well-being of water bodies and freshwater ecosystems over the ability of people to provide for their social, economic, and cultural well-being. Furthermore, the proposed development will not give effect to Te Mana o te Wai, which seeks to preserve the balance between the water, the wider environment, and the community, nor will it result in the protection of habitats for indigenous freshwater species.

It is accepted that the proposed landfill will be consistent with the relevant objectives and policies within chapters B3.4. Energy, B7.5. Air, B10.2. Natural Hazards and Climate Change, E2. Water Quantity, Allocation and Use, E11. Land Disturbance – Regional, E12. Land Disturbance – District, E14. Air Quality, E24. Lighting, E25. Noise and Vibration, E27. Transport, E33. Industrial and trade activities and E36. Natural Hazards and Flooding of the AUP(OP) as well as some of the policies within NPSFW 2020. Consistency will also be achieved with the requirements of the NES-AQ and the NPSRE. However, such consistency is not sufficient to outweigh the assessed inconsistencies, with no evidence having been presented that the importance of the proposed landfill is such that its provision should be favoured in place of an acceptable environmental outcome.

3. In the context of this non-complying activity application for district and regional land use, streamworks, discharge and water resource consents, where the objectives and policies of the AUP (OP) were prepared having regard to the relevant statutory documents, with the exception of the NPSFM 2020, and Part 2 of the RMA, they capture all relevant planning considerations and contain a coherent set of policies designed to achieve clear environmental outcomes. They also provide a clear framework for assessing all relevant potential effects such that there is no need to go beyond the provisions of these documents and look to Part 2 in making this decision, as an assessment against Part 2 would not add anything to the evaluative exercise.

   With respect to the NPSFW 2020, a clear management hierarchy is detailed within its only objective, with the first priority being the health and well-being of water bodies and freshwater ecosystems; the second priority being the health of people; and the third the ability of people and communities to provide for their social, economic, and cultural well-being. The associated policies also require freshwater to be managed in a manner that: gives effect to Te Mana o te Wai, which seeks to preserve the balance between the water, the wider environment, and the community; and protects the habitats of indigenous freshwater species. These are clear objective and policy requirements and as they serve to reinforce and strengthen the associated objectives and policies contained within the AUP(OP), there is no need to undertake a further assessment against Part 2 to address any inconsistencies.

ATTACHMENT 1

APPLICATION

The application material has not been re-produced in this agenda. It can be found at

https://www.aucklandcouncil.govt.nz/have-your-say/have-your-say-notified-resource-consent/notified-resource-consent-applications-open-submissions/Pages/ResourceConsentApplication.aspx?itemId=393&applNum=BUN60339589

The further information received from the applicant post-notification has not been re-produced in this agenda. It can be found at

https://onedrive.live.com/?authkey=%21AJzLh98gdkxrkkU&id=943FC6A80B823296%2112250&cid=943FC6A80B823296

ATTACHMENT 2

COUNCIL SPECIALIST REPORTS

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Consulting Advice Note

Date	18 September 2020
From	Jon Styles
To	Warwick Pascoe, Auckland Council
Project	Resource consent application- Auckland Regional Landfill (BUN60339589)
Re	**Acoustic review- Auckland Regional Landfill**

1.0 Introduction

Auckland Council has engaged Styles Group to review the resource consent application by Waste Management NZ Ltd (**WMNZ)** to construct and operate a regional landfill at 1323 State Highway 1, Wayby Valley (the Site[1]). The resource consent application is accompanied by an assessment of environmental noise effects prepared by Marshall Day Acoustics (**the MDA report**). This advice sets out my review of:

i. The acoustic assessment submitted with the application[2], (the **MDA Report**);

ii. The response to the Councils' further information requests relating to acoustics[3];

iii. The proposed conditions of consent relating to construction and operational noise effects[4];

iv. The relevant sections of the AEE, the relevant plans and supporting documentation;

v. The submissions raising noise issues.

This review has been prepared following a visit to the Site specifically for the purpose of informing this review, and liaison with Mr Ross (the reporting planner).

This review covers only the most important aspects of the acoustic assessments and potential noise effects. In many areas where I agree with the assessments provided, the comments in this review are brief.

[1] The Site refers to all of the land held in common ownership by WMNZ that comprises the application site

[2] *Auckland regional Landfill Assessment of Environmental Noise Effects,* Rp 001 20180331, 9 May 2019, Marshall Day Acoustics

[3] Various responses, including from Tonkin & Taylor and Marshall Day Acoustics

[4] As provided to Styles Group and dated 25 August 2020

1.1 Qualifications and experience

My full name is Jon Robert Styles. I am an acoustic consultant and director and principal of Styles Group Acoustics and Vibration Consultants. I lead a team of nine consultants specialising in the measurement, prediction and assessment of environmental and underwater noise, building acoustics and vibration.

I have approximately 19 years' experience in the industry, the first four as the Auckland City Council's Environmental Health Specialist – Noise, and the latter 15 as the Director and Principal of Styles Group.

I hold a Bachelor of Applied Science majoring in Environmental Health and I have completed the Ministry for the Environments' Making Good Decisions programme. I am in my second term as the president of the Acoustical Society of New Zealand and prior to being elected I was the secretary and on the committee of the Society for 8 years.

I have extensive experience advising on the management of noise and vibration effects within and between land uses, including the noise effects of major and strategic infrastructure (including port, road, air and rail), quarries, landfills, clean and managed fills and the management of noise from industrial, commercial, rural, temporary and recreational activities. I have been involved a significant number of major resource consent processes, District Plan reviews, plan changes and master planning processes across New Zealand. I was involved with the Redvale land fill consenting process in 2014/2015, and I have been involved in several other landfill projects around New Zealand.

2.0 The Site and surrounds

The Site comprises many individual sites that are all held in common ownership by WMNZ. The extent of the Site and the locations of the nearest receivers of noise are shown in Figure 2 of the MDA Report. The Site and all nearby surrounding receivers are located in the Rural – Rural Production Zone (the **RPZ**).

The Site and surrounds are rural in nature and is generally very sparsely developed. The area does not contain any significant noise generating activities other than State Highway One (SH1) running approximately north-south past the western extents of the Site. The noise from traffic on SH1 is a major noise source in the area and is a significant factor in the assessment of noise effects from this proposal. In areas remote from SH1, the ambient and background sounds are likely to be low, and dominated by natural sounds.

The area is predominantly in the RPZ, and the noise from activities anticipated by the RPZ provisions could be expected.

The MDA Report only assesses the effects at receivers physically existing at the current time, and does not provide any assessment for future development that is anticipated by the AUP.

3.0 Permitted noise standards

The MDA report correctly identifies the relevant Chapter E25 standards for the management and assessment of construction noise, operational noise levels and blasting activities. The noise limits applying to activities permitted in the RPZ are set out in E25.6.3 of the Auckland Unitary plan, (the **AUP**).

Standard E25.6.3 *Noise levels in rural and future urban zones* is reproduced below:

> (1) The noise (rating) level from any activity in the Rural – Mixed Rural Zone, Rural – Rural Production Zone, Rural – Rural Coastal Zone or the Future Urban Zone measured within the notional boundary on any site in any rural zone must not exceed the limits in Table E25.6.3.1 Noise levels in the Rural – Mixed Rural Zone, Rural – Rural Production Zone, Rural – Rural Coastal Zone or the Future Urban Zone below:

Table E25.6.3.1 Noise levels in the Rural – Mixed Rural Zone, Rural – Rural Production Zone, Rural – Rural Coastal Zone or the Future Urban Zone

Time	Noise Level
Monday to Saturday 7am - 10pm	55dB L_{Aeq}
Sunday 9am – 6pm	
At all other times	45dB L_{Aeq} 75dB L_{AFmax}

The notional boundary is defined in Chapter J of the AUP as:

> *A line 20m from any side of a building containing an activity sensitive to noise, or the legal boundary where this is closer to the building.*

Activities Sensitive to Noise are defined in Chapter J of the AUP as:

> *Any dwelling, visitor accommodation, boarding house, marae, papakāinga, integrated residential development, retirement village, supported residential care, care centres, lecture theatres in tertiary education facilities, classrooms in education facilities and healthcare facilities with an overnight stay facility.*

I understand that Care Centres for up to 10 people and dwellings are permitted activities in the RPZ and should therefore be anticipated. It appears that dwellings are the most common activities sensitive to noise in this area.

The noise limits for the RPZ are set at the top end of the range of acceptable noise limits for residential use, without requiring activities sensitive to noise to acoustically insulate themselves. The relatively high noise limits provide an environment where noise generating activities are afforded maximum flexibility whilst remaining compatible with un-insulated activities sensitive to noise. Residential amenity is low, but acceptable. If the maximum permitted noise levels were any higher, buildings containing activities sensitive to noise would need to be acoustically insulated and outdoor amenity would be seriously eroded.

In my view, the MDA Report takes a relatively simplistic view of the application of the standards in E25, and applies them to the proposal as if the proposed activity were permitted. Given that the proposal is for a non-complying activity overall, I consider that a more holistic assessment of the noise effects is required including against the relevant objectives and policies and having regard to the noise effects that may arise from activities anticipated in the RPZ. Given that parts of the evaluation require planning input and may ultimately inform or become the planners view, I have had a number of discussions with Mr Ross in preparing this section of the review of noise effects.

I have undertaken a review of the noise effects using the permitted standards in E25.6 as a guide, and having regard to the noise-related elements of the relevant objectives and policies, (in conjunction with Mr Ross).

4.0 The proposal

The proposal is to comply with the noise and vibration standards for activities in the RPZ. Resource consent is not required for an infringement of any noise standard.

4.1 Noise sources

The proposal and its noise sources are set out in detail in the AEE, plans and the MDA Report. I do not repeat those here.

I have reviewed the sections of the MDA Report that describe the noise sources associated with the proposal, along with the sound power level data in Appendix D. I consider that the range of noise sources and sound power level data appear to be reasonable and I agree in general terms with those sections of the report.

I agree with the MDA Report that the ongoing activities associated with the bin exchange, haul routes, filling and cell development would all be included in the definition of 'operational' noise. In my view, the operational noise sources should be those associated with the regular ongoing activity.

Section 6 of the MDA Report sets out a brief analysis of the construction noise effects which is limited to the Crowther Road upgrade and the roundabout construction. We agree that these construction activities should be assessed against the requirements of the construction noise standards in E25.6.27 as they are 'one-off' construction activities that must be completed before the operational phase of the proposal can proceed. There will be other construction activities associated with the initial and ongoing development of the landfill, but these should be limited to activities that fit the definition of construction noise according to the AUP[5].

[5] Construction Work is defined in NZS6803:1999 by reference in E25.6.1 *General Standards*

4.2 Noise modelling

I have reviewed the noise modelling methodology, inputs, assumptions and outputs as set out in the MDA Report. I consider that the noise modelling methodology is robust and has been undertaken in accordance with the correct standards and assumptions in terms of calculations, meteorological effects and timeframes.

I agree with the application of the various adjustments that have been applied to determine the Noise Rating Level (the overall noise level derived in accordance with NZS6802) and I agree with the noise model outputs.

The noise modelling process is not capable of producing an output for every scenario that may eventuate, but it can be used to describe the spatial propagation of noise for the relevant and reasonable 'worst case' scenarios. I consider that the MDA Report is sufficiently robust in terms of noise modelling and predicted noise levels.

4.3 Receivers

Based on my visit to the Site and surrounds, the activities sensitive to noise that are mapped in the MDA Report as receivers appear to be correct. All receivers are dwellings and are activities sensitive to noise.

4.4 Noise level predictions- operational noise

Table 5 and Appendix G of the MDA Report sets out the noise level predictions arising from a variety of scenarios over the life of the landfill.

I generally agree that the predictions are representative of those scenarios, but they should only be considered indicative at this stage, given the large number of variables involved. I consider that the noise level predictions are suitably robust for the purpose of this process.

The vast majority of the receivers are predicted to receive noise levels less than 40dB L_{Aeq}, including during the day, with many receivers predicted to receive noise levels that are below 30dB L_{Aeq}. These are generally very low levels of noise and reflect the large separation distances available.

The night time L_{AFmax} noise level predictions show that all receivers are predicted to receive levels below 45dB. Only receivers 01 and 29 are predicted to receive levels slightly higher, at 48dB and 56dB L_{AFmax} respectively. Both of these levels are compliant with the maximum permitted noise level of 75dB L_{AFmax} for activities permitted in the RPZ.

I note that there is often a high degree of variability in the level of L_{AFmax} noise events, and that it would be quite possible for the L_{AFmax} noise levels to be higher than those predicted by MDA on some occasions. I would expect that a variability of up to +5dB could be expected on occasion. Even if this arose, compliance with the maximum permitted noise levels for the RPZ would still be achieved by a considerable margin.

Such noise levels are unlikely to result in sleep disturbance effects.

5.0 Assessment of effects

5.1 Relevant objectives and policies

Ultimately, it is the planner's role to assess the proposal against the objectives and policies of the AUP. However, it is my experience that the planner's assessment can be helpfully informed by input from an acoustics expert.

I have provided comments against the relevant objectives and policies from E25 of the AUP below.

E25.2. Objectives

(1) People are protected from unreasonable levels of noise and vibration.

The focus of this objective is protecting people from unreasonable noise. What is reasonable is not defined in the AUP or the RMA, and instead requires a specific assessment of the relevant factors in each case.

In this case, I consider that the assessment of what is reasonable requires an evaluation of factors such as:

1) The overall noise levels and noise effects likely to be generated by the proposal;
2) The noise effects of the proposal in the context of the existing noise environment;
3) The noise effects of the proposal in the context of what could be reasonably expected to occur in the RPZ;
4) The overall positive effects of the proposal.

Some of these factors are not able to be evaluated by a noise expert, so a full assessment of what is reasonable in this case cannot be reached in this review.

E25.3. Policies

(2) Minimise, where practicable, noise and vibration at its source or on the site from which it is generated to mitigate adverse effects on adjacent sites.

The noise emissions from the proposal are contained within the subject site in most cases. There are some locations where noise levels above the maximum permitted noise levels for the RPZ extend beyond the site boundaries, as shown in the noise level contour maps appended to the MDA Report.

The MDA Report attempts to confirm the right to generate noise levels up to and over and above the noise levels shown in the MDA Report by imposing the 'date stamp' approach to the proposed noise limit condition. The applicant's approach would be contrary to this policy. For the reasons set out earlier in this review, I do not support the date stamp approach.

(3) Encourage activities to locate in zones where the noise generated is compatible with other activities and, where practicable, adjacent zones.

In terms of noise effects, I consider that the noise from the landfill will be compatible with other activities in the RPZ, (activities sensitive to noise in particular) provided that the maximum noise

levels permitted by the consent conditions are reduced to ensure that the effects are approximately commensurate with what could reasonably be expected by an activity sensitive to noise located in the RPZ.

> *(4) Use area or activity specific rules where the particular functional or operational needs of the area or activity make such rules appropriate.*

As set out above, I consider that my recommended noise limit condition will provide activity-specific noise controls to adequately manage the adverse noise effects associated with this particular proposal.

> *(9) Avoid, remedy or mitigate the adverse effects of noise in the rural environment, having regard to the working nature of this environment.*

As set out above, I consider that my recommended noise limit condition will ensure that the adverse effects are mitigated, having regard to the working nature of the environment, but also the fact that some activities sensitive to noise are permitted in the zone as well.

I generally agree with the description of effects contained in section 5.3.2 of the MDA Report. During the daytime, the noise from the landfill is likely to be audible at many of the properties but generally at a low level. In many cases, the noise from the landfill will be consistent with or below the ambient L_{Aeq} noise levels from other sources of noise.

In calm meteorological conditions, the noise from landfill activities may be clearly audible and potentially the dominant source in the environment for some receivers. Although the overall level of noise will be relatively low.

Importantly, the noise limit conditions proposed in the MDA Report allow noise levels up to the limits prescribed for activities permitted in the RPZ, (55dB L_{Aeq} and 45dB L_{Aeq} during the day and night respectively). The effects of this possibility have not been assessed by the applicant. If the noise levels from the landfill activity were to reach the maximum noise levels for permitted activities in the RPZ the noise from the landfill would be significantly louder than it is predicted to be, and would likely dominate the sound environment at most receivers at a level that would be intrusive and annoying to a considerable proportion of the population.

5.2 Noise effects extending beyond the Site boundaries

As demonstrated in the noise level contour plans attached to the MDA Report at its Appendix G, the noise level contours corresponding to the relevant noise limits fall mostly within the boundaries of the Site. However, there are some areas where the noise contours corresponding to the maximum permitted noise levels in E25 extend beyond the Site's own boundaries and onto neighbouring land. A clear example is around the Bin Exchange area. Using Scenario 6 in Appendix G of the MDA Report as an example, the noise level contours near the Bin Exchange area extend westwards across SH1 and onto neighbouring land. This includes the orange 45dB L_{Aeq} contour that extends several hundred metres into the properties to the west.

The MDA Report notes that there are no activities sensitive to noise in the area encompassed by the 45dB L_{Aeq} noise level contour, so there is no infringement of the permitted standards in E25. We agree that this is currently the case.

Ordinarily, an activity that has effects extending beyond its own boundaries could be vulnerable to encroachment, where an activity sensitive to noise is established after consent is granted and in an area exposed to noise levels above those permitted by the resource consent or AUP rule. The MDA Report proposes to limit this vulnerability by including a 'date stamp' approach in the noise limit conditions. Proposed condition 131 states (emphasis added):

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

This date stamp qualifier means that the proposal will not have to comply with any noise limit at any activity sensitive to noise that is established in the future, including any activity sensitive to noise which may locate on land that is exposed to noise levels above the maximum permitted noise levels in E25.

This approach allows the applicant to extend its noise effects beyond its own boundaries, using neighbouring land as a buffer and potentially limiting the ability to develop the neighbouring land in a way that is provided for by the RPZ provisions.

I consider that the suggestion of fixing the compliance point to be the dwellings at the date the consent is granted would be inappropriate and a very poor substitute for best practice. There are many problems with this approach in principle, as follows:

1. Between now and when consent is granted, some dwellings may come and some may go. The compliance positions are therefore quite arbitrary;
2. The approach allows the landfill to externalise its effects and use the neighbouring land as a buffer zone. The noise emissions over the neighbouring land could be relatively high, and the noise effects on the intervening land are not known or described, resulting in potential significant limitations on the ability to develop that land in the way that the RPZ provisions intend.
3. The proposed conditions simply require compliance with a night time noise limit of 45dB L_{Aeq}. The compliance point nearest to the Bin Exchange Area is some distance away (House 29) and the 'worst-case' night time noise level prediction at this property is 42dB L_{Aeq}. According to the proposed conditions, noise levels could be up to 3dB higher than that predicted and still comply with the proposed conditions. If this was to eventuate, the 45dB L_{Aeq} noise level contour could easily extend over even more of the neighbouring land, further limiting its development potential.
4. The ways in which the neighbouring land might be developed in a way that would have regard to the higher noise levels is uncontrolled by the applicant's approach or the AUP. The applicant's approach relies on the owners / occupiers of the neighbouring land to know about the qualifier in the consent condition that fixes the compliance point in location and time. In my experience, it is quite common for development to occur in such circumstances without the owner / developer or the Council being aware of the potential noise issues on the land. The issue does not often become apparent until sometime after a new dwelling is occupied and there is a noise complaint. Whilst the noise maker might be protected from any action by its

> fixed compliance point (beyond the new dwelling) the owner of the new dwelling will in my experience be aggrieved. Whilst I accept that proper due diligence may avoid this issue, the fact is that the issue still arises, and more often than it should. I consider that it results in a very inefficient and unclear planning framework that does not properly manage development on the intervening land.

In my view, there are other far more effective and efficient methods of providing the protection that the date stamp approach seeks. One of the most common and robust methods of protecting noise makers from encroachment is to provide a noise control boundary. This is essentially a line on the planning maps that surrounds the landfill site, within which a set of planning controls apply to manage the compatibility issues. The land within the noise control boundary can be developed appropriately if the effects are known, and land use planning controls can be drafted to support this.

This approach is very widely used in modern district plans for a large variety of land uses, including ports, airports, road and rail infrastructure, quarries, industrial areas and motorsports activities. There are many examples of noise control boundaries around industrial areas in New Zealand District Plans. They have been developed to provide methods for managing different land uses in a controlled and efficient manner using the noise control boundary concept, recognising that the noise making activities they deal with would often be classified as regionally or nationally significant.

However, such an approach is not sought in this proposal and it has not been sought in Proposed Plan Change 42 either.

Based on my analysis above, I do not support the date stamp qualifier proposed by the applicant in this case. I consider that it is inconsistent with several objectives and policies of the RPZ and E25, including:

> *H19.2.1.(2) Rural production activities are provided for throughout the rural area while containing adverse environmental effects on site.*
>
> *H19.2.2.(2) Require rural production activities to contain and manage their adverse environmental effects on-site to the fullest extent practicable.*
>
> *H19.2.6.(2) Manage rural industries, rural commercial services and other non-residential activities to:*
>
> > *(a) avoid creating reverse sensitivity effects;*
> >
> > *(b) contain and manage adverse effects on-site; and*
>
> *E25.3.(2) Minimise, where practicable, noise and vibration at its source or on the site from which it is generated to mitigate adverse effects on adjacent sites.*

I consider that the date stamp qualifier should be removed from the proposed conditions in order to achieve consistency with these objectives and policies.

This approach encourages the applicant to internalise its effects and does not allow the applicant to rely on the use of neighbouring land (that may as of right contain an activity sensitive to noise in the future) as a buffer, potentially limiting the development of that land in an unknown and unquantifiable way. The noise effects do not need to be internalised now, but may need to be in

the future if the land affected is developed with new activities sensitive to noise. The arrangement I suggest would be the same as for any other resource consent where noise effects extend beyond the site's own boundaries.

5.3 Character, duration and timing of noise levels

As per H19.3.1 *Zone Description*, the purpose of the RPZ is to provide for the use and development of land for rural production activities and rural industries and services, while maintaining rural character and amenity values. To this end, Policy H19.2.4(2) recognises the typical features of the RPZ include noise associated with the use of land for farming, horticulture, forestry, mineral extraction and clean / managed fills.

While the typical noise levels of farming activities are often temporary, seasonal and intermittent, the noise levels associated with rural industries and services can involve more constant noise levels throughout the day time period. The AUP recognises the potential adverse effects of large scale rural industries by requiring activities that are not always able to wholly internalise their effects to obtain a resource consent (as per the RPZ activity table). For example, clean fills and managed fills are afforded a discretionary activity status in the RPZ, while landfills are non-complying. The resource consent process enables the potential adverse effects of these activities to be considered on a case by case basis, taking into account the objectives and policies of H19.2.5 and H19.2.6 relating to "*rural industries, rural commercial services and non- residential activities".* These objectives and policies (as they relate to noise effects) seek to ensure:

- The character, intensity and scale or rural industries and services are in keeping with the character of the relevant rural zone (H19.2.5(2))
- Rural industries are managed to contain adverse effects on-site (H19.2.6(2))

While there are no specific policies relating to landfills, the policies relating to cleanfills are considered relevant. H19.2.6(4)(a) seeks to ensure that cleanfills should not adversely affect or inhibit the use of surrounding land for productive purpose, or for carrying out any permitted, restricted discretionary or discretionary activity in the relevant Rural Zone. This includes the extent to which activities sensitive to noise (including residential amenity) might be affected by noise (recognising that rural areas provide an environment for people to live and recreate (H19.2.1)).

While the application proposes to comply with the maximum permitted noise levels for the RPZ; the timing, character and duration of the noise levels must also be taken into account. The proposal seeks to authorise the following operations:

- Operation of the working face 7 days per week between the hours of 5:00am – 10:00pm.
- Operation of the bin exchange area 24 hours a day, 7 days per week.
- Works within the stockpiles and borrow areas (outside the landfill valley) between 7:00am – 8:00pm. Between September and December, work within Stockpile 1 and the clay borrow area will occur from one hour after sunrise to one hour before sunset (Monday to Saturday)
- Seasonal construction works will occur between 06:00am to 8:00pm Monday to Sunday, and up until 10pm during summer.

- Maintenance of plant and machinery 24 hours a day, 7 days per week.

The intensive operation of the landfill and the associated character and duration of the noise levels throughout the day and night time period are greater than what could reasonably be expected by activities anticipated in the RPZ. It is my view that the maximum permitted noise levels for the RPZ were not prescribed to anticipate and provide for the noise levels of a landfill that may generate noise close to or at the limits on a constant basis, throughout the day and night, on a 24/7 basis. The noise effects of such an arrangement would be considerably greater than that likely to be generated the current proposal.

A key consideration in this case is that the noise level predictions for the landfill show that in most cases, the predicted noise levels are well below the maximum permitted noise levels of the RPZ. This contrasts significantly with the level of noise effects that the proposed conditions allow for, which is for noise levels right up to the maximums permitted by the RPZ provisions and authorised for the life of the consent. The applicant has not provided an assessment of noise effects that assumes that the noise levels could be as high as the limits proposed in their conditions. In many cases, the margin between the predicted noise levels and those permitted by the proposed conditions is significant.

I consider that the conditions of consent should be tailored to reduce the maximum permitted noise levels to permit noise effects that represents a balance of the effects that have been predicted and assessed by the applicant (mostly significantly below the RPZ maximum permitted noise levels) and to be approximately commensurate with the effects that could reasonably be expected in the RPZ, (particularly at night) including allowance for the effects of noise from SH1.

In my view, the noise limits for the RPZ are acceptable during the day time periods, but for receivers located remote from SH1 (where ambient noise levels are inherently lower) the night time noise limit for landfill activities should be lower than that applying to activities permitted in the RPZ.

5.4 Construction noise

The MDA Report sets out that only the Crowther Road upgrade and the roundabout construction have the potential to generate noise levels that may approach or exceed the maximum permitted noise levels without careful mitigation. I agree that this is the case, and that the construction works undertaken further inside the subject Site will be able to comply with the permitted controls, and in most cases by a significant margin.

The MDA Report recommends a set of conditions to manage the potential construction noise effects. I generally agree with those conditions, but note that there are opportunities to improve the clarity and certainty of the conditions, and to provide a clear understanding of the purpose of each condition. My suggestions are set out in section 9.

5.5 Blasting

Section 7 of the MDA Report sets out the possible locations of blasting at its' figure 4. The MDA Report states that based on an MIC of 3kg, compliance with the maximum permitted noise levels for blasting would be achieved. In my experience, an MIC of 3kg would be very light for a situation such as this, and an MIC of up to 10kg or possibly greater might be possible. Notwithstanding, I

consider that the blasting can be designed to ensure that compliance with the noise and vibration standards in E25.6.27 can be achieved.

I have recommended an amendment to the CNVMP condition to ensure that any blasting is designed, conducted and monitored to ensure and demonstrate compliance with the permitted standards in E25.

6.0 Proposed conditions

We have reviewed the draft condition set dated 25 August 2020. The table in section 9 of this advice sets out our comments on the proposed conditions relating to the management of construction and operational noise along with our suggested set of conditions.

7.0 Submissions

I have reviewed the submissions on the resource consent application relating to noise and vibration effects. The issues raised in the submissions broadly relate to:

- Construction and operational noise effects on the amenity of adjacent sites;
- Noise and vibration effects of traffic movements, particularly through Dome Valley
- Noise effects associated with the bin exchange, and consideration of alternative locations.
- Noise effects on 147 Waiwhiu Conical Peak Road.

Point 9 of the S92 response (March 2020) provides discussion on the location of the bin exchange area and consideration of alternatives, and states:

> *"the selected area near the site entrance was the only suitable area available that met all of these criteria. All other parts of the site between the entrance and the landfill are on relatively steep terrain and all other locations on the landholdings considered for the bin exchange purpose would disproportionately increase effects in relation to other environmental aspects such as noise, visibility, vegetation clearance, fuel efficiency, traffic flow and neighbourhood disruption".*

In my view, the MDA Report, the applicant's responses and this review address the issues raised in submissions.

8.0 Conclusion

I have reviewed the MDA Report and associated responses, plans and the relevant sections of the AEE. The following key points summarise my findings:

1. The MDA Report appears to accurately record the locations of all physically existing dwellings at the current time. The MDA Report does not record the presence of any other activities sensitive to noise in the area, other than dwellings. Importantly, the MDA Report only assesses the effects at receivers physically existing at the current time, and does not provide any assessment for future development that is anticipated by the AUP.
2. The MDA Report correctly sets out the noise limits that apply to activities permitted in the RPZ. However, I consider that the MDA Report takes a relatively simplistic view of the application of the standards in E25, and applies them to the proposal as if were permitted. Given that the proposal is for a non-complying activity overall, I consider that a more holistic assessment of the noise effects is required including against the relevant objectives and policies and having regard to the noise effects that may arise from activities anticipated in the RPZ.
3. I have reviewed the sections of the MDA Report that describe the noise sources associated with the proposal, along with the sound power level data it's in Appendix D. I consider that the range of noise sources and sound power level data appear to be reasonable and I agree in general terms with those sections of the report. I have reviewed the noise modelling methodology, inputs, assumptions and outputs as set out in the MDA Report. I consider that the noise modelling methodology is robust and has been undertaken in accordance with the correct standards and assumptions in terms of calculations, meteorological effects and timeframes. I consider that the MDA Report is sufficiently robust in terms of noise modelling and predicted noise levels.
4. I generally agree with the description of effects contained in section 5.3.2 of the MDA Report. During the daytime, the noise from the landfill is likely to be audible at many of the properties but generally at a low level. In many cases, the noise from the landfill will be consistent with or below the ambient L_{Aeq} noise levels from other sources of noise.
5. Importantly, the noise limit conditions proposed in the MDA Report allow noise levels up to the limits prescribed for activities permitted in the RPZ, (55dB L_{Aeq} and 45dB L_{Aeq} during the day and night respectively). The effects of this possibility have not been assessed by the applicant. If the noise levels from the landfill activity were to reach the maximum noise levels for permitted activities in the RPZ the noise from the landfill would be significantly louder than it is predicted to be, and would likely dominate the sound environment at most receivers at a level that would be intrusive and annoying to a considerable proportion of the population.
6. The noise level contours corresponding to the relevant noise limits fall mostly within the boundaries of the Site. However, there are some areas where the noise contours corresponding to the maximum permitted noise levels in E25 extend

beyond the Site's own boundaries and onto neighbouring land. Ordinarily, an activity that has effects extending beyond its own boundaries could be vulnerable to encroachment, where an activity sensitive to noise is established after consent is granted and in an area exposed to noise levels above those permitted by the resource consent or AUP rule. The MDA Report proposes to limit this vulnerability by including a 'date stamp' approach in the noise limit conditions. This approach allows the applicant to extend its noise effects beyond its own boundaries, using neighbouring land as a buffer and potentially limiting the ability to develop the neighbouring land in a way that is provided for by the RPZ provisions. I consider that the suggestion of fixing the compliance point to be the dwellings at the date the consent is granted would be inappropriate and a poor substitute for best practice. I recommend that all references to the date stamp be removed from the conditions of consent. This will ensure consistency with the relevant objectives and policies.

7. In most cases, the predicted noise levels are well below the maximum permitted noise levels of the RPZ. This contrasts significantly with the level of noise effects that the proposed conditions allow for, which is for noise levels right up to the maximums permitted by the RPZ provisions and authorised for the life of the consent. The applicant has not provided an assessment of noise effects that assumes that the noise levels could be as high as the limits proposed in their conditions. I consider that the conditions of consent should be tailored to reduce the maximum permitted noise levels to permit noise effects that represents a balance of the effects that have been predicted and assessed by the applicant (mostly significantly below the RPZ maximum permitted noise levels) and to be approximately commensurate with the effects that could reasonably be expected in the RPZ, (particularly at night) including allowance for the effects of noise from SH1.

8. The MDA Report sets out that only the Crowther Road upgrade and the roundabout construction have the potential to generate noise levels that may approach or exceed the maximum permitted noise levels without careful mitigation. I agree that this is the case, and that the construction works undertaken further inside the subject Site will be able to comply with the permitted controls, and in most cases by a significant margin.

9. Section 7 of the MDA Report sets out the possible locations of blasting at its' figure 4. I consider that the blasting can be designed to ensure that compliance with the noise and vibration standards in E25.6.27 can be achieved.

10. I have reviewed the submissions on the resource consent application relating to noise and vibration effects. In my view, the MDA Report, the applicant's responses and this review address the issues raised in submissions.

Overall, it is my view that if the conditions I have recommended are imposed and complied with, the noise effects (including level, character and timing) of the proposal will be:

- compliant with the noise limits applying to activities permitted in the RPZ; and
- consistent with the level of effect that is anticipated and provided for by the relevant objectives and policies of the AUP, insofar as an acoustics assessment can determine.

Please contact me if you require any further information.

Yours sincerely,

Jon Styles, MASNZ
Director and Principal

9.0 Appendix 1 – Suggested conditions of consent

Condition number	Proposed condition	Styles Group comment/ recommended update
Construction noise		
72	Construction noise shall be measured and assessed in accordance with NZS 6803: 1999 “Acoustics - Construction Noise”.	Recommend delete. This condition is not necessary as it is covered by the requirement to comply with the AUP generally as well as condition 73 below.
73	Construction noise shall comply with the noise limits in Standard E25.6.27 of the Auckland Unitary Plan.	Whilst a repeat of the AUP provisions and therefore probably not necessary, I support this condition for the clarity it provides. If it is to be retained, I suggest the following wording that incorporates the definition of Construction Work as defined in the AUP as well. I suggest the following wording: *Noise from construction work undertaken on the site shall comply with the requirements of standard E25.6.7. Construction noise shall be assessed in accordance with E25.6.1.*

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Condition number	Proposed condition	Styles Group comment/ recommended update
74	A Construction Noise and Vibration Management Plan (CNVMP) shall be prepared by a suitably qualified person and submitted to Auckland Council for certification at least three months prior to the construction commencement date. The CNVMP must be implemented throughout the initial construction works and expanded and updated as appropriate. The CNVMP shall include as a minimum the relevant measures from Appendix E of NZS 6803:1999 "Acoustics – Construction Noise". The CNVMP shall also include the following controls: a No heavy vehicles associated with the landfill construction shall access the site via the Crowther Road access prior to 0730 hrs b No construction materials or earthmoving plant delivered to the site via the Crowther Road access prior to 0730hrs; and c No construction or maintenance works on Crowther Road prior to 0730 hrs within 150 m of a residential dwelling.	A condition requiring a CNVMP is supported, but I consider that this condition requires some amendment to improve its clarity and relevance, and to provide it with a clear objective. I suggest the following wording: *A Construction Noise and Vibration Management Plan (CNVMP) shall be prepared by a suitably qualified person and submitted to Auckland Council for certification at least three months prior to the construction commencement date. The objective of the CNVMP is to identify and clearly set out the Best Practicable Option for minimising the noise effects arising from the work and to ensure that the noise limits set by condition 73 are complied with at all times.* *The CNVMP shall address all aspects of the construction of the landfill and all associated infrastructure, roading, drainage, buildings, earthworks and structures necessary to complete the substantive construction phase prior to any refuse being accepted.* *The CNVMP must be implemented throughout the initial construction works and updated as necessary, when there are changes to the work methodology or any other aspect that requires noise management but has not been addressed adequately. The CNVMP shall include as a minimum the measures set out in Appendix E of NZS 6803:1999 "Acoustics – Construction Noise". The CNVMP shall also include provisions that mandate the following controls:* *a) No heavy vehicles associated with the landfill construction shall access the site via the Crowther Road access prior to 0730 hrs* *b) No construction materials or earthmoving plant may be delivered to the site via the Crowther Road access prior to 0730 hrs; and* *c) No construction or maintenance works may be undertaken on Crowther Road within 150 m of a residential dwelling, prior to 0730 hrs.* *The CNVMP must set out the methods and procedures for monitoring and reporting on the noise emissions generated by the construction of the roundabout and upgrade of Crowther Road. The CNVMP shall record that the objective of this monitoring is to clearly demonstrate to the Council that the noise generated by those works will be managed and monitored to ensure that it is consistently compliant with the noise limits set out in Condition 73, to a high degree of certainty.* *The CNVMP must set out the methods and procedures for the design, firing and monitoring of any blasting undertaken on the site. The CNVMP shall record that the objective of this section shall be to ensure that the air overpressure and vibration arising from any blasting is carefully designed to ensure compliance with the relevant standards in E25, and that monitoring of the noise and vibration of all blasts is conducted to demonstrate to the Council that compliance was achieved.*

Condition number	Proposed condition	Styles Group comment/ recommended update
75	Noise measurements shall be carried out by a suitably qualified acoustic engineer within one week of construction works commencing on each of the roundabout and the upgrade of Crowther Road to determine whether compliance with Standard E25.6.27 of the Auckland Unitary Plan is being achieved. If non-compliance with the Standard is identified, noise mitigation measures are to be implemented. Once compliant noise emissions are confirmed the process shall be documented and submitted to the satisfaction of Auckland Council.	This condition is no longer required as it has been incorporated into the CNVMP requirements.
130	If trucks accessing the bin exchange area between 7pm-7am are fitted with reversing alarms, then the alarms shall be fitted with broadband reverse alarms.	The purpose and intent of this condition is to preclude the use of tonal reverse alarms as set out in section 5.3.2 of the MDA Report. However, the condition is not as clear as could be. To ensure tonal reverse alarms are not permitted on the site, the condition should be amended to state that the use of tonal reverse alarms are prohibited on the site. I suggest the following wording: *Tonal reverse alarms are prohibited on all vehicles on the site. Broadband reverse alarms are permitted.*

<table>
<tr><th>Condition number</th><th>Proposed condition</th><th>Styles Group comment/ recommended update</th></tr>
<tr><td>131</td><td>Any noise emitted from activities authorised by this consent shall comply with the following noise limits at the notional boundary of any dwelling existing as at the date of granting consent (excluding any houses on land owned by the consent holder):
<table>
<tr><th>Time period</th><th>Noise limit</th></tr>
<tr><td>0700 – 2200 hours Monday to Saturday</td><td rowspan="2">55dB L_{Aeq}</td></tr>
<tr><td>0900 – 1800 hours Sunday</td></tr>
<tr><td>At all other times</td><td>45dB L_{Aeq}
75dB L_{AFmax}</td></tr>
</table></td><td>This condition adopts the maximum permitted noise levels prescribed under Table E25.6.3.1, and adds the “date stamp” restricting compliance with the noise levels to notional dwellings existing at the time of consent.
This condition means that no noise limit will apply on any notional boundaries that may be established in the future. I do not support this approach. Further discussion on the proposed date stamp approach is set out in Section 5 of this advice.
This condition also permits a significantly greater level of noise effects a considerable number of the receivers than has been assessed in the MDA Report and application generally. I consider that the noise limits be reduced for receivers further from SH1 to preserve the level of amenity that could reasonably be anticipated in the RPZ for an activity operating on an almost constant basis.
I suggest the following wording:

The cumulative noise from all operational activities operating on the site shall comply with the following Noise Rating Levels:
<table>
<tr><th>Time period</th><th>Noise limit for notional boundaries within 300m of SH1</th><th>Noise limit for notional boundaries beyond 300m of SH1</th></tr>
<tr><td>0700 – 2200 hours Monday to Saturday</td><td rowspan="2">55dB L_{Aeq}</td><td rowspan="2">55dB L_{Aeq}</td></tr>
<tr><td>0900 – 1800 hours Sunday</td></tr>
<tr><td>At all other times</td><td>45dB L_{Aeq}
75dB L_{AFmax}</td><td>35dB L_{Aeq}
65dB L_{AFmax}</td></tr>
</table></td></tr>
<tr><td>132</td><td>Noise levels shall be measured and assessed in accordance with New Zealand Standards NZS 6801:2008 “Acoustics - Measurement of Environmental Sound” and NZS 6802:2008 “Acoustics - Environmental Noise</td><td>These standards are the appropriate acoustical standards for the measurement and assessment of operational noise. Although a repetition of the AUP requirements, it may be retained for clarity if desired.</td></tr>
</table>

Condition number	Proposed condition	Styles Group comment/ recommended update
133	Noise measurements shall be carried out: a. Within one month after the commencement of initial operation of: • The Working Face • The Clay Pit • Stockpile 1 • Stockpile 2 • Bin Exchange area b. Within three months after of commencing operations of any item of permanent fixed plant, including any landfill gas utilisation plant, landfill gas powered electricity generator, leachate treatment plant, leachate evaporator or flare, that brings the total power (adding power consumption or power output whichever is the greater for each item), ignoring silent heat loss, to 3 MW more that at the time of any previous noise monitoring.	This condition sets out noise monitoring requirements, but it does not clearly state the purpose of the measurements or locations or times for the monitoring. I recommend that the following wording should be used: *The consent holder shall undertake a series of noise level measurements as set out below. The purpose of the measurements is to demonstrate whether the noise levels arising from activities authorised by this consent are compliant with the maximum permitted noise levels set out in those conditions. The noise measurements shall be carried out:* *a. Within one month after the commencement of initial operation of:* • *The Working Face* • *The Clay Pit* • *Stockpile 1* • *Stockpile 2* • *Bin Exchange area* *b. Within three months after of commencing operations of any item of permanent fixed plant, including any landfill gas utilisation plant, landfill gas powered electricity generator, leachate treatment plant, leachate evaporator or flare, that brings the total power (adding power consumption or power output whichever is the greater for each item), ignoring silent heat loss, to 3 MW more than at the time of any previous noise monitoring.*
134	The Consent Holder must submit to Council a report by a suitably qualified acoustic engineer outlining the measured noise levels at the notional boundaries of the nearest residential dwellings existing as at the date of granting consent with all the plant operating that can reasonably be operated together at the instances described in Condition XX.	I have suggested a comprehensive rewording of this condition to improve clarity and certainty, and to remove the date stamp qualifier. *Within one month of the noise level measurements required in condition 133(a) being completed, and again within one month of any further noise measurements required by condition 133(b) being completed, the Consent holder must submit a report prepared by a suitably experienced and qualified acoustics expert to the Council for certification. The report must demonstrate the results of the noise level measurements required by condition 133, including the details of any adjustments that have been applied to the measurements. The report shall also set out a detailed analysis of the cumulative noise rating level beyond the site boundaries at any notional boundary (as defined in the AUP) arising from the concurrent operation of all activities that are permitted to operate concurrently on the site.*

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Condition number	Proposed condition	Styles Group comment/ recommended update
135	Prior to the installation of any new plant on site (e.g. generators, leachate evaporators, blowers and flares) within 1 km of a dwelling existing at the time of granting of this consent (excluding dwellings within the Precinct WMNZ landholdings), the potential noise levels at the notional boundary of those dwellings shall be calculated, including the simultaneous operation of the new and existing plant that would reasonably be expected to operate together. Once the new plant is operational, the noise emissions shall be measured to confirm compliance with noise limits in Condition XX. If non-compliance with the noise limits of Condition XX is identified, noise mitigation measures are to be implemented as soon as practical to achieve compliance. Once compliant noise emissions are confirmed, the results and any mitigations process shall be documented in a report and that report shall be submitted to Auckland Council.	This condition expands on condition 133 by requiring the design and commissioning of fixed plant to be compliant with the noise limits in these conditions. I generally agree with the condition, but have recommended it be worded as set out below, including the removal of the date stamp qualifier: *Prior to the installation of any new noise generating plant on site (e.g. generators, leachate evaporators, blowers or flares) within 1 km of any notional boundary (as defined in the AUP), the consent holder must submit a report from a suitably qualified and experienced acoustics expert to the Council for certification that sets out the following:* *a) The predicted noise rating level arising from the operation of the new plant at all notional boundaries within 1km of the plant;* *b) The predicted cumulative noise rating level arising from the operation of the new plant and all other noise sources on the site that may operate concurrently and that are subject to the noise limits in condition 133.* *The new plant may not be commissioned if the noise rating level predictions show non-compliance with the noise limits in condition 133.* *Once the new plant is operational, the noise emissions shall be measured to confirm compliance with noise limits in Condition 133, either by direct measurement at the most exposed notional boundary, or if that is not practicable, by a measurement near the source to verify the predictions undertaken in accordance with the requirements above.* *If non-compliance with the noise limits of Condition 133 is identified, noise mitigation measures are to be implemented as soon as practical to achieve compliance. Once compliant noise emissions are confirmed, the results and any mitigation process shall be documented in a report prepared by a suitably qualified and experienced acoustics expert and that report shall be submitted to Auckland Council for its certification within one month of the mitigation measures being implemented.*

Technical memo for a resource consent application relating to air discharges

To:	Mark Ross, Consultant Planner – Premium Consenting
From:	Paul Crimmins, Senior Specialist – Contamination, Air & Noise
Date:	9 September 2020

1 Application details

Applicant's name:	Waste Management NZ Ltd
Application number:	BUN60339589 (Air discharge: DIS60343780)
Activity considered:	Discharge of contaminants into air
Site address:	Proposed Auckland Regional Landfill: 1232 State Highway 1, Wayby Valley

2 Executive summary

Waste Management NZ Ltd is seeking consent to discharge contaminants into air from the construction and operation of a landfill for municipal waste in Dome Valley, Rodney. This review assesses the air quality effects relating to discharges of hazardous air pollutants, odour and dust from the landfill.

Air discharges from the landfill are assessed in detail by Tonkin & Taylor on behalf of the applicant. The assessment's methodologies are in general accordance with good practice expert guidance.

Discharges of hazardous air pollutants, odour and dust from the proposed Landfill can be adequately controlled by conditions of consent and management measures so that they are not likely to cause significant adverse effects beyond the boundary of the site. The most significant identified air quality risk is potential human health effects arising from discharges of hazardous air pollutants, particularly from unplanned fires.

To minimise air quality effects from the landfill and ensure the discharges are not contrary to the objectives and policies of the Auckland Unitary Plan (Operative in Part) and National Environmental Standards for Air Quality a comprehensive set of conditions of consent are recommended.

3 Introduction

3.1 Scope of air quality assessment

As requested, I have reviewed the above resource consent application, relevant supporting information, and submissions received with reference to the requirements of the *Auckland Unitary Plan (Operative in Part)* (AUP(OP)), Chapter E14: Air Quality, and the *Resource Management (National Environmental Standards for Air Quality) Regulations 2004* (NES:AQ).

This review relates to the actual and potential air quality effects arising from the proposed construction and operation of a Landfill at 1232 State Highway 1, Wayby Valley. The air discharges and resulting air quality effects considered within this review are outlined in Table 1.

Table 1: Scope of air discharges and effects considered

On-site air discharge sources	Off-site air quality effects
Dust from bulk earthworks for construction	Amenity (deposition, visual); human health
Dust from landfill operation	Amenity (deposition, visual); human health
Odour from landfill operation (including landfill tipping and receipt areas)	Amenity
Hazardous air pollutants from landfill operation (including fugitive and point-source discharges of landfill gas, energy generation, leachate evaporation, and particle-bound contaminants)	Human health (where the hazardous air pollutant exposure arises from an airborne receptor pathway); ecosystem impacts (where gas-phase hazardous air pollutants interact with living organisms)
Potential abnormal events (including landfill fires)	Human health (where the hazardous air pollutant exposure arises from an airborne receptor pathway)

With respect to emissions of hazardous air pollutants from vehicles travelling to and from the landfill, I also note these are Permitted Activities under Rule E14.4.1(A114) of the AUP(OP). I review these emissions briefly in section 6.3 below.

This review pertains to the resource consent application only; I assess the air quality effects of the associated Private Plan Change Request in a separate memo.

3.1.1 Climate change

With respect to concerns regarding climate change effects resulting from greenhouse gas emissions from the landfill and associated vehicle movements, section 104E of the *Resource Management Act 1991* (RMA) specifically prohibits an assessment of climate change effects arising from an application to discharge contaminants into air, except to the extent that the use and development of renewable energy enables a reduction in the discharge into air of greenhouse gases. Therefore, it is only within this narrow framework that I have reviewed climate change effects, noting that most concerns raised by submissions fall outside of this scope and should be addressed at the

national level as directed by the *Resource Management (Energy & Climate Change) Amendment Act 2004*. The scope for climate change considerations is further discussed in a memo dated 28 August 2020, included as Appendix A.

3.2 Material reviewed

I have reviewed the following documents received as part of the resource consent application and responses to requests for further information:

- *Auckland Regional Landfill: Assessment of Environmental Effects*, Tonkin & Taylor, 30/05/2019 ('the AEE');
- *Auckland Regional Landfill: Air Quality Assessment*, Tonkin & Taylor, 30/05/2019 ('the AQR');
- *Auckland Regional Landfill: Risk Management Assessment*, AECOM, 23/05/2019 ('the RMR');
- *Auckland Regional Landfill: Waste Acceptance Criteria*, Tonkin & Taylor, 30/05/2019 ('the WAC');
- *Auckland Regional Landfill: Human Health Risk Assessment*, Tonkin & Taylor, 20/08/2019 ('the HRA');
- *Auckland Regional Landfill: Draft Landfill Management Plan*, 30/01/2020 ('the LMP');
- *The s92 response (collectively, 'the s92 Response'):*
    - *Auckland Regional Landfill – s92 response ['Tranche 1']*, Tonkin & Taylor, 08/11/2019;
    - *Auckland Regional Landfill – s92 response ['Tranche 2']*, Tonkin & Taylor, 06/12/2019;
    - *Auckland Regional Landfill – s92 response ['Tranche 3']*, Tonkin & Taylor, 20/12/2019;
    - *Auckland Regional Landfill – s92 response ['Tranche 4']*, Tonkin & Taylor, 12/02/2020;
    - *Auckland Regional Landfill – s92 response ['Tranche 5']*, Tonkin & Taylor, 21/02/2020.

I have reviewed all submissions received that are relevant to air quality effects (including dust, odour, human health risk via airborne exposure to hazardous air pollutants, and climate change). Those particularly pertinent for my assessment and referred to in this memo are outlined in Table 2 below, although I note that there are other submissions that raise similar matters.

Table 2: Notable submissions relevant to air quality

Submission Number	Submitter	Abbrev.	Air Quality Concerns: General Air Quality	Fire Risks	Local Odour	Alternatives
9310	Robyn Lorraine Brown		General	Fire	Odour	Alternatives
9426	Craig Purvis		General	Fire	Odour	
9503	Jennifer Lynn Driskel		General			
9512	Mark Croft (Mahurangi East Residents and Ratepayers Association)	MERRA	General			Alternatives
9544	Love Kaipara Ltd	LKL		Fire		Alternatives
9569	Rupert Mather				Odour	
9575	Fire and Emergency New Zealand	FENZ		Fire		
9582	Zero Waste Network	ZWN	General			Alternatives
9602	Matt Lomas		General	Fire	Odour	Alternatives
9684	Fight the Tip Tiaki Te Whenua Incorporated	Fight the Tip	General	Fire	Odour	Alternatives
9711	Meryl Elizabeth Bacon			Fire	Odour	
9772	Karen Pegrume			Fire		
9794	Te Uri o Ngāti Rango Kaitiaki	Ngāti Rango	General			Alternatives
9826	Sustainable Energy Forum	SEFI				Alternatives
9914	Tinopai RMU Limited	Tinopai	General			
9926	Forest and Bird Warkworth Area	Forest & Bird		Fire		Alternatives
9956	Ngāti Whātua Ōrākei	Ngāti Whātua	General			
9989	Bonnie Ellen Cohen		General			Alternatives
9998	Waterfall farm (Waiwhiu) Limited	Waiwhiu			Odour	

Further, I have reviewed various technical guidance documents and relied on my experience (particularly with Redvale and Whitford Landfills) as referenced in the below assessment.

3.3 Reviewer information: Qualifications and experience

My full name is Paul Edward Crimmins and I am employed as a Senior Specialist within the Contamination, Air & Noise Team of Auckland Council's Specialist Unit at Graham Street, Auckland Central.

I have been employed in this role since a restructure in October 2017 and in a similar Senior Specialist role since February 2013. Prior to this I was employed as a Consents and Compliance Advisor (Air Quality) by Auckland Council and as an Environmental Scientist with Beca Limited. I have over ten years' experience in air quality assessments (human health and amenity effects).

I hold a Master of Science (First Class Honours) in Environmental Science from the University of Auckland (2018), and a BSc (Environmental Science) and BA (Politics) from the University of Auckland (2009). I am a member of the Clean Air Society of Auckland and New Zealand (CASANZ).

I have been involved with consenting and compliance for numerous air discharge permits throughout the Auckland Region over the past decade. Some examples include:

a. Industrial air discharges (including NZ Steel, Pacific Steel, O-I Glass, Winstone Wallboards, Tasman Insulation, Southdown Power Station, Industrial Processors, numerous asphalt plants);

b. Construction projects (including City Rail Link, America's Cup Wynyard Quarter works, Waterview Tunnel, Northern Expressway Extensions, East-West Link);

d. Waste facilities (including Whitford Landfill, Redvale Landfill; Mangere Wastewater Treatment Plant and biosolids fill; hazardous waste treatment facilities at Neales Rd, Miami Pde and Stonedon Dr; numerous refuse transfer stations).

As part of this assessment, I have visited the Site and surrounding area to observe the terrain and separation distances to nearby sensitive receptors.

Relevant to operational air discharge effects, I have also visited Redvale and Whitford Landfills dozens of times over the past ten years as part of assessing air discharge consent compliance for those landfills. These visits generally included inspections of the tip-faces (from vantage points within 100 m) and the energy compounds of each of these comparable landfills. I have also conducted numerous field odour assessments in the surrounds of these existing landfills to pro-actively assess odour effects and in response to odour complaints received from nearby residents.

I had lead responsibility for assessing compliance of the air discharge consents held for Whitford Landfill from 2012 to late 2017 and for Redvale Landfill from 2015 to late 2017. Since October 2017, an internal restructure has changed my compliance role to a specialist advisory function, although I have maintained contact with landfill operators and compliance staff over this time, reviewing submitted reports and undertaking further site inspections alongside Compliance Monitoring staff as required.

4 Summary of proposal and location

4.1 Proposal as relevant to air quality

The applicant, Waste Management NZ Limited (WMNZ), is seeking consent to discharge contaminants into air from the construction and operation of a landfill and associated processes. A full description of the proposal is provided in the AEE. In brief:

- WMNZ has purchased 1020 ha of plantation forestry and farmland at the northern end of Dome Valley and propose to construct and operate a new landfill for municipal waste over a 60 ha area within a valley on the property.
- It is proposed to deposit 25.8 Mm³ of waste into lined cells within the valley over a period exceeding 35 years prior to final capping of the landfill with a clay liner.
- Each cell within the valley is proposed to be constructed in accordance with the *New Zealand Technical Guidelines for Disposal to Land* ('Landfill Guidelines', WasteMINZ, 2018) with a base liner and leachate collection system and the progressive filling of waste with application of daily cover material (minimum depth of 150 mm) so that waste is not exposed over an area larger than 80 m x 80 m (typically less than 60 m x 60 m) or overnight.
- A waste receipt ('bin exchange') area is proposed near the existing road at 1232 State Highway 1 to temporarily store waste trucked to the site within sealed standardised containers prior to on-site haulage vehicles transporting the containers to the tip face. Trucks carting waste in non-standardised containers shall bypass the bin exchange area and progress to a weighbridge and the landfill tipping pad.
- Tipping is proposed to occur between 05:00 and 22:00 Monday to Saturday and 07:00 to 17:00 Sundays. The bin exchange area is proposed to operate 24/7.
- Proposed Waste Acceptance Criteria is detailed in section 5.1 of the AEE, Appendix O and the s92 Response. Notably, the 'Class 1' landfill is proposed to accept (largely) non-hazardous solid wastes from residential, commercial and industrial sources. It is acknowledged that a portion of the waste may be contaminated with non-accepted hazardous substances at an estimated rate of <200 g/tonne. The Waste Acceptance Criteria notably excludes malodorous wastes, such as wool-scourings, unless pre-treatment occurs to reduce odour.
- A landfill gas extraction system is proposed to be progressively installed throughout the landfill using vacuum-extraction wells. Extracted landfill gas (LFG) is proposed to be combusted within flares and up to 12 operational generators in accordance with the requirements of Regulations 25 to 27 of the NES:AQ at a centralised Energy Facility. The generators shall be progressively installed over the life of the landfill as LFG generation increases with the volume and age of deposited waste, with each generator consuming approximately 600 m³/hour of LFG with a gross heat generating capacity of 1 MW (for a total capacity of 12 MW).

- Air discharges from the generators shall occur through stacks, each approximately 10 m high. Excess LFG that is flared shall be destroyed at a temperature in excess of 750°C with a 0.5 second retention time. The flares shall discharge to air from stacks approximately 9 m tall.

- Once sufficient LFG is available to provide heating, the leachate collected from the landfill shall be piped to a low-temperature (maximum operating temperature of 90°C) leachate evaporator unit (LEU) to evaporate water and any volatile contaminants. Air discharges from the LEU shall be fed to the flare so that volatile contaminants are oxidised. The condensed leachate (reduced by approximately 90% in volume) shall be sprayed onto the landfill surface. Prior to the installation of the LEU, leachate shall be stored in tanks and trucked for off-site treatment and disposal.

- The entranceway, main access road, and bin exchange area and proposed to be sealed. A wheel wash is proposed to minimise tracking of mud to the public road.

- Odour neutralising sprays are proposed to be utilised in the vicinity of the tipping area.

- Overall, the operation of the proposed landfill is likely to be similar to that undertaken by WMNZ at the current Redvale Landfill (Dairy Flat) and Kate Valley Landfill (Waipara, Canterbury).

- Filling is proposed to be undertaken over a period of at least 35 years.

4.2 Location as relevant to air quality

The proposed Landfill is to be constructed within a valley to the north of State Highway 1 at the northern end of Dome Valley. The Landfill and proximity of existing residential dwellings in the surrounding area is shown in Figure 7 of the Drawings set and reproduced as Figure 1 below.

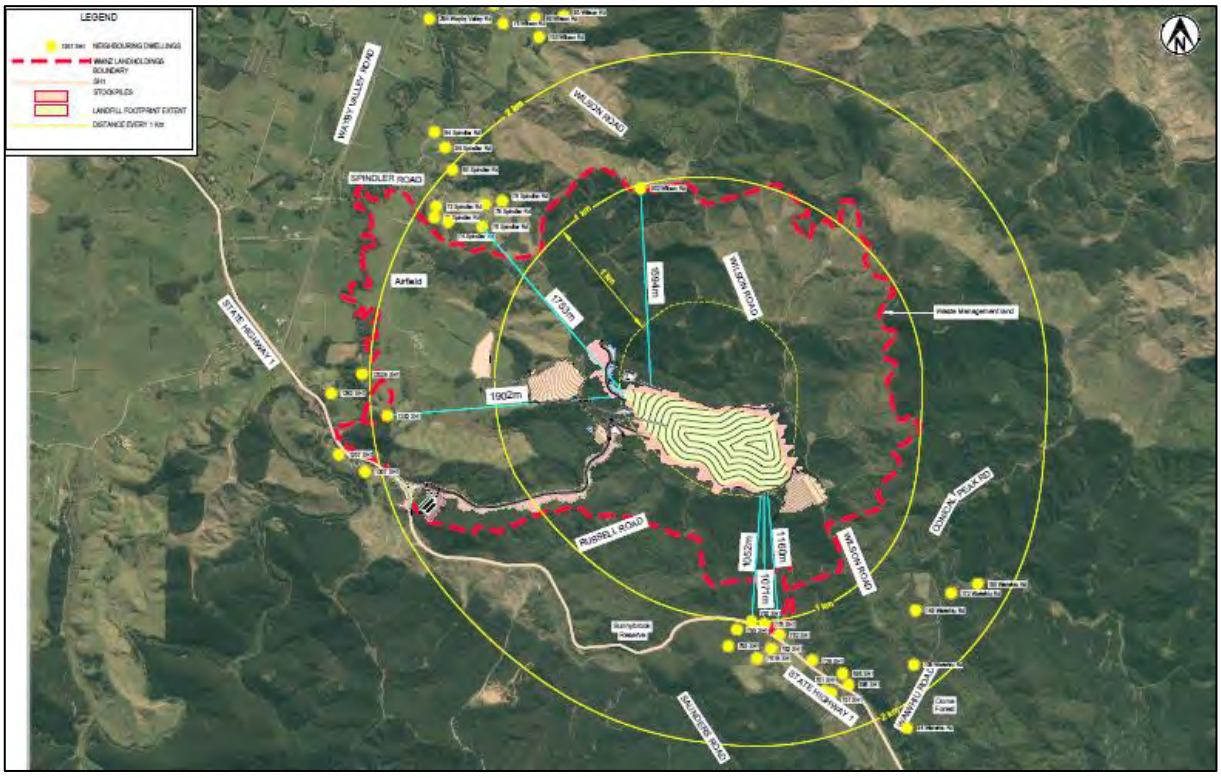

Figure 1: Location of Landfill, with site boundaries marked in red-dash and distances from the landfill footprint to nearby residential dwellings marked.

The applicant provides a description of the site and receiving environment in section 4 of the AEE and section 2 of the AQR. In brief:

- The AUP(OP) zones the site as Rural – Rural Production Zone. Chapter E14 of the AUP(OP) schedules this zone as a 'Medium air quality – dust and odour area (rural)' in recognition of its reduced air quality amenity expectations and range of rural air discharge activities provided for.

- No existing or permitted future dwellings or other activities defined by the AUP(OP) as 'activities sensitive to air discharges' are located within 1 km of the proposed Landfill footprint. The nearest dwellings are 795, 792 & 776 State Highway 1, located between 1050 – 1070 m south of the Landfill. The proposed Energy Centre, (where point source air discharges shall occur from the generators, flares and LEU) is approximately 1600 m south of the nearest dwelling.

- Section 2.4 of the AQR assesses the potential for further residential dwellings to be constructed nearer to the Landfill, concluding that no properties where subdivision is a Permitted Activity under the AUP(OP) exist in close proximity to the Site.

- The presence of walking tracks is noted by section 2.4 of the AQR. It is noted that people may be exposed for short durations to any air discharges from the Landfill while walking on these tracks. The AQR concludes these walking tracks (including those that may be formed within the Site) are not particularly sensitive to air quality effects given the low frequency and duration of people being present.

- The topography of the area is important to the movement of air discharges from the Landfill and is detailed in section 4.3.1 of the AEE and Appendix B of the AQR. The Landfill lies within a valley with steep ridges to the east, north and south falling to rolling hills to the west.

- Winds at the site are assessed within section 2.2 of the AQR. The nearest weather station, 3 km to the south of the Landfill, shows winds are predominantly from the south-west and north-east; which accords with the general wind pattern across the Auckland Region. A multi-layered meteorological model is presented in Appendix B of the AQR to estimate typical winds at the Landfill based on local topography and the results of regional weather monitoring stations. This model predicts a less defined predominant wind direction at the Landfill given the complex topography.

- Several submissions (notably 9602: M. Lomas) draw on local knowledge to note that the Site has high rainfall (in excess of 2000 mm/year), and frequent storm events. I consider these local viewpoints are important to consider as the volume of rainfall impacts how wet the waste within the landfill is, and the subsequent LFG generation rate. The Mahurangi Forest weather station (referred to in the AQR) is located at RL 270 m, on a peak immediately south of State Highway 1 from the Landfill, and therefore I consider it is representative of the rainfall likely to occur at the Landfill. I have reviewed rainfall data collected from this weather station between January 2014 and June 2020, noting that annual rain over this period varied between a high of 2110 mm (2018) and a low of 1265 mm (2015). All years except 2015 recorded at least one month with more than 200 mm of rain. This rainfall level is notably higher than that recorded at the Warkworth monitoring station (average monthly rainfall: 140 mm at Mahurangi, compared to 113 mm at Warkworth).

5 Reasons for application: Air discharges

5.1 Reason for application: Air discharges

Resource Consent is required for air discharges from the site under the provisions of the AUP(OP), Chapter E14 Air Quality:

Rule E14.4.1: Discharge of contaminants into air from activities not provided for in other rules in this table

(A2): Activities not meeting the permitted activity standards and not provided for by any other rule [Discretionary Activity in all zones].

The LEU discharges contaminants into air as part of the low-temperature evaporation of leachate. Although the AQR assesses that the relevant Permitted Activity Standards (E14.6.1.1) are likely met for this process given the predicted levels of hazardous air pollutant discharges and separation distance to the boundary of the site, the AEE takes a precautionary approach to include these air discharges as a reason for consent.

Rule E14.4.1: Discharge of contaminants into air from combustion activities

(A54): Combustion activities not meeting the permitted, controlled or restricted discretionary activity standards [Discretionary Activity in all zones].

As detailed in the AQR, the Landfill shall extract LFG and use this as a fuel for up to12 operational generators and the LEU, with excess LFG to be flared. The peak volume of LFG combustion is predicted to be in the order of 10,000 m³/hour, arising at the end of the 35-year filling duration sought. The combustion of LFG is not provided for by the Permitted, Controlled or Restricted Discretionary combustion rules and air discharges from the combustion of LFG is therefore a Discretionary Activity.

Rule E14.4.1: Discharge of contaminants into air from waste processes

(A154): Refuse transfer stations with more than 30 m³ of refuse or 500 m³ of green waste [Controlled Activity in Rural Zones];

(A160): Landfills that do not comply with restricted discretionary or discretionary activity standards [Non-Complying Activity in all zones].

The air discharges from the Landfill are a Non-Complying Activity under Rule E14.4.1(A160) as the Landfill does not meet Discretionary Activity Standard E14.6.4.1(1) which requires landfills receiving domestic and industrial wastes to have been established prior to 2002.

Although not identified by the AEE, I consider the bin-exchange area could be defined as a Refuse Transfer Station given its similarities to the AUP(OP) definition (refer to Chapter J). I consider air discharges from the bin-exchange area are a Controlled

Activity under Rule E14.4.1(A154) as it complies with the Controlled Activity Standards E14.6.2.4 (the nearest dwelling is more than 300 m distant, the area is to be sealed, refuse is to be stored in enclosed containers, and a range of management measures shall be in place to mitigate odour and dust effects).

Overall, the discharges of contaminants into air from the proposed Landfill are a Non-Complying Activity.

Pursuant to section 15(1)(c) of the RMA, no person may discharge any contaminant from an industrial or trade premises into air unless the discharge is expressly allowed by a national environmental standard or other regulations, a rule in a regional plan, or a resource consent.

5.2 Other discharges considered

5.2.1 Construction dust

Construction of the Landfill shall involve large-scale earthworks. Discharges of dust from this construction activity are assessed in section 7.2 of the AQR and section 6.2 below. Discharges of dust from earthworks are provided for as either a Permitted Activity (Rule E14.4.1(A1)) or Restricted Discretionary Activity (Rule E14.4.1(A83)) under Chapter E14 of the AUP(OP) depending on compliance with the General Air Quality Permitted Activity Standards E14.6.1.1.

In the below assessment, I agree that the nature of the proposed earthworks, dust controls to be employed, and receiving environment (with notable separation distances to activities sensitive to air discharges), are sufficient to comply with Permitted Activity Standard E14.6.1.1(2). Therefore, I consider the potential discharges of dust during the construction activity are a Permitted Activity under Rule E14.4.1(A1), subject to compliance with the relevant standards.

5.2.2 Vehicle emissions

Diesel and petrol-powered vehicles on-site and travelling to and from the site emit a range of hazardous air pollutants as part of their engine exhaust emissions. On-road vehicle emissions arising due to the proposal were raised as a concern by a number of submitters. Rule E14.4.1(A114) of the AUP(OP) states that engine emissions are a Permitted Activity without standards whether on- or off-road, given that exhaust emissions are regulated at a national level. I agree that air discharges from the engines of vehicles and mobile machinery on-site and on-road are a Permitted Activity.

While exhaust emissions are permitted by the above rule, I consider that the higher-order NES:AQ must be complied with for all sources. Given the increase in heavy-vehicle traffic created by this proposal and its proximity to residential receptors (in Warkworth), I sought additional information to ensure that the potential increase in air pollutants from vehicle exhaust emissions would not cause an exceedance of the NES:AQ Ambient Air Quality Standards at any location where people are likely to be exposed. The response to this request is assessed in section 6.3 below.

6 Technical assessment of air quality effects

6.1 Assessment of air quality effects: Introduction

The applicant's assessment of air quality effects is detailed within the Air Quality Report (AQR) and Human Health Risk Assessment (HRA), with further assessment provided by the Risk Management Report (RMR) and the s92 Response. I do not intend to repeat information supplied in these reports as part of this assessment.

In my below assessment, I initially review two relatively simple air discharge impacts (construction dust and vehicle emissions), noting that both are deemed by the AUP(OP) as Permitted Activities. Secondly, I assess the operational air discharge effects in detail. This review is split into an overview of the basis and assumptions of the assessment, an overview of the proposed mitigation measures (conditions of consent and the Landfill Management Plan (LMP)), and an assessment of the actual and potential effects arising from the discharges of:

- Hazardous air pollutants (HAPs, including fine particulate matter, constituents of landfill gas, and products of combustion);
- Odour;
- Dust; and
- HAPs from unplanned events.

6.2 Construction phase air discharges

Section 7.2 of the AQR assesses the potential air discharges from bulk earthworks and other construction activities for the establishment of the Landfill and ancillary activities. Notably, discharges of dust are likely to arise from the earthworks and associated vehicle movements as described by the *Good Practice Guide for Assessing and Managing Dust* ('GPG:Dust', Ministry for the Environment, 2016).

The AQR notes that most of the construction activities shall occur within the large site, with sufficient distance for any dust generated to deposit so that it is unlikely to travel beyond the site boundary. For the construction of the entrance and bin exchange area, there are some dwellings within 500 m and therefore, dust discharged from the construction of these areas is considered the highest risk for off-site effects. The AQR also assesses the potential impacts on flora from dust deposition.

The application includes a draft Construction Erosion and Sediment Control Plan and proposes to undertake the construction earthworks activity in accordance with 'best practice erosion and sediment control' in general accordance with *Auckland Council Guideline Document 2016/05* (GD05). GD05 requires that exposed surfaces and vehicle accessways are stabilised to minimise the potential for dust discharges from earthworks activities. The AQR states that 'standard dust control measures' shall be in

place, including limiting vehicle speeds and using water to dampen surfaces. These measures are recommended by GD05 and the GPG:Dust.

The proposed conditions of consent in Appendix G of the AEE do not specifically reference dust control measures for the construction phase, although a Construction Environmental Management Plan is proposed to avoid, remedy or mitigate all adverse construction phase effects.

Overall, I agree with the conclusion of the AQR, that discharges of dust during the construction phase are not likely to cause notable adverse effects either to human receptors beyond the boundary of the site or to flora. I consider that the typical dust control measures outlined by the draft Construction Environmental Management Plan shall appropriately mitigate dust discharges during these works so that the discharges comply with the relevant Permitted Activity standards of E14.6.1.1.

6.3 Vehicle emissions

As described above in section 5.2.2, discharges of HAPs from vehicles are a Permitted Activity under the AUP(OP) without standards as they are controlled at a national level. However, for completeness, in the s92 Response (Tranche 2, question 83) the applicant has assessed the potential discharges of key HAPs from on-road vehicles accessing the landfill using the 'Preliminary Air Quality Technical Assessment Methodology' recommended by the *Guide to assessing air quality impacts from state highway projects, version 2.3* (NZTA, October 2019). This method estimates the worst-case potential ambient concentrations of fine particulate matter (PM_{10}) and nitrogen dioxide (NO_2) arising from a given number of vehicles and background air quality concentrations alongside a road using conservative modelling parameters.

The model shows that for a nominal receptor 20 m from State Highway 1, the increased volume of heavy vehicles shall have a negligible impact on the ambient concentrations of PM_{10} and NO_2. The cumulative concentrations of PM_{10} and NO_2 predicted are not predicted to approach the NES:AQ Ambient Air Quality Standards.

Discharges of HAPs from on-site vehicles and mobile machinery have not been specifically assessed. I consider that the numbers of diesel machines likely to be used on site shall not discharge significant quantities of HAPs (notably including PM_{10}, black carbon and NO_2), particularly if they are maintained regularly. Further, the separation distances are sufficient for these discharges to disperse to negligible ambient concentrations beyond the boundary of the Site.

Overall, I consider that the discharges of HAPs from vehicle and mobile machinery exhausts are a Permitted Activity under the AUP(OP) and are not likely to cause any notable adverse air quality effects.

6.4 Operational air discharges: Approach to air quality assessment

The AQR and HRA assess the likely generation of LFG from the Landfill and subsequent off-site effects of HAPs from the discharges of LFG and LFG combustion, drawing upon guidance from the US EPA (AP-42, section 2.4: Municipal Solid Waste Landfills, 2008 draft) and data collected at Redvale Landfill. The effects of odour and dust are assessed based largely on data collected at Redvale Landfill.

The AQR focuses on odour and 'priority' HAPs, indicative pollutants that are discharged from combustion processes and have robust health-based ambient air quality assessment criteria. The AQR only considers HAP discharges from the key point sources, being the combustion of LFG. A wider suite of HAPs and discharge sources are considered by the HRA. Notably the actual and potential human health effects arising from discharges of HAPs within fugitive discharges of LFG are assessed in the HRA.

The *Good Practice Guide for Assessing Discharges to Air from Industry* ('GPG:Industry', Ministry for the Environment, 2016) recommends air dispersion modelling to assess the likelihood of a proposed industrial air discharge from a point-source (such as a stack) to cause an exceedance of relevant ambient air quality assessment criteria as part of an overall assessment of effects. Computer dispersion models predict worst-case ambient concentrations across a spatial field based on the parameters of the discharge, meteorological data, and terrain. Typically, these predicted maximum ground level concentrations (MGLC) are reported across a grid terrain surrounding the discharge point, and/or at discrete receptor points entered to the model, being locations where people are likely to be exposed. Specific best-practice recommendations regarding air dispersion modelling are provided by the *Good Practice Guide for Atmospheric Dispersion Modelling* (GPG:Modelling, Ministry for the Environment, 2004).

Appendix B of the AQR ('the Modelling Report') details how priority HAP discharges from key point sources (notably the generator and flare stacks) were input into a computer dispersion model to estimate the resulting MGLCs for comparison against ambient air quality criteria (AAQC) for the protection of human health, in accordance with the guidance of the GPG:Industry and GPG:Modelling. When assessing compliance with the AAQC, assumed existing background concentrations of HAPs are added to the modelled concentrations to assess cumulative effects, in accordance with the GPG:Industry. The HRA reports further dispersion modelling undertaken to estimate potential human health effects from a wider range of HAPs and Landfill discharge sources.

The potential off-site effects of odour are also assessed by the Modelling Report, and are also qualitatively assessed in accordance with the tool-kit of assessment methods recommended by the *Good Practice Guide for Assessing and Managing Odour* ('GPG:Odour', Ministry for the Environment, 2016).

Dust discharges and effects are assessed by qualitative methods in accordance with the GPG:Dust and experience with Redvale Landfill.

Unintended HAP discharges arising from landfill fires are not quantified, with priority given to detailing proposed methods to minimise the risk of these discharges and resulting effects. This is further discussed in section 6.8 below.

The assessments within the AQR, HRA and AEE account for proposed mitigation measures to minimise the above air discharges and resulting effects, including proposed conditions of consent provided in Appendix G of the AEE.

6.4.1 Sources of operational air discharges

The principal sources of air discharges at the Landfill are the generator and flare stacks (HAPs), and fugitive emissions from the tip-face (odour). Other air discharge sources include:

- Fugitive dust discharges from the tip-face and vehicle movements;
- Odour discharges from the bin exchange area, capped landfill areas and leachate collection systems;
- HAP discharges from the LEU, capped landfill areas and the tip-face (fugitive LFG emissions), and vehicle movements.

The quantity of HAPs discharged from the generator and flare stacks, along with fugitive LFG discharges, is related to the quantity of LFG generated by the waste mass. This is discussed in section 6.4.2.1 below. Odour arises from fresh refuse, LFG and leachate and is discussed in section 6.6.

The 'GE-Jenbacher' modular generators are proposed to each discharge contaminants into air from stacks approximately 10 m high and 0.3 m in diameter. This type of generator is currently in use at Redvale Landfill. The s92 Response notes that over time, different generator technology may become available, although any generators with notably differing discharge characteristics may necessitate an amendment to the consent.

The enclosed flares are proposed to have stacks approximately 9 m tall and will combust LFG not utilised by the generators in accordance with the performance requirements of the NES:AQ. Notably these requirements include a continuous auto-ignition system and a minimum retention time of 0.5 seconds at more than 750°C to ensure complete combustion of the LFG.

The LEU is proposed to discharge contaminants into air through one of the flare stacks, so that VOCs generated by the low-temperature heating of leachate and the combustion of LFG within the LEU are destroyed. I note that Redvale Landfill is currently trialling a LEU that discharges contaminants from the combustion of 370 m³/hour of LFG and the low-temperature heating of leachate (at up to 90°C) directly to air. I consider that if a similar technology is proposed for the Landfill, a s127 variation to the consent could be required.

The generators, flares and LEU are proposed to be located within the 'Renewable Energy Facility', immediately to the west of the landfill footprint, near the centre of the Site. The dispersion model assumes that discharges shall occur from 12 generator stacks and a single combined flare stack, at the temperatures and efflux velocities detailed in Table 4.3 of the AQR, Appendix B.

The landfill tip-face, which is to be open to the air while waste deposition is occurring during the day and covered with at least 150 mm of 'daily cover' material overnight, is proposed to be a maximum of 80 x 80 m (6400 m²). The entire landfill area is 60 ha and shall be progressively capped with intermediate cover and final cap layers as cells are filled.

The bin exchange area shall be a source of some dust and odour, although it is noted that waste is to be retained within sealed containers to minimise odour and the surface shall be sealed to minimise dust.

6.4.2 Predicted rates of air discharges

6.4.2.1 LFG generation rates

The biological decomposition of organic waste under anaerobic conditions generates LFG, a mixture of methane (approximately 50%) and carbon dioxide with trace amounts of odorous reduced sulphur compounds and other VOCs. In accordance with the requirements of the NES:AQ to reduce the climate change effects of methane emissions, LFG is to be extracted from the Landfill and combusted within flares and generators. As described in section 3.2 of the AQR and AP42 Chapter 2.4, the LFG generation and capture shall progressively increase over the life of the Landfill as methanogenic conditions are established with additional waste placement and capping.

LFG extraction wells are to be progressively installed and covering of the Landfill is proposed to minimise fugitive LFG discharges as far as practicable, as detailed in the AQR and proposed conditions of consent. The extraction of LFG requires careful management to balance the competing imperatives of maximising LFG extraction while minimising the volume of air drawn into the landfill mass. If air is drawn into the waste, aerobic conditions can establish which increase the risk of subsurface landfill fires occurring.

The rate of LFG generation depends on a range of factors, notably the nature of the waste (organic content), and the moisture content. The estimation of LFG generation for the Landfill is presented in Appendix C of the AQR, utilising an equation recommended by AP42, with parameters set according to recommendations of the Ministry for the Environment for greenhouse gas accounting (*Climate Change (Unique Emissions Factors) Regulations 2009*). The equation and parameters for methane generation (assumed as 50% of total LFG) are summarised in

Table *3*.

Table 3: Methane generation rate prediction assumptions

LFG emission equation:		$Q_{methane} = L_o R (e^{-kc} - e^{-kt})$	
Parameter	**Parameter description**	**Parameter unit**	**Value selected for Landfill**
$Q_{methane}$	Methane generation rate at year t	m³/year	Variable as calculated
L_o	Methane generation potential	m³/tonne	100 (upper bound) 79 (lower bound)
R	Average annual waste acceptance rate	tonne/year	500,000
k	Methane generation rate constant	$year^{-1}$	0.063
c	Time since closure	years	0 until closure in year 35, then increasing
t	Time since opening	years	Increasing from year 0

Based on data collected at Redvale, I consider the selected values for parameters Lo and k appear reasonable. I note that AP42 recommends lower k value for American landfills (0.02 – 0.04 $year^{-1}$), as these typically receive lower volumes of rain than New Zealand. However, AP42 recommends a default k value of 0.3 $year^{-1}$ for 'wet landfills'.[1] Given the high rainfall in Dome Valley, a higher k value (which would estimate higher LFG generation) may be suitable.

The L_o values selected assume that the majority of waste (60% for upper-bound and 47% for lower-bound) is organic. Based on data collected at Redvale Landfill over the past decade, I consider this is a conservative estimate. The organic content of waste deposited at Redvale has been notably declining to below 40% with increasing volumes of inert soil and construction and demolition wastes received over the past decade. I consider that Auckland Council's proposed introduction of a separated food and organic waste bin for separate collection and anaerobic digestion is likely to further reduce the organic content of waste received at the Landfill, decreasing the true L_o value (which would estimate lower LFG generation).

The AQR predicts that LFG generation shall peak shortly after closure in year 35 of the landfill operation at between 8800 and 11,100 m³/hour. Overall, I consider that the potential real-world differences in the L_o and k values are likely to generally cancel

[1] US EPA AP42 recommends that 'wet landfills' are those that add water, wastewater or leachate directly to the waste to speed up bio-reaction. The Dome Valley Landfill does not propose to utilise this method, with limited recycling of leachate condensate and low-permeability capping proposed.

each other out so that the predicted LFG generation rates set out in the AQR are a reasonable assumption for basing the assessment on.

At the year of closure, 95% of the LFG generated is predicted to be extracted to 12 operational generators (each utilising approximately 600 m³/hour of LFG) and residual LFG of up to 2,900 m³/hour is to be flared. The remaining 5% of LFG shall discharge as fugitive emissions, although as detailed in the s92 Response (see Tranche 2, question 75), it is predicted that the majority of these fugitive LFG emissions shall be bioremediated as they interact with microbes within the soil cap rather than discharged as methane directly to air.

Over the lifetime of the Landfill, the AQR predicts that at least 90% of LFG generated shall be captured and utilised by the generators or flared. This is higher than the default 75% lifetime LFG capture rate recommended by AP42, although I note this average figure accounts for older landfills existing across the United States.

There is no ability to fact-check the assumed LFG generation and capture rates with certainty at this stage. However, I note that measurements of captured methane at Redvale 27 years into filling are generally tracking along the predicted curve between the above assumed upper- and lower-bound parameters (L_o=79-100 m³/tonne, k=0.063 year^{-1}, capture efficiency=90%), as shown by the measured methane collected (blue dots) compared to prediction lines 2-4 in Figure 2 below. This supports the LFG generation rates assumed for the Landfill.

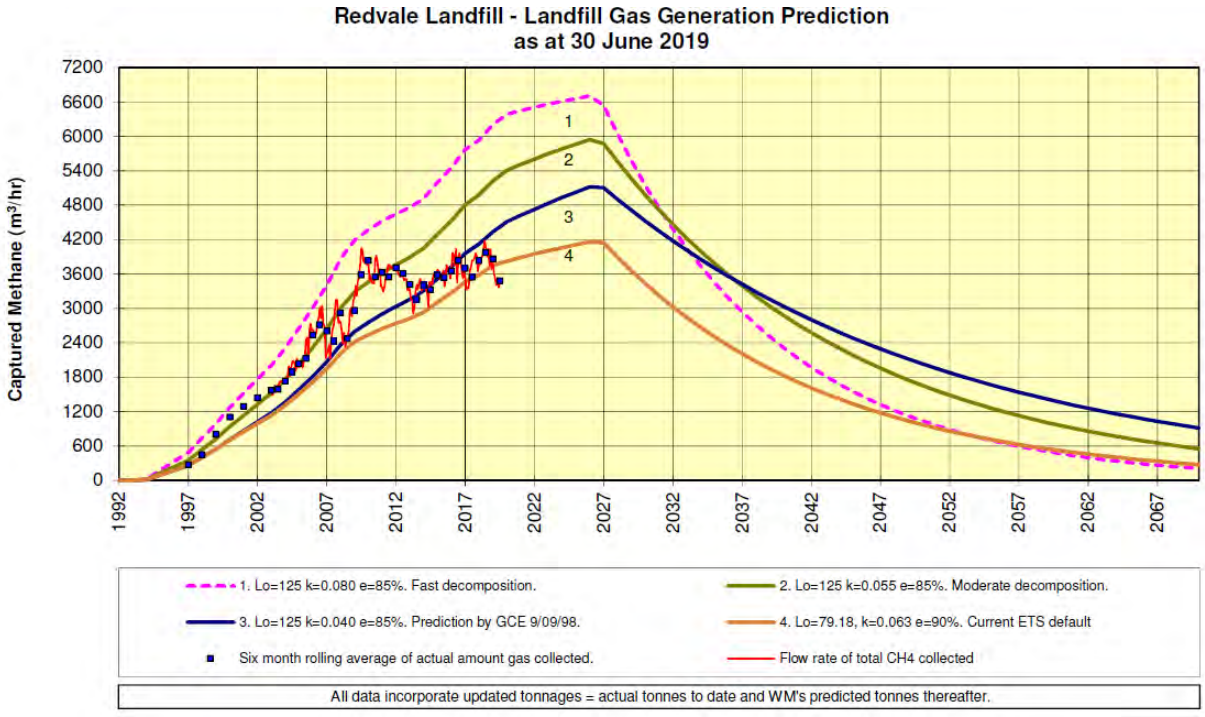

Figure 2: Redvale Landfill methane generation predictions compared to captured methane measurements, 1997-2019 (Redvale Landfill Annual Gas Report, 14/02/2020).

6.4.2.2 Energy facility HAP discharges

HAPs are discharged from the combustion of LFG. Assuming a worst-case LFG combustion rate of 10,089 m³/hour (600 m³/hour in 12 generators and 2900 m³/hour in a single flare stack), the AQR predicts that discharges of HAPs shall arise at the rates detailed in section 4.1 of Appendix B. The priority HAPs discharged from LFG combustion are:

- Fine particulate matter less than 10 µm and less than 2.5 µm in diameter (PM_{10} / $PM_{2.5}$);
- Nitrogen oxides (NO_X), discharged and oxidising to Nitrogen dioxide (NO_2);
- Sulphur dioxide (SO_2);
- Carbon monoxide (CO);
- Non-methane and volatile organic compounds (NMOC / VOC)

The discharge rates for the flares, NMOC / VOCs and SO_2 are derived from US EPA AP42 guidance. The selected HAP discharge rates for other priority HAPs from the generators are generally higher than any measurement taken at similar generators operating at Redvale. PM_{10} and $PM_{2.5}$ are assumed as discharging at a rate of 0.03 g/s from each generator, equating to 30 mg/m³.

NO_X is assumed to comprise of 20% NO_2 at the discharge point (the highest ratio measured at Redvale) and discharge at 0.5 g/s, equating to 500 mg/m³. A condition of consent, PC104, states that the generators shall be tuned every six-months to achieve a maximum NO_X discharge of 550 mg/m³. While NO_X discharges authorised by PC104 may be up to 10% higher than the modelled scenario, I consider this is tolerable given the model's other conservative assumptions that likely outweigh the potential difference in NO_X discharge rates.

The selected HAP discharge rates for the dispersion modelling assessment assume the maximum rate of LFG combustion occurring, which is not likely to arise until at least 40 years into the future at the currently predicted filling rates. Further, as above, I consider the LFG generation rate has been conservatively predicted based on a high percentage of organic material received. The assumed HAP discharges rates used for the assessment of effects may therefore not actually arise in reality during the period of this consent.

Further discharges of HAPs may arise from the LEU, although these are proposed to discharge through the flare stack to oxidise any VOC species arising from the evaporation of leachate and combustion of LFG. The HRA quantifies the maximum likely discharges of NMOC and VOC species, along with discharges of Mercury as a volatile (gas phase) heavy metal, in accordance with AP42 guidance.

Overall, I consider the predicted rates of HAP discharges from the Energy Facility are suitably conservative to enable an assessment of the worst-case emissions scenario.

6.4.2.3 Odour emissions

Odour is an unavoidable discharge from waste handling processes, particularly due to the biological degradation of organic wastes. Odour is likely to be discharged from the following areas of the landfill (ordered by highest-to-lowest as I consider based on experience at Redvale and Whitford Landfills):

- The refuse tip-face and working area;
- Landfill areas under daily cover;
- The bin-exchange waste receipt area;
- The leachate collection system (where this is exposed to or vents to air);
- Landfill areas under intermediate and final cover (particularly where cracks exist);
- Any perfumed odour suppressant sprays used (although I note that odourless neutralising agents, such as dilute chlorine dioxide solutions, are proposed for this Landfill);
- The Energy compound where LFG combustion and low-temperature leachate evaporation occurs (noting that the LEU discharges through a flare stack).

Section 5.4.1 of the AQR states that the LFG generators and flares are assumed to have 100% odour destruction efficiency and that areas of the Landfill with intermediate and final cover also have no appreciable odour discharges. I agree with these statements based on my experience with Redvale and Whitford Landfills.

As described in the GPG:Odour, quantifying odour discharges is a complex task and not achievable for many sources, particularly where there is not a defined point source for the discharge. A recommended method for measuring odour discharge rates (termed olfactometry) is described in section 4.3.1 of the GPG:Odour. Olfactometry involves drawing a sample of the air into a sealed bag for assessment by a panel of people who have had their sensitivity to odour tested to be within a 'normal' range. The dilution rate of the sample is gradually increased to a point where 50% of the panel can detect an odour as compared to a clean-air blank. This sample dilution point is termed 1 OU (odour unit), and the undiluted sample is calculated as being a number of OU in reference to this point. A calculation of the discharge characteristics (air flow rate from the discharge point) yields an OU/s odour discharge rate that can be input to a dispersion model.

Special considerations are required for non-point sources of odour, such as the tip-face and daily cover area sources. It is highly uncertain what the air flow rate from these areas is (this shall differ under differing meteorological conditions with increased discharges during falling atmospheric pressure) and the wastes present across these areas are heterogenous with differing odour levels. Area sources are typically calculated as discharging odour in units of OU/m²/s.

Despite the inherent difficulties for the quantification of odour discharges from Landfills, the Environment Court directed that WMNZ undertake olfactometry analysis at Redvale for subsequent dispersion modelling as a condition of Land-Use Consent LAN61338. The results of this sampling are included in the Modelling Report, along with reference to olfactometry sampling undertaken at Australian landfills, some of which identified higher odour discharge rates at the tip-face and daily cover areas (see Tables 3.1 & 3.2 of the Modelling Report).

The complete details of how olfactometry sampling has been undertaken at various landfills across Australasia is available in the report *WMNZ Redvale Landfill: Odour Dispersion Modelling Investigation* (Tonkin & Taylor, 2017). Critiques of the exercise and results are made in reviews of this report by AECOM (*Redvale Landfill Independent Review of Odour Management Practices*, 15/12/2017) and myself (*Re: Redvale Landfill annual independent odour review report 2017*, 15/01/2018). The critiques conclude that while the olfactometry assessment was undertaken appropriately in compliance with the consent condition, it did not yield useful results. The odour measured from all types of capped areas (daily, intermediate or final) yielded negligible odour discharge rates, similar to samples taken above clean soil. The resulting odour dispersion modelling then concluded that there should be no detectable odour within or near to Redvale Landfill, contrary to real-world experience. These compliance reports are available on the air discharge consent file for Redvale Landfill.

My concerns regarding the efficacy of olfactometry at landfills are such that I do not give the quantitative odour results reported in the Modelling significant weight in this assessment. In my experience at Redvale and Whitford Landfills , I consider that operational odour effects are predominantly caused by variations in practice. These notably include:

- Receipt of odorous loads of waste to the tip-face;
- Pulling back the daily cover at the start of the day;
- Digging into refuse to bury hazardous waste such as asbestos;
- Chemical reactions within the waste caused by the receipt of some industrial wastes, such as wastewater treatment plant sludges;
- The initial laying of a ‘fluff layer’ of refuse at the base of a cell (where daily cover material often does not completely cover the refuse);
- Issues with the leachate and/or gas collection system (such as condensation blockages that caused significant odour discharges at Redvale in 2017);
- Significant cracks and/or break-out in areas capped with intermediate or final cover.

Odour is therefore best assessed by qualitative comparative methods as described by the GPG:Odour.

6.4.2.4 Dust discharges

Dust arises at landfills predominantly from the handling of dry wastes, earth-moving activities (such as for the relocation of cover material stockpiles), and vehicle movements.

Quantitative data regarding the predicted rates of dust discharges from sources such as vehicle movements and the handling of wastes and soils is not available. As recommended by the GPG:Dust, a qualitative assessment of these discharges, and measures to control, monitor and manage dust, are included in the AQR and section 6.7 below.

6.4.2.5 Other air discharges

Some fugitive discharges of HAPs shall arise, particularly in the event of any unplanned incident, such as a landfill fire. The frequency and scale of these incidents – and hence the associated HAP discharges – are not quantifiable. The AEE focuses on detailing control, monitoring and management measures to minimise the risks of these discharges occurring as far as reasonably practicable. These measures and an assessment of the risk of such discharges arising are further discussed in sections 6.4.4, 6.4.5 and 6.8 below.

Over 40% of LFG comprises carbon dioxide (CO_2), and the combustion of methane at the Energy Facility shall result in discharges of more significant quantities of CO_2. Equations to estimate CO_2 emissions from the LFG combustion processes are detailed in AP42. However, emissions of CO_2 are not assessed in this review as it is not currently considered to be a HAP as outlined in section 3.1.

A portion of the methane and NMOC contaminants within LFG are not destroyed by the generators or flares and are discharged to air from these point sources along with fugitive discharge sources (largely from the tip-face as detailed in the s92 Response, Tranche 2 Q75). AP42 estimates the methane and NMOC destruction efficiency of flares and generators is approximately 97%. The NES:AQ includes performance criteria for LFG flares to maximise the methane destruction efficiency. Methane is also a GHG rather than HAP for the purposes of this review and these discharges are not considered further.

The discharges of NMOC contaminants from the generators, flares and fugitive sources are of interest due to their potential health effects. The HRA's assessment of NMOC HAPs primarily utilises LFG analysis undertaken at Redvale Landfill to select the maximum measured content for each NMOC species. The HRA then assumes these discharges occur from the generators, flares and landfill tip-face, assuming the maximum rate of LFG generation.

Mercury is likely to be present within the LFG in various oxidation states and discharged from the combustion activities. As described in Appendix H of the HRA, the HRA has used AP42 recommendations for the mercury content of LFG and subsequent discharges, noting that this is higher than that measured at UK landfills (no

robust data exists for NZ landfills). The risk of mercury within leachate being volatised and discharged from the LEU and is also discussed in Appendix H of the HRA.

6.4.3 Dispersion model parameters

The dispersion model selected was CALPUFF (v. 7.2), an advanced puff model recommended by the GPG:Modelling for complex terrain and land-use modelling scenarios. Modelling was completed over two representative years-worth of meteorological data inputs (2015 and 2017) to ensure that inter-annual variability in the modelling results are adequately explored in accordance with the GPG:Industry.

The dimensions of the stacks or area sources, emission efflux characteristics (velocity and temperature), nearby buildings and terrain are important for the model to predict how the air discharges are likely to be dispersed in the air. There are no notable structures that may cause building downwash effects near to the discharge sources for input to the model. The terrain has been obtained from LIDAR (Auckland Council, 2006), with modifications to the elevations within the valley where filling is to occur.

The dispersion model predicts the maximum ground-level concentrations (MGLC) of HAPs and odour at grid points across an area of 6x6 km at 100 m resolution. Further, MGLCs are predicted for discrete receptor points, input at the locations and elevations of dwellings in the surround area (as marked in Appendix A of the AQR).

Further details of the input parameters of the dispersion model are detailed in the Modelling Report, with a print-out of the selections included for the odour modelling runs in Appendix C. Aside from changes made to account for conditions specific to this application, most technical parameters have largely been set to the default settings recommended by the model developers.

6.4.3.1 Discharge rates

The emission rate is noted by the GPG:Modelling as the ‘number one critical parameter’ for modelling ambient air quality concentrations. The GPG:Industry recommends that ‘continuous maximum emissions from normal operation’ should be assumed for modelling to ensure conservatism. As described in section 6.4.2 above and in the Modelling Report, the model assumes continuous discharges of HAPs and odour at the maximum predicted rates (which are not likely to arise until near the end of the proposed consent term).

A sensitivity analysis for the odour emissions is reported in section 3.4 of the Modelling Report, with odour discharge rates from the active tip-face and areas with daily cover assuming to occur at much-higher rates as measured at Melbourne Regional Landfill. In this sensitivity analysis, odour emissions are increased by an approximate factor of 10 for the active tip-face and daily cover areas.

6.4.3.2 Discharge source characteristics

For odour, two discharge scenarios are modelled, representing conditions approximately 25 years and 35 years into filling to investigate potential differences in odour effects over the life of the Landfill as filling occurs at different parts of the valley and at increasing heights. The locations of the area sources where odour discharges are modelled to occur from are shown in Figure 3.1 of the Modelling Report, with Scenario A filling occurring at the western (toe) end of the landfill and Scenario B filling at the eastern end.

For conservatism, the active tip-face (where the most significant odour emissions occur) is assumed by the model to be larger than proposed in reality (100x100 m modelled, 80x80 m maximum proposed, 60x60 m stated likely). Emissions from the active tip-face are constant within the model over time; meaning that the model does not account for the covering of the active tip-face with daily cover that shall occur each night.

The model assumes that odour emissions occur from an open tip-face of 10,000 m² and an area of 20,000 m² with daily cover only. No odour emissions are included from areas with intermediate or final cover, given the very low measurements of odour in these areas observed at Redvale and Australian landfills. The combustion of LFG and low-temperature leachate evaporation within the LEU are also assumed to not discharge odour by the model.

For priority HAPs, only the final discharge configuration of 12 generator stacks and a single flare stack are modelled, being the worst-case scenario. As noted in the s92 Response, it is likely that two flare stacks shall be used in reality for a principal and back-up flare, but that modelling a single combined flare stack source is not likely to notably impact the results.

The HRA expands on the AQR's modelling of priority HAPs from the generators and flares by also including predicted HAP discharges within fugitive LFG discharges arising from an assumed open tip-face of 10,000 m².

6.4.3.3 Dispersion modelling meteorological input

The development of a bespoke multi-layered meteorological data file for input to the dispersion model is described in section 2 of the Modelling Report. Notably, real-world data from meteorological monitoring stations at Mahurangi Forest (approximately 3 km south of the Site) and Leigh (approximately 20 km north-east of the Site) and upper air data observed by Australia's CSIRO agency were included into a meso-scale interpolative model to produce a 3D matrix of meteorological data-points across a grid 40x30 km at a resolution of 200 m.

The two-years of modelled meteorological data are compared to real-world observations in Appendix B of the Modelling Report. This appendix concludes that the two selected modelling years are likely to represent typical meteorological conditions at the Site.

6.4.3.4 Consideration of existing (background) air quality

The GPG:Industry recommends that cumulative concentrations of HAPs are assessed against the relevant AAQC, to account for existing background concentrations arising from other activities such as vehicle emissions and domestic home heating. In practice, this means that the modelled MGLC results predicted from on-site air discharges are added to background data to report a cumulative MGLC. Background data can either be obtained from conservative default values recommended for various land-use setting by the GPG:Industry, representative air quality monitoring data recorded in a similar land-use setting, or undertaking an on-site pre-construction air quality monitoring exercise.

The derivation of background air quality data for this assessment is described in section 2.3 of the AQR. Constant background air quality values are assumed in accordance with default values recommended by the GPG:Industry (termed a 'Tier-2' approach) rather than a more complex consideration of varying background concentrations over time. The Modelling Report does not consider background air quality, reporting only MGLCs modelled to arise from the Site's discharges.

The background air quality values selected for this assessment are detailed in **Table *4*** with the source noted. Further details on how background air quality is considered as part of dispersion modelling assessments is provided in Auckland Council GD2014/01.

Table 4: Assumed background air quality

Pollutant	Averaging period	Assumed background value (µg/m³)	Source
$PM_{2.5}$	24-hour	11	Average of the 2nd highest values recorded 2012-2016 at Auckland Council's Rural Background site (Patumahoe)
	Annual	4	Average recorded 2012-2016 at Auckland Council's Rural Background site (Patumahoe)
PM_{10}	24-hour	28.4	NZTA background air quality map
	Annual	12	Average recorded 2012-2016 at Auckland Council's Rural Background site (Patumahoe)
CO	1-hour	5000	GPG:Industry (rural areas)
	8-hours	2000	GPG:Industry (rural areas)
SO_2	1-hour & 24-hour	0	GPG:Industry (only recommends SO_2 background for urban areas)
$NO_2 + O_3$	1-hour	95	GPG: Industry (represents background NO_2 and available O_3 to convert NO to NO_2)
	24-hour	75	GPG: Industry (represents background NO_2 and available O_3 to convert NO to NO_2)

I consider the background air quality values selected are appropriate for the modelling exercise and shall enable the likely worst-case cumulative MGLCs to be compared against relevant ambient AAQC. I consider the adopted default background air quality

values are conservative, and consider that actual air quality concentrations near dwellings in the Dome Valley area are likely to be generally lower than these adopted values.

6.4.3.5 Dispersion model selection and parameters review

I consider the dispersion modelling has been appropriately conducted by suitably qualified and experienced specialists in general accordance with relevant good practice guidelines. I agree that the model with its input parameters adequately predicts the likely worst-case off-site MGLCs at nearby dwellings, where people are likely to be exposed to air discharges from the Landfill.

Some aspects of the modelling are notably conservative and are therefore likely to over-predict MGLCs. Particularly, I consider the HAP discharge rates utilised (calculated from the estimated maximum rate of LFG extraction, maximum measured discharge rates from Redvale and AP42 guidance) are higher than are likely to occur. These predicted rates of HAP discharges shall not occur any sooner than at least 25 years into the future, given the lag-time for LFG generation to occur.

The odour discharges are assumed to occur from larger-than-proposed areas of active tip-face and daily cover, which likely more-than outweighs any low-level odour discharges from other continuous sources (intermediate and final capped areas and the LFG combustion) that were not included in the model. While I consider the dispersion model for odour has been set-up to predict MGLCs as well as possible, I do not consider it is a definitive tool for an assessment of odour effects, as discussed in section 6.6.

6.4.4 Proposed conditions of consent

Proposed conditions of consent considered 'key' to the management of effects are included in Appendix G of the AEE. Section 14 of the AEE notes that these key proposed conditions should form a starting point for further conditions to ensure that adverse effects are adequately avoided, remedied and/or mitigated.

The proposed conditions relating to air discharges are numbered 95-122, with further relevant conditions provided in the general conditions relating to the Operations phase. In this memo, I refer to these proposed conditions as PC.95 – PC.122.

I note that the PC are generally similar to those that currently apply to air discharge consents for Redvale and Whitford Landfills and some are similar to conditions recommended by the GPG:Industry. The PC are categorised by type of air discharge (dust, LFG, odour) and also include a range of proposed monitoring conditions (PC.108-118).

Limit conditions for dust and odour (no offensive or objectionable effects beyond the boundary of the Site) are proposed in general accordance with the wording recommended by the GPG:Odour and GPG:Dust. Both dust and odour are to be further controlled by adherence to management measures listed by PC.97 and PC.122

respectively. These controls are also matters to be detailed in the Landfill Management Plan (PC.149-154). Dust shall be further controlled by the wheel wash facility proposed by PC.137. Odour shall be further controlled by adherence to the maximum size of the tip-face (maximum of 80x80 m as in PC.66) and level of daily cover applied (150 mm thick soil covering all refuse as in PC.67).

LFG is proposed to be managed in accordance with a specific management plan (PC.156) and conditions of consent that set minimum requirements for the LFG extraction system, generators and flares. Fugitive LFG discharges are to be minimised by a limit of 5000 ppm at the Landfill surface (PC.105) and 50,000 ppm in sub-surface wells around the Landfill perimeter (PC.106). The potential for fugitive LFG shall be inspected weekly (visual, PC.108) and three-monthly (surface emission monitoring, PC.109). The efficiency of the LFG extraction wells is to be regularly monitored and tuned to optimally balance the system (so that the maximum volume of LFG is extracted while not drawing air into the landfill giving rise to conditions conducive to subsurface fires).

Discharges of HAPs are proposed to be controlled by monitoring the quantity and quality of LFG extracted, routine stack testing of the generators and operating the LEU at a temperature of less than 95°C. The generators are proposed to be limited to a maximum of 12, tuned to have NO_X discharges less than 550 mg/m³ (PC.102-104).

Specific monitoring for landfill fires is not featured in the PC, although an Emergency Management Plan (PC.156) and monthly monitoring against a maximum nitrogen content within the LFG extraction wells (PC.107 & 112) are proposed. Elevated levels of nitrogen within LFG extraction wells indicates that air is being drawn into the landfill (over-suck) which is conducive to subsurface fires.

I have assessed the actual and potential effects of the application accounting for the PC. Notably, this means that where physical limits are proposed (including discharge rates, presence of infrastructure such as the LFG extraction system, operating parameters such as the size of the tip-face), I assume compliance with these conditions shall occur. Where compliance with PC requires specific management measures (such as the minimisation of fugitive LFG discharges), I account for the risk of non-compliance with the PC given the proposed management measures as part of my assessment.

6.4.5 Draft Landfill Management Plan

A Draft Landfill Management Plan (DLMP) was provided within Tranche 5 of the s92 Response (20/02/2020). The DLMP is based upon the operative Redvale LMP.

The DLMP contains sub-plans specific to the management of incoming wastes, application of cover materials, LFG and emergency management. A specific Odour Management Plan is also included in the DLMP, but is not listed as a proposed sub-plan for the final LMP to be submitted for certification under PC.150.

Of particular note within the DLMP and relevant to air discharge controls are the minimum specifications for landfill cover types (see DLMP 3.03), waste deposition procedures and working face size (DLMP 3.02), and waste acceptance criteria (DLMP 3.01). These measures provide further air discharge controls than are set by the PC.

Specific details for the installation, operation and monitoring of the LFG collection system are included in the DLMP 3.42: Landfill Gas Management Plan. The provision of this sub-plan is also a PC. The key objective of the Landfill Gas Management Plan is for LFG to always be extracted at the maximum practicable rate. LFG is not to be 'stored' in the landfill in the event that the generators are unavailable, thereby requiring sufficient flaring capacity to always be available.

6.5 Hazardous air pollutants

HAPs are air pollutants that cause adverse effects to human health and/or ecosystems when exposure occurs at sufficient levels for sufficient durations. A description and assessment of each HAP is provided in the below sub-sections following a summary of the applicable ambient air quality assessment criteria for the assessment.

6.5.1 Ambient air quality assessment criteria

6.5.1.1 Human health assessment criteria

Although many HAPs have no recognised safe level of exposure (at which no observable health risks exist) a range of ambient air quality guidelines and standards have been set for short and long-term exposure durations by various agencies to minimise health risks. These criteria vary from statutory standards (as set by the NES:AQ Ambient Air Quality Standards (AAQS)), regional or national targets and guidelines (AUP(OP) Auckland Ambient Air Quality Targets (AAAQT), NZ AAQG), to international guidelines and standards (WHO AAQG, US EPA RfC, California OEHHA REL). It is important to note that these AAQC are set to minimise risks to human health assuming general population exposure. They are therefore significantly lower than corresponding Workplace Exposure Standards which presume shorter exposure by healthy working-age individuals.

As recommended by the GPG:Industry for short-term (1-hour average) concentrations, the 99.9th percentile modelled result is compared against the relevant AAQC to determine compliance. This avoids undue influence from unusual artefacts within the dispersion model and reflects that some short-term criteria (such as the NES:AQ AAQS for NO_2 and SO_2) allow a certain number of exceedances to occur.

The most appropriate AAQC are determined according to a hierarchy recommended by the GPG:Industry. The relevant human health assessment criteria for the priority HAPs

for the Landfill are detailed in **Table *5***. These criteria generally reflect the World Health Organisation Air Quality Guidelines (2005).[2]

Table 5: Relevant ambient air quality human health assessment criteria for priority HAPs

Pollutant	Averaging period	Ambient air quality criteria (µg/m³)	Source of criteria
$PM_{2.5}$	24-hour	25	AAAQT
	Annual	10	AAAQT
PM_{10}	24-hour	50	NES:AQ
	Annual	20	AAAQT
NO_2	1-hour	200	NES:AQ
	24-hour	100	AAAQT
	Annual	40	AAAQT
CO	1-hour	30,000	AAAQT
	8-hour	10,000	NES:AQ
SO_2	1-hour	350 / 570	NES:AQ
	24-hour	120	AAAQT
Mercury (inorganic)	Annual	0.33	AAAQT

6.5.1.2 Ecological assessment criteria

Some HAPs also affect vegetation, by limiting photosynthesis and/or damaging foliage. The New Zealand Ambient Air Quality Guidelines (Ministry for the Environment, 2002) recommends specific ambient air quality assessment guidelines to minimise the risks of ecological effects. These 'Critical Levels' are noted by the guidelines as having a high degree of uncertainty, as there are generally fewer studies regarding non-human health effects of HAPs and very few for a New Zealand context. The ecological criteria for notable HAPs discharged from the Landfill are outlined in Table 6.

Fauna are generally considered to be adequately protected by compliance with the human health assessment criteria, although the guideline recommends considering toxicological loading to assess any cumulative effects (this is completed in the HRA).

[2] The exception where an NES:AQ AAQS or AAAQT does not match the WHO AAQG is for SO_2, as further discussed in section 6.5.5.

Table 6: Relevant ambient air quality ecological assessment criteria for priority HAPs from the *NZ Ambient Air Quality Guidelines* (2002)

Pollutant	Averaging period	Ambient air quality criteria (µg/m³)	Ecosystem
SO_2	Annual and winter	20	Forest / Natural vegetation
	Annual	10	Lichen
NO_2	Annual	30	Vegetation

6.5.2 Fine particulate matter (PM_{10}, $PM_{2.5}$)

Where particulate matter has an aerodynamic diameter of less than 10 µm, referred to as PM_{10}, it is respirable and is considered to be a HAP owing to its significant risks to human health (particularly to the respiratory system). The finest commonly measured fraction of particulate matter has an aerodynamic diameter of less than 2.5 µm ($PM_{2.5}$) and can enter the bloodstream, causing cardio-vascular diseases and other health effects. Particles larger than 10 µm in diameter that are discharged to air are included within the size classification 'Total Suspended Particulate' (along with PM_{10} and $PM_{2.5}$) but are not respirable and are largely associated with nuisance dust effects, such as soiling.

Ambient exposure to PM_{10} and $PM_{2.5}$ air pollutants has been found to cause mortality and morbidity effects on both short-term and chronic scales. The World Health Organisation's (WHO) Review of Evidence on Health Aspects of Air Pollution (REVIHAAP, 2013) concludes that there is strong evidence that exposure to PM_{10} and $PM_{2.5}$ causes human health effects and confirms the conclusions of the WHO Air Quality Guidelines (2005) regarding PM_{10} and $PM_{2.5}$. REVIHAAP also notes that health risks are present at lower concentrations than the recommended WHO Air Quality Guidelines and that $PM_{2.5}$ acts as a delivery mechanism into the bloodstream for other hazardous semi-volatile pollutants. The International Agency for Research on Cancer has determined that exposure to outdoor air pollution, specifically including PM_{10} and $PM_{2.5}$, is carcinogenic to humans (Group 1) (IARC Monograph 109, 2016). Therefore, it is important to minimise both short and long-term exposure to PM_{10} and $PM_{2.5}$ as far as practicable.

At the Landfill, PM_{10} and $PM_{2.5}$ are likely to be discharged as a result of combustion processes. I consider that 100% of the particulate emitted from the combustion of LFG is likely to be in the finest $PM_{2.5}$ category, given the temperature of combustion. As above, $PM_{2.5}$ discharges from each of the generators are predicted to occur at a rate of 0.03 g/s, with further $PM_{2.5}$ discharged from the flare stacks.

Fugitive dust discharged from vehicle movements and the handling of waste and cover materials is likely to have a larger size fraction (generally greater than 10 µm) owing to its abrasive/mechanical generation processes (as described in the GPG:Dust). While some of this fugitive dust is likely to be PM_{10}, it is difficult to quantify for a dispersion modelling or other quantitative assessment. The GPG:Dust recommends prioritising

controls for these dust discharges over theoretical exercises to quantify discharges. The potential effects of these fugitive dust discharges and proposed management measures are assessed in sections 6.2 and 6.7.

The PM_{10} / $PM_{2.5}$ discharges from the maximum 12 generator and flaring scenario were included within the dispersion model described above to estimate the resulting MGLC. PM_{10} and $PM_{2.5}$ are assessed against 24-hour and annual average AAQC. As there is no provision for a human receptor to be present at the site boundary continuously, the AQR assesses the MGLC recorded at dwellings only as places where people are likely to be exposed. These modelled MGLCs are added to assumed background concentrations of PM_{10} and $PM_{2.5}$ arising from transport emissions, domestic home heating and natural sources as detailed in section 6.4.3.4.

The maximum modelled ambient air quality concentrations of $PM_{2.5}$ / PM_{10} arising from the combustion of LFG at the Energy Facility are presented in Table 6.1 of the AQR and **Table *7*** below. The modelled MGLCs for $PM_{2.5}$ / PM_{10} arising from the generators and flares at the nearest dwelling is 4.6 µg/m³ as a 24-hour average and 0.3 µg/m³ as an annual-average. Added to the assumed background concentrations of $PM_{2.5}$ and PM_{10}, these MGLCs are not likely to approach the NES:AQ AAQS or AUP(OP) AAAQT.

Table 7: PM_{10} and $PM_{2.5}$ dispersion modelling results

Pollutant	Averaging Period	Assumed background concentration (µg/m³)	Maximum sensitive receptor: site only (µg/m³)	Maximum sensitive receptor: cumulative (µg/m³)	Assessment Criteria (µg/m³)
PM_{10}	24-hr	28.4	4.6	33.0	50
	Annual	12	0.3	12.3	20
$PM_{2.5}$	24-hr	11	4.6	15.6	25
	Annual	4	0.3	4.3	10

While the cumulative ambient concentrations of $PM_{2.5}$ are not likely to exceed the relevant AAQC, I consider the increase in ambient concentrations above those currently existing at the site represents an adverse effect in increased health risks to residential receptors. As above, any increase in exposure to $PM_{2.5}$ presents an increased health risk as there is no recognised 'safe threshold' for exposure.

While the increase in short-term ambient concentrations is notable, the increase to annual-average ambient $PM_{2.5}$ concentrations is 0.3 µg/m³, or 3% of the applicable guideline, and is based on an assumed LFG combustion rate that is not likely to occur for 30 years. Therefore, I consider that the predicted PM_{10} and $PM_{2.5}$ discharges shall not cause any more than minor off-site effects if controlled in accordance with the conditions of consent.

6.5.3 Nitrogen dioxide (NO_2)

Oxides of nitrogen (NO_X) are produced as a result of the oxidation of nitrogen molecules during combustion. At the point of discharge from the LFG generators and flares, more than 80% of NO_X exists as nitric oxide (NO), which is not considered to be a HAP until oxidised to nitrogen dioxide (NO_2). The atmospheric conversion of NO_X to NO_2 in Auckland is generally limited by the availability of ground-level ozone (O_3), based on correlative studies between ambient concentrations of NO_2, NO_X and O_3. These studies, outlined in Appendix 3 of Auckland Council GD2014/01, demonstrate that NO_2 levels are negatively correlated with O_3.

Epidemiological studies have demonstrated that exposure to high concentrations of NO_2 affects the respiratory system, causing the lungs to be more susceptible to infection. NO_2 is also used as a marker species to indicate concentrations of a range of difficult-to-detect contaminants of combustion. Correlative studies have demonstrated that a population's level of mortality and hospitalisations are linked to NO_2 exposure (REVIHAAP: World Health Organisation, 2013).

As detailed in section 6.1.3 of the AQR, NO_2 at 1-hour and 24-hour averaging periods has been assessed using the 'proxy method' to consider the atmospheric conversion of NO to NO_2. This method is described in Auckland Council GD2014/01 and the GPG:Industry, and recommends that modelled 1-hour average NO_2 results are increased by 95 µg/m³ to account for background NO_2 and O_3 (which can oxidise any associated NO to NO_2). I note that this is a conservative method, as the proxy NO_2+O_3 background values are taken from the highest values recorded in the Auckland urban area and it does not account for time-lag in the NO to NO_2 conversion process.

The maximum modelled ambient air quality concentrations of NO_2 arising from the combustion of LFG at the Energy Facility are presented in Table 6.1 of the AQR. The modelled cumulative MGLCs for NO_2 arising anywhere beyond the boundary (for 1-hour averages) and at the nearest dwellings (for 24-hour and annual averages) are:

- 124 µg/m³ (1-hour average);
- 89 µg/m³ (24-hour average);
- 0.9 µg/m³ (annual average, no background added).

I consider the modelling of the maximum LFG discharge scenario (12 generators and flaring) adequately demonstrates that NO_2 concentrations shall not exceed the NES:AQ AAQS or AUP(OP) AAAQT at any location beyond the boundary of the Site. These predicted off-site NO_2 MGLCs shall not cause more than minor effects.

6.5.4 Carbon monoxide (CO)

Carbon monoxide (CO) is particularly associated with poorly tuned combustion processes. Exposure to high concentrations of CO reduces the ability for blood to transport oxygen and can result in acute impacts to those with heart conditions.

Ambient CO levels in Auckland have greatly reduced over the past two decades as catalytic converters have become standard for vehicles.

The AQ Report assumes discharges of CO from the combustion of LFG based on AP42 recommendations. The dispersion modelling exercise predicts that the maximum ambient concentrations of CO shall be negligible at the site boundaries (maximum 497 µg/m³ as an 8-hour average). When added to conservative assumed background concentrations, the 1-hour and 8-hour average MGLC for CO are insignificant compared to the relevant AAQC and shall not cause notable effects.

6.5.5 Sulphur dioxide (SO_2)

SO_2 is discharged from the combustion of sulphur-bearing fuels, including LFG that contains approximately 300 mg/m³ hydrogen sulphide (H_2S). Other forms of sulphur oxides (SO_X, including SO_3) exist, but SO_2 is the predominant form discharged and present in air. Short term exposure to SO_2 is associated with respiratory conditions (particularly for sensitive individuals such as those with asthma) and irritation of the nose, throat and lungs. Chronic exposure to SO_2 has been linked to cardiovascular disease and mortality, particularly given its secondary formation of sulphate-$PM_{2.5}$ particles. SO_2 also has ecosystem effects, damaging foliage and in high concentrations, contributing to acid rain events.

As detailed in Table 5 above, the most-applicable AAQC for SO_2 are those of the NES:AQ AAQS (lower standard of 350 µg/m³ as a 1-hour average) and AUP(OP) AAAQT (120 µg/m³ as a 24-hour average). These AAQC are selected in accordance with the hierarchy recommended by the GPG:Industry.

In 2006, the WHO reduced their air quality guideline for SO_2 to 20 µg/m³ as a 24-hour average. The most compelling evidence for the reduced guideline was improved health outcomes correlated with a drop in ambient SO_2 in Hong Kong following a major reduction in the sulphur content of fuels (Hedley et al., 2002). Further, in 2010, the US EPA revised their SO_2 air quality standard to 75 ppb (approximately 200 µg/m³) as a 1-hour average.

These criteria are considerably more stringent than the above NES:AQ and AUP(OP) criteria. The Proposed Auckland Unitary Plan sought to introduce a 24-hour ambient air quality standard for SO_2 in accordance with the 2006 WHO guideline. This was opposed by a number of industries, including WMNZ, who critiqued the evidential basis for the guideline, noting that $PM_{2.5}$ also decreased in Hong Kong over the study period analysed by Hedley, et al. (2002), and that it was difficult to attribute health improvements to SO_2 reductions in isolation. The outcome of the appeal (ENV-2016-AKL-000217, et al.) was to retain the previous SO_2 ambient air quality target of the *Auckland Regional Plan (Air, Land and Water)*, which was the same as that set by the *NZ Ambient Air Quality Guidelines* (2002).

As detailed in section 6.4.2.2, the AQR predicted a rate of SO_2 discharge by mass-balance calculations of the maximum LFG combustion rate and sulphur content. I agree these SO_2 discharges represent a worst-case scenario.

Dispersion modelling results for SO_2 are summarised in Table 6.1 of the AQR and the MGLCs spatially plotted in Figures A9-12 of the Modelling Report. The MGLCs predicted to occur at any location beyond the boundary of the site (1-hour average) and at an off-site dwelling (24-hour average) are 33 µg/m³ and 16 µg/m³, respectively. Therefore, the MGLCs for SO_2 comply with all relevant AAQC, including the lower WHO and US EPA criteria.

Further assessment of SO_2 discharges and ecological effects is provided in the s92 Response (Tranche 3, Q.77). This assessment demonstrates that SO_2 discharges are unlikely to cause adverse effects to ecosystems, with the ambient SO_2 concentrations complying with the relevant ecosystem critical levels of the *NZ Ambient Air Quality Guidelines 2002*.

Overall, I consider the predicted SO_2 MGLCs shall not cause more than minor effects.

6.5.6 Non-methane organic compounds (NMOC)

LFG contains a range of Volatile Organic Compounds (VOC) which are typically referred to as NMOC in the context of LFG management. The majority of these NMOCs are considered HAPs due to their effects to human health (some NMOC species are also recognised carcinogens, linked to increased cancer risks). The HRA undertakes an in-depth analysis of NMOC discharges and resulting effects. In comparison, I note that the most-recent air discharge consent for Redvale briefly referred to a summary of a 2002 health-risk assessment to conclude that VOC discharges were not likely to cause any notable effects.

Here, I only assess the health-effects from air discharges of NMOCs within LFG via the airborne inhalation exposure scenario. Health effects from other exposure pathways, including the deposition of airborne contaminants onto water and soil, are being assessed by my colleagues Sharon Tang and Natalie Webster.

6.5.6.1 NMOCs as assessed by the HRA

The HRA assesses health risks associated with airborne NMOC exposure to a representative worst-case residential receptor at the nearest dwelling. The NMOCs considered include genotoxic carcinogens (toxins that damage cells with no recognised safe exposure threshold) and other NMOCs that are identified to cause health effects on exposure to high concentrations by other mechanisms (termed threshold compounds).

The HRA considers the potential health risks associated with exposure to all measured genotoxic carcinogenic NMOC species and undertakes a screening assessment to select the ten threshold NMOC species of greatest concern. These are the NMOC species that are present within LFG in the greatest quantity compared to the ambient air quality assessment criteria. For the exercise, conservative 'Effects Screening Levels' published by the Texas Commission for Environmental Quality (TCEQ ESLs) are used given their comprehensive coverage of nearly all NMOCs.

The HRA justifies the screening process to focus only on those contaminants selected as 'Contaminants of Potential Concern' as:

> *If the HHRA shows that the effects of this sub-set of priority contaminants are acceptable, then it can be inferred that the risks posed by contaminants that are present in smaller quantities and that are less toxic will also be acceptable.*

I agree with this methodology for air discharges, noting that there are many NMOCs potentially present within LFG in trace quantities. I consider the TCEQ ESLs are conservative, typically much lower than AAQC derived by more robust health studies. The only exception to this is for 1-3 Butadiene, which is responded to in the s92 Response using a revised AAQC (Tranche 3, Q.104).

The assessed receptor for inhalation effects is assumed to breathe in air containing NMOCs discharged at near the maximum predicted rate continuously for a period of 30 years, including 6 years of childhood exposure. These parameters are detailed in section 8.3 of the HRA. I agree that the assessed inhalation exposure scenario shall enable a conservative assessment of the life-time NMOC exposure effects.

The HRA identifies that all threshold NMOCs do not approach the relevant AAQC (selected in accordance with the GPG:Industry hierarchy) at the worst-case residential receptor. Therefore, it is considered that discharges of threshold (non-genotoxic) NMOCs are not likely to cause any notable health risk either in isolation or cumulatively.

The total health risk (cumulatively from all exposure scenarios, including those outside the scope of this review) is expressed in a risk level for comparison against a 'tolerable risk level' of 10^{-5}. This tolerable risk level anticipates that for a lifetime exposure, there is a one-in-100,000 chance of a receptor developing cancer. The cumulative risk level is calculated by the HRA as 2.34×10^{-7}, much lower than this assessment criterion. Table 9.1 of the HRA concludes that the NMOC air discharges from the landfill may cause a lifetime incremental cancer risk of 6.17×10^{-8}, or 0.0617 additional cases per million people exposed.

Overall, I consider the NMOC discharges and inhalation exposure pathway have been appropriately assessed by the HRA. The HRA adequately demonstrates that NMOC air discharges are highly unlikely to cause an unacceptable risk to human health.

6.5.6.2 Other NMOC health assessment methods

The theoretical approach taken by the HRA is supplemented by a literature review of international studies presented in Appendix A of the HRA and reference to real-world ambient VOC monitoring undertaken at Whitford Landfill in the s92 Response (Tranche 2, Q.74).

Some submissions, including J.M O'Sullivan (NoR submission number 127), reference a study that identified a correlation between proximity of residents to nine Italian landfills and poor health outcomes, including respiratory disease and mortality (Matolini

et al., 2016). The Matolini et al. (2016) study is referenced in the literature review in Appendix A of the HRA, along with other similar studies, largely completed in Europe.

The HRA's literature review concludes that studies regarding population health effects and landfills is unclear as to any health impact correlation and/or required separation distances for landfills. There is a particular absence of data regarding health effects from modern landfills. Some studies find no correlation between health effects and residents' proximity to landfills, while others do. Although generalisation of the studies is difficult, it is notable that some of the landfills where health impact correlations were identified lacked LFG controls and/or accepted hazardous wastes.

Overall, having reviewed various studies relating to general health impacts of living near to landfills (including undefined inhalation of NMOCs), I agree that there is inconclusive evidence for or against. Therefore, I consider the theoretical approach presented by the HRA and reference to ambient air quality monitoring undertaken at comparative landfills is the best available assessment of inhalation effects.

The Whitford Landfill VOC monitoring was undertaken in 2015 and did not detect significant concentrations of VOCs within or near to the landfill. The VOCs recorded were considered indicative of low-levels of fugitive LFG discharges and were also associated with pine trees and on-road vehicles. Benzene was recorded at the highest concentration of any VOC (0.3 µg/m³ over 90-days), likely as a result of on-road vehicle emissions. This benzene concentration was less than 10% of the relevant chronic ambient air quality assessment criterion (3.6 µg/m³, AAAQT).

I consider the Whitford Landfill VOC monitoring was a valuable exercise to measure any impact of fugitive LFG discharges and associated NMOC exposure. I recommend similar studies are periodically undertaken at the Dome Valley Landfill to test the assumptions and conclusions of the HRA throughout the landfilling period.

6.5.7 Mercury

Mercury is a toxic heavy metal that enters a landfill largely through inappropriate disposal of mercury-containing domestic items, such as older-style compact fluorescent lightbulbs. These items are being phased out, so that I consider there is a lower risk of significant quantities of mercury entering the landfill following the proposed opening in 2028.

As described in Appendix H of the HRA and section 6.4.2.5 above, the HRA assumes a mercury content within the LFG from testing conducted in the UK (0.58 µg/m³ within LFG) due to the absence of data from NZ landfills. This concentration did not rank within the top-20 contaminants of concern for specific consideration in the HRA (see HRA Appendix B for the ranking exercise and methodology).

Further assessment regarding the potential health effects of mercury from the landfill is provided in the s92 Response (Tranche 4, Q.102). This s92 Response details that potential air discharges of mercury from the landfill were entered into the dispersion model using a higher assumed mercury content within LFG (2.4 µg/m³, taken from

AP42) and the maximum LFG combustion rate. The dispersion modelling predicts an annual average MGLC of 4.5 $x10^{-6}$ µg/m³ which is insignificant compared to the relevant AAQC (0.33 µg/m³, AAAQT).

I consider that the trace air discharges of mercury are not likely to cause detectable health effects. Further, I note that these landfill mercury discharges to air not a scheduled activity under the Minamata Convention on Mercury, signed by NZ in 2013 and currently in the ratification process.

6.5.8 HAP discharges conclusion

The AQR and HRA assume maximum continuous discharges of HAPs from the Landfill and assess the potential effects of these discharges by comparing dispersion modelling results against AAQC. No HAP is predicted to approach the relevant health-based AAQC at any location where people are likely to be exposed, either as a result of the Landfill's assumed air discharges in isolation or cumulatively with existing background HAPs. Similarly, those HAPs that cause direct ecosystem effects are modelled to not exceed relevant thresholds outside of the Site boundaries. I consider that the AQR and HRA's air quality assessments adequately demonstrate that HAP discharges from the Landfill shall cause no more than minor effects.

6.6 Odour

Odour is a human sensory response to the inhalation of chemicals in the air. A person's perception of odour can vary significantly depending on the sensitivity of the person to that odour. Odour can affect people's quality of life and can have a range of adverse effects, including embarrassment, stress, nausea.

The GPG:Odour describes the difficulty of assessing odour as:

> *Humans have a sensitive sense of smell and can detect odour even when chemicals are present in very, very low concentrations. Given that odour is a human perception, it is extremely difficult to measure an odour using a chemical, mechanical or electronic apparatus as is possible for other nuisance impacts such as noise and light. At present, assessment by human nose is the most reliable method for determining an odour.*

Odour is a key consideration for the siting and management of landfills. The key sources of odour at the Landfill and proposed management measures, as identified from experience with the comparative Redvale Landfill, are detailed in the s92 Response (Tranche 5, Appendix B, Q.72). As above, odour is primarily discharged directly from freshly received waste and from fugitive LFG discharges (which contains odorous VOCs).

The degree of odour effect is described by the GPG:Odour as dependent on the five 'FIDOL' factors: Frequency, Intensity, Duration, Odour character, and Location. In practice, an enforcement officer applies the 'reasonable person test' to assess an

odour effect using these five factors to determine if, overall, the odour is the cause of an 'offensive or objectionable' odour.

The GPG:Odour describes a tool-kit of odour assessment methodologies for proposed odorous activities (see Table A2.3). These include community consultation, learnings from comparative facilities, consideration of the terrain and meteorology and odour dispersion modelling. As described in Table 5.1 of the AQR, a range of these methods have been utilised to predict the likely odour effects from the landfill. In the below assessment, I place different weighting on these methods and consider additional experience from similar facilities to assess the odour effects and how these can be best controlled.

6.6.1 Bin exchange area odour

The bin exchange area is proposed to receive and temporarily store containers of waste. The AQR considers that the sealed municipal refuse bins and generally fresh nature of the short-term stored refuse shall sufficiently mitigate odour discharges so that significant odour effects from this source are unlikely to arise. The AQR concludes, based on experience with the comparative Kate Valley Landfill, that detectable odour in the vicinity of the bin exchange area is not likely to extend beyond 'a few tens of metres.'

The bin exchange area is separated from dwellings by approximately 500 m. The AUP(OP) recommends that a 'refuse transfer station' (where refuse may be stored within an open-sided shed for a number of days) is separated from activities sensitive to air discharges by at least 300 m to minimise odour nuisance effects. I consider that the greater separation of the bin exchange area, and lesser risk of odour discharges as compared to a refuse transfer station, sufficiently demonstrates that odour discharges from the bin exchange area shall cause, at most, minor adverse effects.

6.6.2 Landfill odour modelling

The AQR details how the assumed odour discharges from the landfill tip-face and daily cover area were input into the CALPUFF dispersion model to estimate the 99.5th percentile odour concentrations for comparison against the assessment criteria recommended by the GPG:Odour.

As detailed in section 6.4.2.3 above, the assumed odour discharge rates are based on olfactometry sampling undertaken at Redvale Landfill. To add a degree of conservatism to the modelling, the AQR assumes odour discharges arise from a working area approximately twice the maximum proposed size.

I do not consider the assumed odour discharge rates for the modelling are reliable to enable a quantitative odour assessment. The GPG:Odour recommends against using odour modelling to predict odour effects where odour emissions are difficult to quantify or highly variable. Both of these caveats apply to the Landfill.

The conclusion of the 2017 Odour Modelling Report for Redvale (from which the odour discharge rates are taken) was that capped landfill areas (including that under daily cover) do not discharge notable odour, but that the odour associated with landfills is likely to arise from fresh refuse and abnormal discharges, such as fugitive LFG through cracks in the capping. These variable sources are not captured by the assumed odour emission rates used for the modelling exercise. For the 'normal emission scenario' modelled for the Landfill, the maximum odour concentrations are trivial compared to the recommended assessment criteria of the GPG:Odour, indicating that effective landfill capping and waste receipt management can minimise odour effects. Odour effects from the Landfill therefore need to be controlled by management of variable sources, such as the receipt of refuse and maintenance of the landfill cap.

While I do not place great weight on the quantitative results of the modelling (the MGLCs), I consider the odour modelling is useful to show how odour from the active tip faces is likely to disperse in the air. The isopleth diagrams provided as Figures Appendix A.1-4 of the Modelling Report show that odour from the initial and later filling phases are not likely to notably flow toward any particular off-site receptor, with generally concentric circles of MGLCs emanating from the assumed tip-faces.

6.6.3 Comparative landfill odour assessment

A comparative odour assessment, drawing on complaint data for Redvale Landfill, is presented in the s92 Response (Tranche 5, Appendix B, Qs.71 & 72). This assessment notes that there are approximately 142 dwellings within 1-2 km of Redvale Landfill, with 5 of these dwellings making the vast majority of odour complaints from any dwelling outside of the 1 km buffer area (97 of 116 complaints, 2014-2018).

This accords with my experience in auditing compliance and the odour complaint histories for Redvale and Whitford Landfills. These complaints indicate that there are intermittent odour events that can cause nuisance to some nearby residents to the point of telephoning council or WMNZ. As discussed in section 4.1 of the GPG:Odour, relying on complaint records is an uncertain odour assessment method as there are various reasons for people lodging a complaint or not.

The complaint histories for Redvale and Whitford landfills illustrate that the size and height of uncovered waste is important, along with minimising or remedying process upsets. For example, in 2017, Redvale received dozens of complaints that were eventually attributed to issues with the LFG collection system (blockages in the condensate pots). Other periods of increased complaints are associated with the receipt of specific waste types, such as wastewater treatment plant sludges that appear to react with other wastes to discharge odorous VOCs, or the establishment of new cells with an initial 'fluff layer' of domestic refuse with less cover.

At both of these comparable landfills, there are more residential dwellings within 5 km than exist near to the proposed Dome Valley Landfill. As shown in AQR Appendix A, there are 24 dwellings within 2 km of the Dome Valley Landfill, compared to approximately 200 sensitive receptors (including a primary school) within 2 km of Redvale Landfill and approximately 100 dwellings within 2 km of Whitford Landfill.

Therefore, I consider there is a lesser risk of significant odour effects for the Landfill than at Redvale or Whitford Landfills.

The topography and meteorology at Dome Valley also assists to reduce potential odour impacts. As described in section 5.2 of the AQR, the nearest dwellings to the Landfill are separated by a ridge-line that shall inhibit katabatic flows of odorous air from impacting these dwellings. Under cool conditions, the meteorological model indicates that air shall flow north-west, toward the centre of the WMNZ land-holdings.

While I consider there is less odour risks than the comparative landfills, I recommend that the experiences at these landfills are useful to inform mitigation and management strategies to minimise the odour risks at the Dome Valley Landfill. Particularly, the Waste Acceptance Criteria, limitation of the working face size, and landfill cover are all important aspects for odour minimisation.

The low odour risk is also illustrated by the fact that few submissions raise potential odour effects as a key concern. Some submissions from the owners and occupiers of nearby farms (for example, see 9711: M.Bacon & 9998: Waterfall farm (Whaiwhiu) Ltd) reference general concerns regarding potential odour nuisances, although specific concerns are not raised. This is understandable in the absence of real-life experience with odour. It is not known if greater concerns would be raised following some years of experience to the intermittent odours that may arise from the Landfill.

For a comparative odour assessment between the proposed Landfill and Redvale Landfill, it is particularly notable that for the first 15-20 years of Redvale's operation, odour complaints were rare (in the order of 5 per year). This changed in 2014, from when far greater numbers of complaints were received (more than 50 per year). In my view, the increased complaints for Redvale Landfill could reflect ill-feeling in the community regarding:

- A submission by WMNZ on the then Proposed Auckland Unitary Plan suggesting a 'Special Purpose Zone' for the Redvale Landfill site with a surrounding 'Proximity Overlay', which was viewed as potentially impacting the subdivision rights of surrounding rural properties;

- A land-use consent application by WMNZ to extend the filling period of Redvale Landfill beyond that originally envisaged.

The GPG:Odour stresses the importance of clear communication with neighbours as a means to reduce and manage perceived odour effects. It appears that particularly associated with the above two actions, WMNZ lost a degree of tolerance for odour effects that may have existed in years prior to 2014, likely exacerbating the number of complaints.

Whitford Landfill has had a more stable odour complaint history over the years. Notable process upsets, such as the leachate treatment pond turning anaerobic when the aerators failed in mid-2015, the establishment of fluff layers with limited cover

materials and issues with spacing out arriving refuse trucks in 2018, are usually able to be determined as the cause of periods of increased complaints.

Taking the above comparative experiences into account, I recommend a range of further odour mitigation measures at the Landfill as recommended conditions to minimise odour risks. These additional measures include routine field odour inspections (at least weekly by landfill staff) and a biennial independent expert review of odour records and management. With these measures in place, I consider the actual and potential odour effects of the proposed Landfill are minor.

6.7 Dust (operational phase)

As described in section 7 of the AQR, dust from the landfill operations can arise from earthworks undertaken to construct new cells and stockpile cover, traffic movements and the receipt of dusty loads. Of these potential dust sources, and based on my experience with comparative landfills, I consider vehicle movements to present the greatest risk.

Dust particles generated by earthworks, vehicle movements and the receipt of waste are likely to be generally of a larger size fraction, greater than 10 µm in diameter. As described by the GPG:Dust, these larger particles primarily cause nuisance effects such as soiling and typically fall out of suspension in the air within tens of metres from the source. A smaller portion of the dust from the landfill is likely to be within the PM_{10} size fraction.

A range of mitigation measures are proposed by the AQR and Proposed Conditions to minimise dust discharges. These include specific management during the receipt of notably dusty loads (such as immediate burial and the use of water sprays) the use of sealed roads and a wheel wash for any vehicle using unsealed haul roads.

The s92 Response (Tranche 2, Q65 & 66) details that dust discharges from the landfill are not expected to be hazardous. Asbestos is to be controlled in accordance with the requirements of the *Health and Safety at Work Act 2015* and associated *Hazardous Substances (Asbestos) Regulations 2016* so that no detectable asbestos particles are likely to be discharged from the tip-face. The dust controls employed at the tip-face are considered adequate to minimise potential ecological impacts due to deposition or any (unlikely) toxic characteristics.

Regarding the potential discharges of dust from vehicle movements, I note that these are to be controlled by sealing the areas of primary movements, and use of a wheel wash to prevent tracking. Proposed conditions of consent relate the establishment and use of dust controls to minimise tracking onto the public road. I consider that any level of tracking of dirt onto State Highway 1 would be inappropriate, although more due to the risk to vehicle safety rather than the potential that tracked material could give rise to a dust nuisance.

Enforcement action has been taken at Redvale Landfill for tracking of dirt onto Dairy Flat Highway. At Redvale, there is limited sealing of haul-roads and large numbers of

trucks accessing the tip-face. The proposed Landfill differs in that most waste shall be delivered to the Bin Exchange Area without trucks leaving sealed accessways. Trucks that do travel to the tip-face shall pass through a wheel wash some distance from the exit so that the risk of tracking onto the State Highway is reduced as compared to Redvale.

As a rural area where unsealed roads and farm races are common, a degree of tolerance is provided for dust (see AUP(OP) Policy E14.3(3)). I consider this tolerance particularly applies to dust that may arise from vehicle movements. As noted above in relation to odour, the landfill is well separated from dwellings and other activities sensitive to air discharges. I consider that this separation distance coupled with the proposed mitigation measures is adequate so that the off-site dust effects are minor.

6.8 Risk of unplanned air discharges and associated effects

The operation of landfills presents a risk of air discharges arising from unplanned incidents. These include fugitive LFG discharges through cracks in the landfill capping or from leaks in the extraction system and HAP discharges from fires.

It is important to note that these potential discharges do not form part of the proposal; WMNZ does not seek permission to discharge contaminants into air from such abnormal/emergency events. However, section 104(1)(a) of the RMA requires an assessment to have regard to any actual and potential effects on the environment of allowing the activity. I consider that the potential effects arising from unplanned air discharges are an important aspect of the proposal that requires assessment given the risk of these events occurring.

The potential discharges of HAPs from landfill fires are the potential air quality risk that I am most concerned about. I consider that fugitive discharges of LFG pose a less substantive risk of effects and these risks are largely adequately mitigated by the measures discussed below.

There is little assessment of these potential effects in the AEE, AQR, HRA and RMR. Further information was sought under s92 of the RMA, but only brief responses were supplied as part of the s92 Response (Tranche 2, Q85; Tranche 3, Q105). Focus is instead placed on proposed mitigation measures to reduce the risk of the occurrence of unplanned air discharges. A rationale for the lack of specific detail within the RMR is included in the s92 Response (Tranche 2, Appendix E & Tranche 5, Appendix J).

6.8.1 Proposed mitigation and contingency measures for unplanned emissions

6.8.1.1 Fugitive LFG

The risks of fugitive LFG discharges are proposed to be minimised by regular monitoring of the LFG extraction system and capped areas of the Landfill. The LFG flow rate to the Energy Facility is proposed to be continuously monitored (PC.113), supplemented by six-monthly tests of the flow rate at each extraction well-head (PC.112 & 114). Visual inspections of capped areas are to be undertaken weekly

(PC.108), with Surface Emission Monitoring using a hand-held Flame-Ionising Device once-every three months (PC.109). The Surface Emission Monitoring procedures are described in the draft Landfill Management Plan, and involve a walk-over of intermediate and final capped areas along a 30 m grid pattern, holding the gas meter just above the capped surface to record methane concentrations (detection limit 50 ppm) along the route.

As discussed in section 7.1.3.2 below, I consider that further monitoring for fugitive LFG (including Optical Remote Sensing techniques) would better comply with the Best Practicable Option and further reduce the risks of fugitive LFG emissions. However, I agree that the proposed measures for maintaining the LFG extraction system and capping are generally adequate to ensure that fugitive LFG is not likely to cause significant off-site effects.

As discussed in section 6.5.6, the HRA estimated the maximum fugitive LFG discharges from the uncapped tip-face as 55 m³/hour using conservative assumptions, and then doubled this estimate to 110 m³/hour for additional conservatism in the subsequent assessment. The s92 Response (Tranche 3, Q105) notes that this level of conservatism ensures that the potential effects of any fugitive LFG discharges from both the tip-face and any cracks in the capped areas (prior to their identification and remediation by the above monitoring) are adequately assessed. I agree with this and consider that the HRA therefore adequately accounts for potential LFG discharges from any occurrence of cracks in the landfill cap prior to their remediation.

6.8.1.2 Landfill fires

Monthly LFG extraction wellhead monitoring is proposed (PC.112). This monitoring shall enable the detection of conditions conducive to, or indicative of, sub-surface landfill fires. The concentrations of Nitrogen, Oxygen, CO, and temperature are all indicators used for landfill fire management. Balancing the extraction rates of the wellheads, placing additional capping material, and re-testing reduces the risk of aerobic (flammable) subsurface conditions. The overall purpose of the LFG extraction system is outlined by PC.98: to maximise LFG extraction while minimising the risk of landfill fire due to over extraction.

The LMP does not highlight landfill fires as a notable risk (there is no mention of fires in the LMP: 'Volume 2: Summary of risks and risk management'). However, the Waste Acceptance Criteria detailed within the WAC and LMP includes some measures that shall reduce the risk of fires (prohibited items include hazardous wastes with flammable characteristics). Daily cover is proposed to be inert soil or similar materials only and compacted to a minimum depth of 150 mm to reduce the potential for aerobic conditions in the waste mass. Potentially combustible materials such as automotive shredder residue (floc) or tyres are not to be used as cover materials. The LMP does not include any specific measures for monitoring for fires by other methods (Optical Remote Sensing or other temperature or visual).

As a contingency measure, WMNZ propose to have an on-site water source available for fire-fighting purposes (see PC.97). The FENZ submission (#9575) reviews the

adequacy of the on-site water sources and appears generally supportive of the proposal. A series of large stormwater ponds are proposed which should provide an adequate water source for fire-fighting, although I invite further comments by FENZ or other emergency response experts on the suitability of drawing water from these ponds using helicopter monsoon buckets and during drought conditions.

A specific Site Emergency Management Plan (SEMP) detailing landfill fire risk management and contingency response measures is proposed by PC.156. A draft SEMP is provided in the LMP (s92 Response Tranche 5, Appendix A, LMP s3.91). The draft SEMP details contingency response measures for fire incidents only (no preventative management measures are included). The response measures escalate from WMNZ staff using water and earthmoving equipment to douse and suffocate smaller fires with escalation points to contact FENZ for specialist response as they deem necessary. In the event that smoke goes beyond the boundary of the Site, a contingency for notifying neighbours is included in the SEMP.

6.8.2 Landfill fire frequency and effects: Learnings from comparative facilities

Landfills present a unique risk of fires given the biological processes that occur within the waste mass and handling of large volumes of waste where the hazard characteristics are not certain. There are two types of landfill fires: surface and sub-surface fires. Surface fires are typically caused by inappropriate materials received as waste, such as hot ashes and more recently, lithium-ion batteries. Sub-surface fires arise when buried organic wastes are exposed to air, increasing the temperature through aerobic decomposition, and spontaneously combusting in the presence of methane. For most landfill fires, the cause is not discovered.[3]

A number of submitters raised concerns regarding the risks of landfill fires, particularly due to the remote nature of the Landfill and lack of resource and expertise held by the local volunteer fire brigade. The FENZ submission did not raise these concerns.

Notable studies and guidance suggest that the risk of landfill fires has increased over the past few decades.[4] In the upper North Island, there are two very recent examples of landfill fire events that several submitters reference to support concerns regarding the potential effects arising from such incidents. Purewa Landfill near Whangarei suffered a fire in January 2020. Hampton Downs Landfill in the northern Waikato had a series of fires in March-April 2019, with the largest of these requiring active fire-fighting over multiple days to bring under control. I have liaised with peers at Northland Regional Council and Waikato Regional Council to obtain details of the circumstances and outcomes of these fires, as I consider they are relevant to this assessment of effects given the comparability of the activities.

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[3] Federal Emergency Management Agency: United States Fire Administration (FEMA). 2002., Landfill Fires: Their magnitude, characteristics, and mitigation.

[4] Fattal, A., Kelly, S., Liu, A., Giurco, D. 2016., Waste Fires in Australia: Cause for Concern? Prepared for the Department of Environment, Canberra by the UTS Institute for Sustainable Futures, Sydney.

Although I shall focus on these two recent local events for this review, I note that many more landfill fires occur around the world (although are frequently not reported) as summarised by overseas reports prepared for the UK Environment Agency (2007), UK Fire Service (2017), US Federal Emergency Management Agency (2002), Australia Dept. for Environment (2016) and others. Some of these landfills differ in design and operational control to that proposed by WMNZ. One such example is a fire in 2012 at an Iowa landfill that utilised crumbed tyres as the initial layer above the liner; the burning of this exposed 3 foot-thick layer of tyres predictably caused a severe fire as reported by Singh et al. (2015) and Barker-Lemar Consultants (2018).

6.8.2.1 Purewa Landfill fire, January 2020

A surface fire occurred at Purewa Landfill, near Whangarei, on 25 January 2020. I have reviewed an incident report submitted to Northland Regional Council from Northland Waste Ltd, dated 11/02/2020.

The fire occurred near the surface of a 'fluff layer' of municipal refuse being laid over the base of a new cell shortly after operations finished on a Saturday afternoon. The fluff layer was approximately 2 m deep with limited daily cover applied. No LFG extraction system was yet installed within the fluff layer of refuse, but damage to an LFG extraction line occurred due to the fire spreading to the grassed cap of a neighbouring cell.

FENZ arrived on-site within 40 minutes of the site closing for the day (at which time operators verified there had been no smoke). Four helicopters with monsoon buckets were utilised over a period of five hours to control the fire. The fire control efforts by site staff and contractors continued overnight, with the fire declared largely extinguished by FENZ at 0700 the following day, 18 hours after it had started. Site staff continued hot-spot monitoring and management throughout the following week.

The exact cause of the fire could not be identified, but the incident report notes that the nature of refuse and compaction of the fluff layer meant there was an increased fire risk from lithium-ion batteries, with hot ashes within refuse also being a possibility. The severity of the fire was exacerbated by dry, windy conditions, the proximity of dry grass on a stabilised slope immediately alongside the cell, and lack of monitoring (the timing meant that no-one was on-site at the time of the fire).

6.8.2.2 Hampton Downs Landfill fire, March 2019

A series of fires occurred in late March 2019 at Hampton Downs Landfill, near Mercer, with the largest of these occurring from 31 March to 3 April 2019. I have reviewed an incident report submitted to Waikato Regional Council, prepared by Envirowaste Services Ltd (undated) that details the 31 March 2019 fire and have discussed further background regarding the fires with Waikato Regional Council staff.

In the early hours of 28 March 2019, a near-surface fire at Hampton Downs Landfill was extinguished with assistance from FENZ within four hours. No details of what

caused this fire were available. A second flaring of waste in the same location was extinguished by on-site staff the following day.

On the morning of Sunday 31 March 2019, neighbours of the landfill alerted landfill staff (who were not present on site) to a significant fire. Around this time, an external remote monitoring company contracted by Envirowaste Services Ltd to monitor a heat-sensing camera erroneously coded an automated alert as a false-alarm. Approximately two hours later, staff arrived on site and FENZ were contacted. By this time, the fire had become significant as the wind increased over the morning. The fire was located at depth in the working tip face area in approximately the same location as the previous two fires.

Four helicopters were utilised to fight the fire over the afternoon of 31 March, contracted by both site staff (some of whom had fire-fighting experience) and FENZ. FENZ remained in control of the site, fighting the fire over the next three days until extinguishing the fire adequately on the morning of 3 April 2019. Site staff continued to monitor and remediate hot-spots over the following two weeks.

There was significant media coverage of the fire. The smoke plume covered approximately 2-3 km from 31 March to 2 April, and varied in direction with the wind. Residents were advised to disconnect roof-water tanks by FENZ, leading to widespread concern of effects. Nuisance odour and smoke from the fire were noted by residents up to 7 km away, intermittently depending on the wind direction which varied over the three days. The presence of ash was mentioned by one resident approximately 2.5 km from the landfill, but no evidence of ash deposition was observed at any dwellings.

Air quality monitoring was conducted in areas impacted by the smoke plume on 2 and 3 April. This monitoring did not identify notably increased concentrations of PM_{10} or VOCs in areas outside of the landfill's boundaries. Fluctuating PM_{10} concentrations were observed immediately near to the landfill with some high instantaneous spikes recorded, but a fixed sample taken 1.7 km downwind of the landfill over 2 April identified a 24-hour average PM_{10} concentration of 6 $\mu g/m^3$.

The cause of the 31 March fire was identified as likely to have been a reignition of the previous 28 March fire, which was determined as likely caused by an ignition source in recently deposited refuse. Several improvement opportunities were identified as a result of the fires, both to operational controls and contingency measures.

6.8.3 Unplanned air discharges and effects conclusion

Overall, I agree that the lack of reporting of landfill fires identified by Fattal, et al. (2016) and differing practices at landfills hampers the ability to quantify the risk of such a fire occurring at the Dome Valley Landfill with any accuracy. However, I consider that the risk from surface and sub-surface fires is certainly higher than the likelihood and consequence ratings qualitatively assigned by the RMR.

I consider it 'Likely' that a surface fire shall occur over the lifetime of the Landfill, even with the proposed management measures in place. However, drawing on the experience of the above incidents at Purewa and Hampton Downs Landfills as a guide, I consider that the incidence of a surface landfill fire is not likely to cause significant off-site air quality effects provided that adequate contingency measures are in place to promptly extinguish a fire. The fires at Purewa and Hampton Downs were responded to and brought under control before significant air discharges occurred despite sub-optimal management and response measures that required remedial attention.
I consider that superior contingency controls can be implemented at the Dome Valley Landfill than were present at these other landfills so that most surface fires could also be brought under control without significant off-site effects, noting that these contingency measures should be determined in conjunction with FENZ.

I have less concern regarding the likelihood of sub-surface fires at the Landfill given the LFG management controls in place. From my reading of available international reports, it appears that sub-surface fires most typically arise where landfills are not constructed and monitored to the same standard as proposed for Dome Valley. Although the likelihood of sub-surface fires is low, the consequences of such an event are high unless the fire is promptly identified and remedied. Hence, it is important that adequate monitoring is undertaken.

Fugitive LFG discharges can be similarly controlled by the proposed management measures so that significant off-site air quality effects are not likely. As above, I agree that these discharges are not able to be quantified, but that the conservative assumptions for the dispersion modelling exercise in the HRA adequately accounts for their potential.

As discussed below in section 7.3, I consider that further management measures (such as remote sensing methods) shall reduce the overall risks (likelihood and consequences) of landfill fires and subsequent air quality effects.

6.9 Assessment of air quality effects conclusion

Section 9.4.4 of the AEE concludes that the adverse effects arising from the air discharges from the Landfill are less than minor. Particularly, it is noted by the AQR and HRA that:

- No HAP discharge is modelled to cause off-site concentrations to approach relevant ambient air quality assessment criteria for the protection of health and ecosystems;
- The lifetime health risks from exposure to HAPs are within acceptable thresholds;
- Odour and dust can be managed so that offensive or objectionable effects are not likely to arise.

I generally agree with the applicant's air quality assessment. I consider the AQR, HRA and s92 Response collectively provide a comprehensive and robust assessment of the

air quality effects arising from these anticipated air discharges. For anticipated air discharges, the applicant's assessment contained several conservative assumptions, so that I consider the actual effects of these air discharges are likely to be generally less than those detailed in the AQR and HRA.

I consider that the proposed conditions of consent generally control air discharges so that significant off-site effects are unlikely to arise. The separation distance and proposed mitigation measures are generally sufficient to minimise risks associated with odour and dust. Accounting for the proposed conditions, I consider that significant or unacceptable adverse effects are unlikely to occur at any location beyond the boundary of the site as a result of the Landfill's air discharges.

I have sought to carefully analyse the basis of the assumptions and assessment made on behalf of the applicant, accounting for the concerns raised by submitters and the necessity to minimise air quality effects. My assessment has largely drawn on national best practice expert recommendations for air quality assessments and my experience with the comparative Redvale and Whitford Landfills.

While I agree that the AQR and HRA's modelled compliance with the relevant ambient air quality assessment criteria for HAPs demonstrates significant health effects are not likely to arise, I note that many HAPs do not have a safe threshold for exposure. Overall, I consider the increase in ambient HAP concentrations for nearby sensitive receptors (occupants of dwellings) above the existing negligible baseline levels represents a minor effect.

One area of disagreement in my review is the potential air quality risks arising from unplanned/abnormal incidents such as landfill fires. I consider that these risks must be carefully managed to ensure they are as low as reasonably practicable, requiring further measures than those outlined in the AEE and the RMR.

Overall, I consider the actual and potential air quality effects arising from the proposed Landfill are best described as 'minor.'

As stated in the scope above, my air quality assessment does not account for greenhouse gas emissions and resulting climate change effects in accordance with section 104E of the RMA.

7 Statutory considerations

7.1 Statutory considerations: Section 104(1)(b)

In section 13 and Appendix J of the AEE and section 9 of the AQR, the applicant assesses the site's air discharges against the relevant statutory planning documents. I consider that the relevant statutory documents for assessing the air discharges from the Landfill (within the scope identified in section 3.1) are the National Policy Statement for Renewable Electricity Generation 2011 (NPS:REG), the NES:AQ and AUP(OP).

As a Non-Complying Activity, the air discharges must satisfy at least one of section 104D(1)(a) or (b). As above, I consider that the adverse effects of the proposed air discharges to the environment (when accounting for the proposed mitigation measures) can be deemed 'minor'. The one aspect where I recommend further controls to avoid the potential of more significant adverse air quality effects relates to monitoring and contingency measures for unplanned air discharges from landfill fires. I recommend this could be addressed by conditions of consent.

Section 104D(1)(b) requires that the air discharges from the Landfill must not be 'contrary to' the objectives and policies of the AUP(OP). This is assessed in section 7.1.3 below.

7.1.1 National Policy Statement for Renewable Electricity Generation 2011

Section 2.4.3 of the AEE outlines that the energy to be provided by the extraction and combustion of LFG is considered to be a form of renewable biomass energy and is therefore provided for by the NPS:REG. I agree with this categorisation, noting that the *NPS:REG Technical Guide* (EECA, 2013) specifically refers to organic waste within landfills as a source of renewable biomass energy.

The Policies of the NPS:REG directs that the benefits of renewable energy generation activities shall be recognised, particularly the reductions of greenhouse gas emissions available. I note that section 104E of the RMA provides for the assessment of greenhouse gases within this framework of renewable energy provision. Within this scope, I agree that the proposed Landfill's generation of electricity from LFG enables a reduction in the discharge of greenhouse gases from electricity generation using fossil fuels.

7.1.2 Resource Management (National Environmental Standards for Air Quality) Regulations 2004 (amended 2011)

7.1.2.1 Prohibited air discharge activities (Regulations 6-12)

None of the activities prohibited by Regulations 6-12 of the NES:AQ are proposed to occur at the Landfill. Notably the burning of waste shall be specifically prohibited by a Proposed Condition (see Appendix G of the AEE) of consent (PC.95) in compliance with Regulation 6.

7.1.2.2 Ambient air quality standards (Regulations 13, 14, 17, 20 & 21)

Discharges of HAPs from the Landfill are not expected to cause an exceedance of the Ambient Air Quality Standards defined in Schedule 1 of the NES:AQ:

- The maximum concentration of PM_{10} (24-hour average) estimated to occur as a result of the combustion of LFG at the nearest location where people are likely to be exposed, added to estimated background concentrations, is 33 µg/m³ compared to the AAQS of 50 µg/m³.
- The maximum concentration of NO_2 (1-hour average) estimated to occur beyond the boundary of the site is 124 µg/m³ compared to the AAQS of 200 µg/m³.
- The maximum concentration of SO_2 (1-hour average) estimated to occur beyond the boundary of the site is 33 µg/m³ compared to the lower AAQS of 350 µg/m³ and upper AAQS (not to be exceeded) of 570 µg/m³.
- The maximum concentration of CO (8-hour average) estimated to occur beyond the boundary of the site is 5,704 µg/m³ compared to the AAQS of 10,000 µg/m³.

The Site is located within the Auckland Rural Airshed. This airshed is not currently considered to be polluted under the definition of Regulation 17(5) of the NES:AQ and therefore, Regulation 17 of the NES:AQ (relating to the restriction of granting consents for the discharges of PM_{10}) is not relevant to this application.

Given the compliance with the AAQS, NES:AQ Regulations 20 & 21 do not restrict the grant of consent.

7.1.2.3 Control of greenhouse gas emissions at landfills (Regulations 26 & 27)

NES:AQ Regulations 26 & 27 apply to the Landfill from the time that it contains more than 200,000 tonnes of waste as it has a total capacity greater than 1 million tonnes and shall accept putrescible/biodegradable waste (refer to Regulation 25).

The AQR and proposed conditions detail that LFG shall, in the long-term, be extracted from the landfill and destroyed by combustion within a combination of generators and flares in compliance with NES:AQ Regulations 26 & 27 (PC.101). Regulation 26 states that LFG must be destroyed by flaring (within a principal flare designed and operated in accordance with the parameters detailed by Regulation 27) or used as fuel for generating electricity.

I agree that the long-term design of the Landfill, featuring a combination of generators and principal and back-up flares to destroy LFG, complies with Regulations 26 & 27. Further, proposed conditions of consent state that concentrations of methane above the surface of the landfill (where capped with intermediate or final cover) shall not exceed 0.5% by volume in air (PC.104), in accordance with NES:AQ Regulation 26(2)(a).

However, Section 3.3.3 of the AQR states that this active LFG extraction and flaring are not likely to occur until at least 18 months after the first waste placement, when the waste depth is at least 15 m. If monitoring shows that LFG generation is causing methane concentrations of concern for health and safety during the early period, a 'pencil flare' (that does not meet the minimum standards of Regulation 27) may be used as an interim measure. I note that the volume of waste after 18-months of operation is likely to exceed the 200,000-tonne trigger for the applicability of Regulations 26 & 27 (assuming a filling rate of 500,000 tonnes/year).

During the early phase of the Landfill operation, the AQR notes that methane generation and resulting discharges shall be limited owing to the absence of methanogenic conditions. I agree that this poses a challenge for strict compliance with Regulations 26 & 27 during the early phase of filling. However, I recommend that further evidence of compliance with NES:AQ Regulations 26 & 27 is required for these early periods of waste deposition.

7.1.2.4 Proposed NES:AQ amendments 2020

In February 2020, the Government announced proposed amendments to the NES:AQ. Public consultation on the proposed amendments closed on 31 July 2020. While the proposals currently have no statutory effect (no decisions have been made), I consider it prudent to reference the proposed amendments here for completeness.

It is proposed to introduce new AAQS for $PM_{2.5}$ (24-hour and annual averages) and change the wording of Regulations 16-17 so that $PM_{2.5}$ is the primary measure of an airshed's particulate pollution status. The proposed $PM_{2.5}$ AAQS match the existing AAAQT referenced in section 6.5.1 above (and the WHO AAQG). The existing PM_{10} AAQS is proposed to be retained, but without significant consequences for exceedances. As detailed in section 6.5.2, the Landfill is likely to comply with the AAAQT for $PM_{2.5}$ and hence, also the proposed AAQS.

Other proposed amendments are limited to increasing restrictions to new solid fuel heaters and significant industrial emitters of mercury compounds to comply with the international Minimata Convention on Mercury.

The Landfill is not a Prohibited Activity under the Minimata Convention (these activities are largely restricted to outdated chemical production techniques that do not exist in New Zealand) and is not an activity included in Annex D of the convention that requires an assessment against Best Practice guidelines for mercury controls (applies to activities that discharge smaller quantities of mercury such as large-scale coal combustion and waste incineration). The Landfill's discharges of mercury to air are assessed in section 6.5.7 above.

I consider the proposed amendments to the NES:AQ are not likely to impact the Landfill's compliance with the NES:AQ as currently in force.

7.1.3 Auckland Unitary Plan (Operative in Part)

Objectives and policies relevant to air quality are contained at a Regional Policy Statement (RPS) level in AUP(OP) Chapter B7.5. Air, and at a Regional Plan level in AUP(OP) Chapter E14. Air Quality. These relevant objectives and policies are operative and those particularly relevant to this application are included below.

7.1.3.1 Regional Policy Statement: Chapter B7.5. Air

B7.5.1. Objectives

(1) The discharge of contaminants to air from use and development is managed to improve region-wide air quality, enhance amenity values in urban areas and to maintain air quality at appropriate levels in rural and coastal areas.

(2) Industry and infrastructure are enabled by providing for reduced ambient air quality amenity in appropriate locations.

(3) Avoid, remedy or mitigate adverse effects from discharges of contaminants to air for the purpose of protecting human health, property and the environment.

B7.5.2. Policies

(1) Manage discharge of contaminants to air from use and development to:

(a) avoid significant adverse effects on human health and reduce exposure to adverse air discharges;

(b) control activities that use or discharge noxious or dangerous substances; …

(d) protect activities that are sensitive to the adverse effects of air discharges;

(e) protect flora and fauna from the adverse effects of air discharges;

(f) enable the operation and development of infrastructure, industrial activities and rural production activities that discharge contaminants into air, by providing for low air quality amenity in appropriate locations;

I consider that significant management and control measures are required as conditions of consent in order to maintain air quality at an appropriate level within the rural area and avoid significant adverse effects on human health and flora in order to comply with the above RPS objectives and policies.

As identified in the above assessment of effects, notable increases in HAP exposure shall occur in the surrounding area as a result of the proposed air discharges. While the AQR and HRA adequately demonstrate that significant adverse effects to human health are not likely to occur as a result of these exposures, I note there is no 'safe threshold' for HAP exposure and therefore, the proposed HAP discharges must be managed and controlled to adequately protect sensitive activities.

Significant effects to flora and fauna are not likely to occur as a result of air discharges, as concluded in section 6.5.

The Landfill is defined as 'Infrastructure' under Chapter J of the AUP(OP). Therefore, Objective B7.5.1(2) and Policy B7.5.2(1)(f) apply to the application.

7.1.3.2 Regional Plan: Chapter E14. Air Quality

E14.2. Objectives

(1) Air quality is maintained in those parts of Auckland that have high air quality, and air quality is improved in those parts of Auckland that have low to medium air quality.

(2) Human health, property and the environment are protected from significant adverse effects from the discharge of contaminants to air.

(3) Incompatible uses and development are separated to manage adverse effects on air quality from discharges of contaminants into air and avoid or mitigate reverse sensitivity effects.

(4) The operational requirements of light and heavy industry, other location-specific industry, infrastructure, rural activities and mineral extraction activities are recognised and provided for.

E14.3. Policies

(1) Manage the discharge of contaminants to air, including by having regard to the Auckland Ambient Air Quality Targets in Table E14.3.1, so that significant adverse effects on human health, including cumulative adverse effects, are avoided, and all other adverse effects are remedied or mitigated.

(3) In the Rural – Rural Production Zone, Rural – Mixed Rural Zone, Rural – Rural Coastal Zone, Future Urban Zone, Auckland Council District Plan – Hauraki Gulf Islands Rural 1-3 and Landform 1-7:

a. recognise that rural air quality is generally a result of dust and odours, and other emissions generated by rural production activities;

b. avoid, remedy or mitigate adverse effects of dust and odour discharges;

c. provide for minor and localised elevation of dust and odour levels where the air discharge is from:

i. rural production activities or rural industry; or

ii. the operation of infrastructure or location specific industry; or …

d. require adequate separation between use and development which discharge dust and odour and activities that are sensitive to these adverse effects.

(6) Avoid the discharge of contaminants to air from industrial activities in rural zones and the coastal marine area except where the activity is: …

c. *infrastructure requiring large separation distances that cannot be provided for within urban areas; or …*

(8) Avoid, remedy or mitigate the adverse effects on air quality from discharges of contaminants into air by:

a. *using the best practicable option for emission control and management practices that are appropriate to the scale of the discharge and potential adverse effects; and*

b. *adopting a precautionary approach, where there is uncertainty and a risk of significant adverse effects or irreversible harm to the environment from air discharges.*

(9) Avoid, remedy or mitigate the adverse effects on air quality beyond the boundary of the premises where the discharge of contaminants to air is occurring, in relation to:

a. *noxious or dangerous effects on human health, property or the environment from hazardous air pollutants; or …*

With regards to the adverse air quality effects that must be avoided, remedied or mitigated in accordance with Policies E14.3(1 & 9), I consider that the assessment of effects detailed in section 6 responds to these requirements. I note that a range of conditions of consent would be necessary to ensure that the proposed air discharges are adequately controlled to comply with these policies. I consider that the dispersion modelling exercise detailed in the AQR adequately demonstrates that no exceedance of the AAAQT is likely to occur, in accordance with Policy E14.3(1).

The Landfill is located within a Rural – Rural Production Zone, where Policy E14.3(3) anticipates odour and dust from rural production activities. Minor and localised elevated levels of odour and dust from the operation of 'infrastructure' such as the Landfill are also provided for by this policy. This tolerance is accounted for by the above assessment of effects (see sections 6.6 & 6.7). However, the provision for odour and dust from the Landfill is balanced by a requirement that the effects of these discharges are sufficiently avoided, remedied and mitigated, including by adhering to adequate separation distances to activities sensitive to air discharges (such as dwellings). As detailed by the AQR, the Landfill footprint and Energy Facility are separated from dwellings by at least 1 km, which I agree is a reasonable degree of separation to comply with this condition. A range of specific conditions of consent are recommended to ensure that odour and dust discharges from the Landfill are adequately controlled to comply with this policy and avoid 'offensive or objectionable' effects.

Policy E14.3(8) requires that air quality effects are controlled by adhering to the Best Practicable Option (BPO, as defined by s2 of the RMA) and adopting a precautionary approach.

I consider that the overall BPO for air discharges from the Landfill is to minimise the potential for these occurring at all by prioritising the waste hierarchy: Reduce > Reuse > Recycle > Recover. As detailed in the s92 Response (Tranche 2, Q61), the responsibility for minimising air discharges from the Landfill by reducing waste being received only partially lies with WMNZ and restrictions on this are governed by other

legislative frameworks. I agree that the origin of the waste, and measures that other parties (including citizens) could take to reduce the portion of that waste that is sent to the Landfill, is outside of the scope of this review of air discharges from the Landfill.

I note that the Landfill design contains elements of Recovery, where some of the bioenergy available in the waste is to be recovered by LFG extraction and used for electricity generation. I consider the air discharges from this better meets BPO than if LFG were only flared without any bioenergy recovery.

It is proposed to install up to 12 generators progressively until 20 years after waste placement begins as LFG generation increases. This shall generate up to 12 MW of electricity that shall be provided to the national grid. The rationale for the selected number of generators and comparison to BPO is provided in the s92 Response (Tranche 2, question 62). I agree that if the actual LFG generation rate differs from that predicted, it may be suitable to apply to vary the air discharge consent to utilise more LFG for electricity generation rather than flaring, but that the currently predicted 12 MW of generation is a reasonable assumption for the purposes of this assessment.

I have reviewed the proposed conditions of consent and Draft LMP and consider the controls and management measures described in these documents generally comply with BPO. Particularly, I consider that the following aspects of the Landfill's air discharge controls generally comply with BPO:

- The Bin Exchange Area shall enable more efficient receipt of waste to the Landfill, minimising dust and odour;
- The sealed vehicle accessways (Bin Exchange Area, entranceway and haul-road) and wheel wash system shall minimise dust;
- The proposed maximum working tip-face area and use of soil as daily cover to at least 150 mm depth is suitable to minimise fugitive discharges of odour and LFG;
- The LFG extraction system and landfill capping and the proposed routine monitoring of this system shall minimise both the risks of fugitive LFG discharges and sub-surface fires;
- The destruction of LFG within the generators and flares, in accordance with the requirements of the NES:AQ and recommendations of the Landfill Guidelines to minimise discharges and resulting effects of HAPs;
- The low-temperature LEU, with a maximum heating temperature to minimise HAP generation and discharges passing through a flare to destroy VOCs;
- The use of odour suppression sprays and water to minimise off-site odour and dust effects;

- The proposed Waste Acceptance Criteria, where hazardous wastes shall not be accepted in accordance with the Landfill Guidelines, to minimise air discharges;

There are some areas of the proposal that I consider should be improved to better comply with BPO. These are largely taken from experience with Redvale and Whitford Landfills, along with my research into the monitoring techniques utilised at comparable landfills. I recommend that these may be required as conditions of consent, as detailed in section 7.3:

- Continuous remote monitoring for landfill fires;
- The use of Optical Remote Sensing to detect fugitive LFG discharges;
- Regular reviews of operational air discharges by independent experts, including the Peer Review Panel, to better enable on-going improvement and control.

I recommend a condition of consent requiring periodic independent expert reviews of the LFG collection and control system against BPO. I recommend that such a BPO review shall provide council with information that may be useful for initiating a review of the consent under section 128 of the RMA in the event that significant air discharge effects arise that could be better minimised, and for WMNZ to ensure emissions are being minimised as far as practicable.

Other aspects of the BPO assessment are discussed in section 7.2.1.2 below, with respect to the potential alternatives to the proposed air discharges.

I consider that given the inherent uncertainty and risks of significant adverse effects and harm associated with the air discharges, Policy E14.3(8)(b) is relevant. I consider that the above assessment of effects appropriately utilises a precautionary approach, noting that the assumed rates of discharges from the Landfill are greater than are likely to occur in reality (particularly, the maximum rate of LFG generation and subsequent HAP discharges are calculated from maximum rates not likely to be achieved for at least 30 years). The combination of each conservative assumption made in the assessment add to a cumulatively precautionary air quality assessment that I consider is consistent with Policy E14.3(8)(b).

7.1.4 Statutory considerations conclusion

I consider that the proposed air discharges from the Landfill are not contrary to the relevant provisions of applicable plans and policy statements, subject to compliance with the recommended conditions of consent.

The key areas where I recommend that further assessment and/or amendments to the proposal (through conditions of consent) are required to ensure compliance with the relevant statutory provisions are:

- Design of the LFG extraction and control system to comply with the requirements of NES:AQ Regulations 26 & 27 from the time that 200,000 tonnes of waste is within the Landfill; likely requiring the implementation of extraction and flaring earlier than proposed.

- The utilisation of Remote Sensing techniques to better detect fugitive LFG emissions and landfill fires to better achieve BPO and reduce air quality effects.

7.2 Matters relevant to discharge or coastal permits (Section 105) and restrictions on certain permits (Section 107)

7.2.1.1 Section 105: Effects to the receiving environment

The nature of the air discharges and effects of these discharges to the receiving environment (considering the sensitivity of the environment, including the proximity of activities sensitive to air discharges) are assessed in section 6 above. I consider the proposed air discharges are not likely to result in significant adverse effects to the receiving environment if adequate conditions of consent are imposed and adhered to.

7.2.1.2 Section 105: Alternative methods of discharge

Section 105(1)(b & c) requires regard to the applicant's choice of discharge and any possible alternative methods of discharge (including discharge into another receiving environment) as part of the assessment.

Plainly, the best alternative to air discharges from a landfill is to avoid waste in the first place (Reduce in the waste hierarchy). As described in the *Auckland Waste Management and Minimisation Plan 2018*, Auckland Council has an ambitious 'Zero Waste to landfill' target. Particularly relevant to air discharges is that the redirection of all organic waste to home or commercial composting would significantly reduce LFG generation and associated air discharges from this Landfill. However, as described in the Section 92 Response (Tranche 2, Q61), the potential for a reduction of waste received to the Landfill as an alternative is outside of the scope of this review.

The rationale for WMNZ's proposed air discharges is set out in section 3 of the AEE. Section 10 of the AEE assesses the alternative methods of discharge, including discharging into alternative receiving environments. I note that the selection of the Site was subject to an extensive analysis, particularly considering how a separation distance of more than 1 km could be achieved between the Landfill footprint and activities sensitive to air discharges.

This sought degree of separation distance was likely determined by WMNZ's experience with Redvale Landfill, where the increasing presence of dwellings within 1 km of the landfill correlates with an increased volume of odour complaints over the past decade. AUP(OP) Discretionary Activity Standard E14.6.4.1 also requires a 1 km separation distance for landfills, although I note this is a rule trigger for existing landfills rather than a recommended separation distance for the avoidance of adverse effects (odour or reverse sensitivity).

A number of submissions raised the potential for alternative methods of discharge, largely focussing on other waste treatment technologies and other locations (including expanding the existing Redvale Landfill).

As an air discharge specialist, I agree with the AEE's assessment of the comparative unsuitability of alternative waste treatment systems such as 'waste to energy', 'incineration' or 'pyrolysis/gasification' plants presented in section 3.5 of the AEE. I consider they are flawed in a New Zealand context, particularly as they do not encourage the upper tiers of the waste hierarchy (Reduce, Re-use, Recycle). The significant capital costs of incinerators need to be offset by generating electricity by incinerating a set quantity of refuse into the future, thereby negating the imperative to Reduce waste. While the Landfill also has significant capital costs, I note that the rate of filling can be varied without impacting the pay-back to the same degree (i.e. the tipping price could be increased, or a longer pay-back period accepted). The discharges of HAPs (and CO_2) from these incinerators also represent a significant risk to the environment.

In comparison to incinerator technologies, I consider that the proposed Solid-Waste Landfill and LFG extraction/control technology is better suited for the Auckland and New Zealand context. The Landfill technology proposed by WMNZ is known, better enabling the control of HAPs and odour through design and conditions of consent.

I do consider that extending the lifetime of the existing Redvale Landfill may present a superior alternative than discharging contaminants into air from a new Landfill in Dome Valley. Redvale Landfill has an existing LFG collection system and electricity generation. The discharges of LFG from any waste deposited on top of this existing landfill would therefore be controlled, as compared to deposited waste within a new facility where LFG collection shall not occur for at least 18 months, and electricity generation not for at least 5 years.

At the Consent and Environment Court Hearings for consent LAN61338 in 2014-2015, WMNZ representatives stated that there was significant airspace available at Redvale for additional waste, enabling it to continue operating possibly as long as until 2049, depending on the volumes of incoming waste (see Figure 3, taken from Ian Kennedy's (WMNZ, General Manager) evidence to the Environment Court, 17/04/2015).

The outcome of the Environment Court hearing for LAN61338 was to grant WMNZ a land-use for Redvale that states that landfilling there is to cease by 31/12/2028 (an extension of 5 years from the original 1992 consent). The AEE states that Redvale may reach filling capacity prior to this date, thereby necessitating the new Landfill. The AEE therefore considers the alternative (that Redvale continue accepting waste beyond 2028) impractical. Similarly, I consider that Whitford Landfill is likely to be filled to capacity in the coming years, making an extension of this landfill impractical.

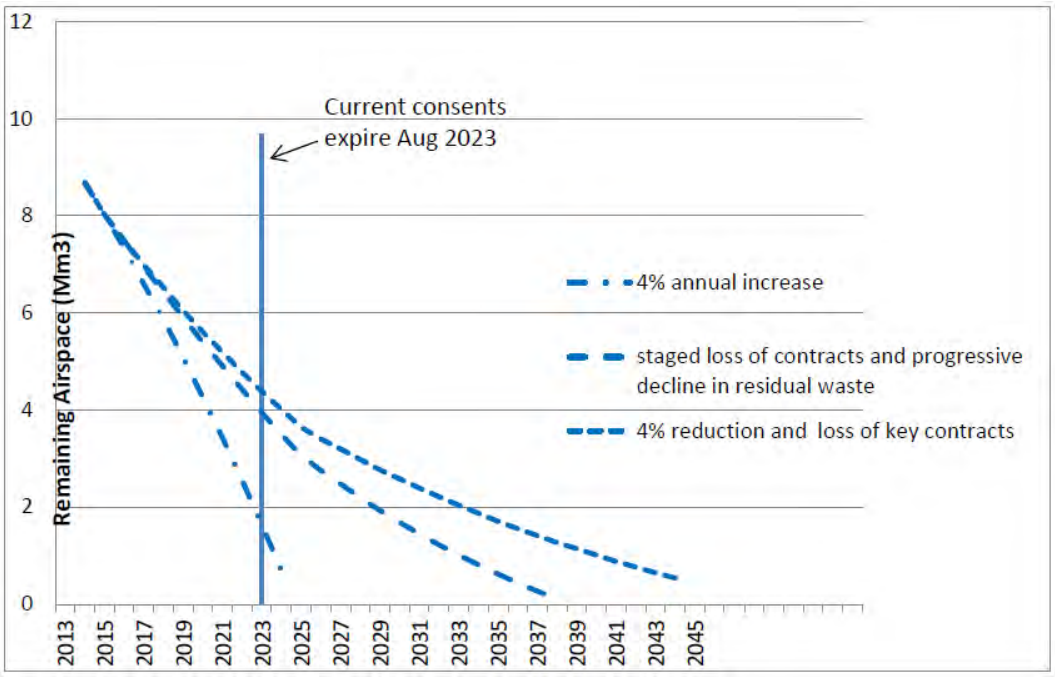

Figure 3: 2013 projections for remaining airspace at Redvale Landfill with variable waste receipt rates.

With respect to utilising other nearby landfills (notably Hampton Downs), the AEE states that having the Landfill within the Auckland Region is desirable to reduce trucking distances, and associated air discharges. There are refuse transfer stations throughout the Auckland Region from which waste is proposed to be trucked to the Landfill. Pikes Point Refuse Transfer Station, Te Papapa, is one of the largest and most-central of these. Using this as a representative starting point, I calculate that trucks would travel 63 km to Hampton Downs Landfill, compared to 76 km to Dome Valley.

Several submitters (notably MERRA #9512 & SEFI #9826) object to the use of trucks to transport waste over long distances to the Landfill, preferring a relocation of a waste treatment facility nearer to the main waste source and/or the use of rail to transport waste as an alternative. I agree that using rail as an alternative to trucks would reduce the overall air discharges from the proposal. Section 12.7 of the AEE summarises discussions between WMNZ and KiwiRail Holdings Ltd, concluding that there a several issues regarding rail delivery as a possible alternative, although I note these are not insurmountable and the option remains open into the future.

Regarding the proposed design and layout of the Landfill within the Site, I agree with the AEE that this appears the best practicable alternative. The selected valley for the Landfill footprint and location of the Energy Facility are well separated from neighbouring dwellings. The sealed surface for vehicle accessways (entrance, haul road and bin exchange area) shall minimise dust and tracking as compared to unsealed surfaces. The design of the LFG extraction and control system utilises known technology capable of adequately controlling LFG and HAP emissions.

7.2.1.3 Section 107: Freshwater effects from the deposition of dust

Section 107(1) of the RMA places restrictions on the granting of certain discharge permits that would contravene sections 15 or 15A of the RMA. I consider this section only applies to air discharge activities where the discharges of contaminants into air fall on land or water and may adversely impact freshwater, such as the deposition of dust onto a waterbody. I do not consider that the likely air discharges from the proposed Landfill shall in themselves cause any of the effects listed by section 107.

7.3 Conditions of consent: Section 108

If it is determined suitable to grant consents to the proposed Landfill, I recommend a range of conditions for the air discharge consent are imposed as detailed in section 1.1 below. These are referred to as 'Recommended Conditions' (RC). I consider these RC shall adequately avoid, remedy and/or mitigate the majority of adverse air quality effects arising from the Landfill as identified in the above assessment.

All specific air quality controls relating to the operational phase of the Landfill are recommended to be included in the air discharge consent (DIS60343780). However, it would be appropriate to link these to general conditions included in the land-use consent (such as limits on the scale of activities, establishment of the Peer Review Panel and Community Liaison Committee, Management Plans, and general operational controls). The land-use consent should also include a condition relating to the control of dust during the construction phase.

The wording of the RCs generally follows the applicant's Proposed Conditions (PC) and those currently applying to air discharge consent number [NRSI]37802: Redvale Landfill (granted January 2013). As discussed in the above assessment, I consider that Redvale is generally operated with appropriate controls to minimise the risks of air quality effects. Therefore, adherence to similar conditions should adequately minimise air quality effects from the proposed Landfill.

A rationale for notable conditions is provided below, while others are in agreement with the proposed conditions and/or are similar to those that have proven effective for the control of adverse air quality effects at similar facilities.

7.3.1 Limit conditions

The recommended limit conditions for HAPs, odour and dust discharges are written in accordance with best practice guidance provided by the GPG:Industry, GPG:Odour and GPG:Dust. These conditions have proven effective, enforceable, and are supported by case-law (for example, see *Crown vs Interclean CRI 2011-092-016845* for a discussion of the odour limit condition).

The maximum discharge rates of HAPs from the generator stacks are set in accordance with the modelling inputs, as this assessment demonstrated that discharges at or below these rates appropriately minimised off-site health effects. NO_2 is recommended to have a specific discharge limit as it is sufficiently indicative of the

efficiency of combustion to also minimise co-emitted HAPs. These other HAPs, including $PM_{2.5}$, SO_2 and NMOCs, are recommended to be monitored for by three-yearly stack testing and by analysis of the constitution of LFG.

It is not possible to measure HAP discharge rates from the flares or fugitive sources, and therefore, specific discharge limits are not recommended for these sources. However, process controls and management measures are recommended to ensure that discharges from these sources are minimised as far as reasonably practicable, including minimum standards for landfill capping.

7.3.2 Process control conditions

As above, Redvale Landfill has been the subject of numerous odour complaints, requiring a range of specific conditions to minimise and respond to odour discharges. However, the proposed Landfill benefits from greater buffer distances to dwellings and other activities sensitive to air discharges, so that I do not consider all of the odour-related conditions that apply to Redvale are necessary for the proposed Landfill.

Measures that I consider useful for controlling odour effects from the landfill are included as conditions of consent, including limiting the receipt of significantly odorous waste and odour field inspections.

The control of HAP discharges from the Landfill largely relates to the efficient capture of LFG and combustion activities Energy Facility. I recommend process controls for these activities in accordance with the minimum standards of the NES:AQ, the PC and Redvale Landfill's existing conditions to ensure they are minimised as far as practicable. These conditions form 'bottom-line' requirements for the control of LFG, while the details of how LFG and HAP discharges are to be minimised in accordance with these conditions shall be included in the LMP.

7.3.3 Monitoring and review conditions

The operation and environmental monitoring of the Landfill is highly technical and complex. I recommend a range of conditions requiring regular independent expert oversight of air discharges. The PC suggest a Peer Review Panel (PRP), comprising independent experts, as exists for Redvale and Whitford Landfills. However, the PC generally seek a limited scope for the PRP to only consider the suitability of the landfill liner system. I recommend a wider scope and role for the PRP to provide expert independent advice to the consent holder and Council Monitoring Officers to ensure that air discharges are effectively monitored and mitigated throughout the consent duration, similar to the roles that have proven useful for Redvale and Whitford Landfills and at other major air discharge facilities such as Māngere Wastewater Treatment Plant. The PRP should have a clear role in the review of the Landfill Management Plan and appended sub-plans, providing Council with expert advice prior to certification.

Further, I recommend periodic expert independent reviews for air discharges in RCs AQ.37 (biennial LFG and odour reviews) and AQ.38 (BPO review). As detailed by these conditions, the reviews are required to be completed by independent experts,

suitably qualified and experienced in air quality assessments, as engaged by the Consent Holder and certified by the Team Leader – Compliance Monitoring.
I acknowledge that the independence of a consultant engaged by the Consent Holder may be open to challenge. However, I consider that the requirement that this expert is 'suitably qualified and experienced' and certified as such by Council sufficiently reduces the risk of bias and shall ensure robust assessments. Such experts regularly affirm their compliance with the Expert Witnesses Code of Conduct contained in the Environment Court Practice Note 2014.

Fugitive LFG discharges are proposed to be monitored by Surface Emission Monitoring (SEM) walkovers, using a Flame-Ionising Device to measure concentrations of methane above the landfill cap (intermediate and final capped areas) at a monthly frequency. However, over the past two decades, significant advances have occurred in Optical Remote Sensing techniques for detecting and measuring fugitive LFG discharges from landfills. I recommend that fugitive LFG discharges are minimised as far as practicable by regular use of both Surface Emission Monitoring (monthly) and Optical Remote Sensing methods (see RC AQ.21-23 & AQ.33).

My greatest concern with the proposal is the air quality risks associated with landfill fires. I recommend a range of conditions requiring constant monitoring (including Remote Sensing), linkages to the Waste Acceptance Criteria, and Management Plans to minimise the risks of such incidents as far as reasonably practicable.

I recommend a review condition is inserted to enable a review of the consent under section 128 of the RMA, able to be enacted at any time throughout the duration of consent in the event that significant and/or unforeseen adverse effects arise.

7.4 Duration of consent: Section 123

The applicant has requested a 35-year term of consent, the maximum duration permissible under section 123 of the RMA for an air discharge consent.

Air discharge consents in Auckland are typically granted for 10 to 15 year durations in order to allow for a thorough periodic reassessment of effects and control measures in light of advances in control technologies and the understanding of air quality health effects and amenity expectations within the surrounding environment.

Limited consent durations for air discharge consents comply with the precautionary approach, which Policy E14.3(8) of the AUP(OP) requires where there is uncertainty and a risk of significant adverse effects. I consider that the uncertainty and the risk of effects arising from this Landfill increase over time into the future. This is particularly because emissions of HAPs and odour from the Landfill increase as it is filled and LFG generated.

Case law in relation to the duration of air discharge consents has followed *PVL Proteins Limited v Auckland Regional Council (A 061/2001)*, which resulted in a partially successful appeal against a condition of an air discharge consent which

provided for a 10 year duration (extended by the Environment Court to 14 years but not the 35 years sought).

The Court recently re-affirmed the relevance of the PVL Proteins Ltd decision with regards to the duration of consents in *Waste Management NZ Ltd & Ors v Auckland Council (NZEnvC 178/2015)*, relating Redvale Landfill consent LAN61338. The matters to be balanced in determining an appropriate duration of consent were determined to be the applicant's requirement for future operating certainty against expected future changes to the receiving environment, historic failures to adequately minimise variable adverse effects and the likelihood of altered standards.

As noted by the PVL Proteins Ltd decision (para 32), a discharge with potentially variable effects which depends upon management practices to avoid adverse effects may require a limitation of the consent duration. The reliance upon a review condition under section 128 of the RMA may not provide a sufficient opportunity to address issues of concern in such a case.

If it is deemed appropriate to grant consent to the proposal, I consider that the air discharge consent could be granted for a **maximum 25-year duration** if a range of conditions of consent, including regular independent reviews and a review condition under section 128 of the RMA, are included.

A consent application for air discharge consent lodged near 2050 to authorise further air discharges from the Landfill would draw on real-world air quality experience and monitoring data from the Landfill's first 25 years of operation. This 'mid-point review' mechanism would provide neighbours to provide feedback on air quality matters, account for changes to air quality standards, and provide WMNZ an opportunity to include changes to the proposed later-operations of the Landfill that are not foreseeable at present (such as a longer filling duration or additional LFG generators) and would not be possible under the framework provided by s128 of the RMA. Such an application would be subject to s124 and s104(2A) of the RMA.

I consider having an expiry date for the air discharge consent after 25 years of operation better complies with the need for a precautionary approach and minimises actual and potential effects on the environment. Compared to a 35-year duration (with review clauses), I consider a 25-year duration better avoids, remedies and mitigates adverse air quality effects while still providing the applicant an adequate degree of future operating certainty.

In making this recommendation for a substantial duration of air discharge consent, but less than that applied-for, I have particularly considered:

- The assumptions of HAP and odour discharge rates underpinning the AQR and HRA, where these were estimated based on worst-case LFG generation rates only potentially reached toward the end of the filling period;

- The settled nature of technology for LFG extraction and control systems, where the designs of LFG generators and flares has not notably changed over the past 20 years and are likely to remain BPO into the future;
- The reliance on operational management to control discharges of odour and HAPs from the Landfill;
- The likelihood of increasing air discharges over the period of filling, with increasing air quality effects.
- The likelihood of increasing standards for air quality, due to scientific advances in the health-risks of HAPs as has occurred over the past decade;
- The ability to introduce routine independent reviews of the effectiveness of air discharge controls through consent conditions;
- The ability to introduce contingency measures to respond to unforeseen air quality effects from the Landfill through consent conditions;
- The generally static nature of the receiving environment, where it is unlikely that notable new residential or other sensitive development shall occur in close proximity to the Landfill over a 25-year duration;
- The predicted MGLCs for HAPs, that are less than relevant ambient air quality assessment criteria currently in force;
- The necessity for future operating certainty;
- The scale and importance of the proposed regionally significant infrastructure.

8 Recommendation and conditions

8.1 Adequacy of information

The above assessment is based on the information submitted as part of the application. I consider that the information submitted is sufficiently comprehensive to enable the consideration of the above matters on an informed basis:

- The level of information provides a reasonable understanding of the nature and scope of the proposed activity as it relates to the NES:AQ and AUP(OP).
- The extent and scale of any adverse effects on the environment are able to be assessed.
- Persons who may be adversely affected are able to be identified.

8.2 Recommendation

The assessment in this memo does not identify any reasons to withhold consent, and the air discharge consent application could be granted consent, subject to recommended conditions, for the following reasons:

- I consider that the overall adverse effects from air discharges on the receiving environment could be controlled by specific conditions of consent so that they are minor.
- Discharges of dust and odour can be adequately controlled by conditions of consent and mitigation measures detailed within the LMP so that offensive or objectionable effects are not likely to occur beyond the boundary of the site.
- Discharges of HAPs from the Energy Facility and Landfill's normal operations can be adequately controlled by conditions of consent so that significant effects to human health or ecological systems are unlikely to occur. These discharges are not expected to cause an exceedance of the relevant ambient air quality criteria as contained within the NES:AQ and AUP(OP) at any location where people are likely to be exposed.
- Fugitive discharges of LFG can be adequately controlled to minimise human health and odour risks by conditions of consent, including maintenance of the landfill cover and capping material and LFG extraction system.
- The risks arising from potential air discharges from unplanned landfill fires may be controlled by conditions of consent to mitigate the likelihood of their occurrence and remedy the discharges by contingency response measures.
- If suitable LFG control systems are implemented prior to the receipt of 200,000 tonnes of waste (as recommended by a condition of consent), the proposed

LFG extraction, flares and generators comply with the requirements of Regulations 26 & 27 of the NES:AQ.

- I consider that the proposed air discharges can be adequately controlled by conditions of consent so that they are not contrary to the relevant provisions of the NES:AQ, AUP(OP), and the integrated management of the air resource.
- AUP(OP) Policy E14.3(3) provides for minor and localised elevations of dust and odour from infrastructure in the Rural – Rural Production Zone.
- The proposed LFG control systems generally accord with BPO for minimising HAP and odour discharges.
- The generation of electricity from waste biomass is a form of renewable energy supported by the NPS:REG.
- The sensitivity of the receiving environment to the adverse effects of the air discharges will not be compromised given the level of the discharge, the application of suitable LFG controls and appropriate on-site management techniques.
- Given the air discharge control measures and separation distances to activities sensitive to air discharges, I consider the activity to be appropriately located with respect to the air quality receiving environment.

8.3 Conditions: Recommended amendments to Proposed Conditions relevant to air quality

Recommended conditions of consent (RC) that are relevant to air quality are detailed in Table 8. Only the wording in the column 'RC wording' is recommended to be applied as conditions of consent. Table 8 also has columns with indicative RC numbering, generally reflecting the Proposed Condition (PC) numbering provided in Appendix G of the AEE but reverting to 'AQ.1 to AQ.40' for specific air discharge consent (DIS60343780) conditions. The corresponding PC number is provided for those RC adopting or adapted from a PC. The conditions relevant to air quality are recommended to apply either to 'All Consents', the 'Land-use consent (Construction) (LUC60339671)', the 'Land-use consent (Operation) (LUC60339671)' or the 'Air discharge consent (DIS60343780)' as noted alongside each condition. The RC wording is provided with ~~strike-through~~ and underlining to show changes from the PC. The notes in the 'Comment' column are for information purposes only within this memo and are not 'advice notes'. Recommended Advice Notes relevant to air quality are included in section 8.4.

Table 8: Recommended conditions of consent

RC #	PC #	Consent	Section Title	RC wording	Comment
C.1	1	General: All consents	General conditions	Activity in accordance with the plans; recommend using 'standard' Auckland Council wording	*Planner to insert 'Activity in accordance with plans' condition.*
C.2	2	General: All consents	Duration	Consents for the initial site construction works shall expire 15 years after the construction commencement date. The regional consents for landfill operations and discharges shall expire 35 years after the landfill commencement date, excepting the air discharge consent (DIS60343780) that shall expire 25 years after the landfill commencement date. This expiry does not apply to the land-use consents for landfill operations, final restoration works or post closure works.	*Rationale for a 25-year duration of the air discharge consent provided in section 7.4.*
C.4	4	General: All consents	Community Liaison Group	The consent holder shall, in consultation with mana whenua, local community groups and representatives of local residents (including those living close to the landfill and in the wider	*I suggest some minor amendments to the CLG based on experience*

RC #	PC #	Consent	Section Title	RC wording	Comment
				community) establish and maintain a Community Liaison Group (CLG). The CLG shall comprise up to 4 representatives of those groups, an independent Chairperson, a representative of the Landfill operator / consent holder and two representatives of Auckland Council. The role of this group will be to bring feedback from the community to the consent holder, disseminate information about the Landfill to the local community, hear concerns of local residents, receive, discuss and consider material	*with Redvale, Whitford and Mangere WWTP CLGs.*
C.5	5	General: All consents	Community Liaison Group	The CLG shall comprise no fewer than 5 and no more than 8 representatives (including the chair but not including the consent holder). Meetings of the CLG shall be held on a quarterly basis (or less frequently as determined by the CLG). Meeting minutes shall be taken and distributed to the members of the CLG. The consent holder shall cover the costs of the meeting venue and independent chair	
C.6	6	General: All consents	Complaints management	Upon receiving a complaint, the consent holder shall: a. Identify the nature of the complaint, the location, date and time of the alleged incident event(s); b. Acknowledge receipt of the complaint to the complainant within 1 working day of receipt; c. Notify Auckland Council of the receipt of the complaint (providing details of the nature of the complaint, the date and time the complaint was received, and the	*I consider it important that council is kept abreast of complaints as they are received to enable Compliance Monitoring to prioritise any investigations required.*

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RC #	PC #	Consent	Section Title	RC wording	Comment
				complainant's details and location if available) within 1 working day of receipt; d. Respond to the complaint in accordance with any relevant Management Plan or condition; and e. Advise the complainant of what steps have been taken in response to the complaint within 10 working days.	
C.7	7	General: All consents	Complaints management	A record of all complaints received shall be kept by the consent holder. This record shall include: a. The name and address of the person(s) who raised the complaints (unless they elect not to provide this) and time and nature of the complaint; b. ~~Where practicable,~~ weather conditions at the time of the concern or complaint, including wind direction and cloud cover if the complaint relates to noise, dust or air quality; c. Known activities occurring on site at the time and in the vicinity of the concern or complaint; and d. Remedial actions taken (if any) and the outcomes of these.	*Weather conditions are to be recorded by the on-site monitor and therefore shall always be available for logging complaints.*
C.8	8	General: All consents	Complaints management	The record specified in Condition C.7 shall be maintained on site by the consent holder, be available for inspection on request, and shall be provided ~~every 6 months~~ quarterly (or as otherwise agreed) to Auckland Council and the CLG.	*Recommend quarterly summaries of complaints for CLG meetings.*

RC #	PC #	Consent	Section Title	RC wording	Comment
C.9	-	General: All consents	Access to site	Access to the relevant parts of the property shall be maintained and made available at all reasonable times to enable the servants or agents of the Council to carry out inspections, surveys, investigations, tests, measurements or take samples whilst adhering to the Consent Holder's health and safety policy.	*This is an important general provision to enable Compliance Monitoring of the consent.*
C.14	14	General: All consents	Management Plan revisions	The consent holder may make amendments to the final management plans that may change how any adverse effect is managed at any time subject to the certification of Auckland Council. a. The amendment to the management plans shall be consistent with the objectives and performance requirements of the management plan and these consent conditions. b. In the event of an amendment to a management plan under Condition C.14(a), the consent holder must submit, in writing, the amendment to Auckland Council for certification 20 working days before the commencement of the relevant works. Certification shall confirm that the amendment is in accordance with Condition 1 and meets the objectives and performance requirements of the management plan. c. Auckland Council shall be requested, no later than 30 working days of receipt of the amendment, to confirm in writing to the consent holder that the amendment is either certified or declined, or shall request that the consent	*Minor amendments suggested only.*

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RC #	PC #	Consent	Section Title	RC wording	Comment
				holder incorporate changes suggested by the Council. If a revised timeframe has been agreed, confirmation shall be made in accordance with that timeframe. If no response is received, approval is deemed to have been given as set out in condition C.16. d. Should Auckland Council decline to certify the amendment or request the incorporation of changes to the amendment the consent holder may then resubmit a revised material amendment to the management plan. e. The Certification process for a revised amendment shall follow the same process described above in Conditions C.14 (a) to (d).	
C.15	-	General: All consents	Review condition	The conditions of this Consent may be reviewed by the Manager pursuant to Section 128 of the Resource Management Act 1991, by the giving of notice pursuant to Section 129 of the Act in order to: a. Deal with any significant adverse effect on the environment arising from the exercise of the Consent that was not foreseen at the time that the application was considered. b. Consider the adequacy of conditions that prevent nuisance beyond the boundary of the Site, particularly if complaints have been received on a frequent basis and have been validated by an enforcement officer.	*Review condition recommended under section 128 of the RMA to respond to unforeseen air quality effects. Should be reviewed by Principal Planner to ensure wording is in accordance with Case Law guidance.*

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RC #	PC #	Consent	Section Title	RC wording	Comment
				c. Consider developments in emission control technology and management practices that would enable practical reductions in discharges to air. d. To take into account any act of parliament, regulation, national policy statement or relevant regional plan that relates to limiting, recording or reducing emissions authorised by this Consent.	
LU.23	23	Land-use consent (Construction)	Construction Environmental Management Plan	The CEMP shall provide details of the responsibilities, reporting frameworks, coordination and management required for effective site management. The CEMP shall provide information on the following matters: … j. Measures to minimise the discharges of dust as far as practicable.	*Dust is an effect requiring control during the construction phase and dust management should be included in the CEMP.*
LU.44	-	Land-use consent (Construction)	Dust	Discharges of dust from the Initial Site Construction Works shall not cause offensive or objectionable effects at any location beyond the boundary of the Site, in the opinion of an enforcement officer when assessed in accordance with the *Good Practice Guide for Assessing and Managing Dust* (Ministry for the Environment, 2016). The consent holder shall ensure that dust management at the Site generally complies with the recommendations of this Good Practice Guide and minimises dust generation as far as practicable. This shall include having sufficient water to dampen exposed soil and unsealed areas, and/or other dust suppressing measures detailed by the CEMP, available as necessary.	*Dust discharges from construction can comply with Permitted Activity Standard E14.6.1.1(2) if this condition is included and adhered to.*

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RC #	PC #	Consent	Section Title	RC wording	Comment
LU.66	66	Land-use consent (Operation)	Refuse Placement	Refuse placement shall include the following measures: a. The working surface of the daily refuse cell shall be kept to a practicable minimum, typically less than 60 metres by 60 metres, and shall not exceed 80 metres by 80 metres at any time (excluding the open area of any inert material); b. Daily cover shall be removed by cutting windows through the previous layer of daily cover before refuse placement at the start of each day; c. Stormwater diversion berms shall be formed to prevent surface stormwater running into the current working area.	*Maximum working surface is an important air quality control. The Draft LMP (3.02) states that the maximum 80x80m size need only occur for short periods, with the maximum size typically less than 60x60m.*
LU.67	67	Land-use consent (Operation)	Landfill cover	Daily cover shall be placed over the entire working face (excluding areas of inert waste) by the end of each operating day and no refuse shall remain exposed overnight. Daily cover shall be 150 mm thickness or more of soil, but may also be one of a number of non-soil alternative daily cover ~~(ADC)~~ options of an appropriate thickness and material where it can be demonstrated that they achieve a comparable level of control with respect to air discharges ~~of odour or dust to air~~, vermin, birds, litter, and visual effects. An equivalent alternative daily cover may be used only with the prior written certification of Auckland Council.	*Daily cover is an important air quality control and must have sufficient thickness and type of material. Some non-soil alternatives are unlikely to be suitable. Those that increase any type of air discharges, including fire risk, would be inappropriate.*

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RC #	PC #	Consent	Section Title	RC wording	Comment
LU.68	-	Land-use consent (Operation)	Landfill cover	Any landfill area containing deposited refuse where further refuse placement is not planned to occur for a period greater than 12 weeks shall have 'thickened interim cover' applied to a minimum thickness of 300 mm. The thickened interim cover shall be soil and shall completely cover all refuse.	*Fugitive LFG can be better minimised by 'thickened interim cover', as currently applied at Whitford Landfill.*
LU.69	-	Land-use consent (Operation)	Landfill cover	Intermediate cover shall be applied to any landfill area containing deposited refuse where further refuse placement is not planned to occur for a period greater than 12 months. Intermediate cover shall comprise soil applied to a minimum depth of 500 mm and then compacted so that it achieves at least 300 mm compacted depth and is free from cracks or defects.	*Intermediate cover is a key requirement for minimising fugitive LFG discharges.* *I recommend setting 'bottom-lines' for the LMP provisions.*
LU.70	-	Land-use consent (Operation)	Landfill cover	Final cover shall be applied to cap the landfill. The final cover shall include at least 600 mm of compacted low permeability soil, achieving a hydraulic conductivity of 10^{-7} m/s or less, and shall be free from cracks or defects.	*Final cover is a key requirement for minimising fugitive LFG discharges.*
LU.71	-	Land-use consent (Operation)	Dust and tracking	All landfill roads, vehicle manoeuvring and stand areas shall be sealed or maintained in such condition that the road base and surfacing can withstand use by vehicles without causing significant breakdown of the surface or significant transport of surface material on tyres. Where necessary, the Consent Holder shall import gravel or other similar materials to provide workable wet weather surface conditions.	*The main vehicle accessways are to be sealed, but unsealed tipping pads present a risk of tracking (causing dust) if not adequately maintained.*

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RC #	PC #	Consent	Section Title	RC wording	Comment
LU.72	137	Land-use consent (Operation)	Dust and tracking	Wheel washing facilities shall be provided and shall be used by all vehicles that have travelled off the sealed road/hardstand areas, prior to the vehicle departing the site.	*Tracking of dirt can cause a dust nuisance.*
LU.73	-	Land-use consent (Operation)	Dust and tracking	All vehicle exits from the site shall be cleaned as necessary such that no dirt or other material is transferred to public roads.	*Tracking of dirt can cause a dust nuisance.*
LU.74	75	Land-use consent (Operation)	Peer Review Panel	The consent holder shall establish and maintain a Peer Review Panel (PRP) at its cost. The objective of the PRP will be to monitor the design, ~~and~~ construction, operation and maintenance of the landfill in order to confirm that these activities are consistent with the requirements of the conditions of these consents and good practice and that the work is undertaken by appropriately qualified personnel.	*I suggest the PRP also has a useful role in reviewing the landfill operations (monitoring data) to ensure it is effectively minimising risks. Redvale Landfill's PRP has this role.*
LU.76	76	Land-use consent (Operation)	Peer Review Panel	The PRP shall consist of a maximum of five members and a minimum of ~~two~~ three members.~~, all of which~~ The PRP members must be employed independently from the consent holder and must have appropriate experience and qualifications in landfill design and management, as certified by council. All members are to be appointed by the consent holder following consultation between the consent holder and Auckland Council.	*The PRP is a complex role requiring at least 3 independent experts, who should be certified as such by the Regulator.*

RC #	PC #	Consent	Section Title	RC wording	Comment
LU.77	77	Land-use consent (Operation)	Peer Review Panel	The consent holder shall provide a report from the PRP at six monthly intervals ending 31 March and 30 September each year to the Auckland Council, on the following matters as relevant to each report period: a. final design; b. construction undertaken; c. lining system performance and design of any new lining system installed; d. landfill gas control system performance; e. more frequent reporting or special reports shall be made as determined by the Auckland Council or the PRP.	*The six-monthly PRP reports are a useful independent audit of the landfill's design and operations.*
LU.78	78	Land-use consent (Operation)	Peer Review Panel	The consent holder shall ensure that records are kept of any site investigations for any engineering works and the results of all monitoring tests associated with all consents granted for the landfill operation and that these records are forwarded monthly to the PRP. These records include but are not limited to: a. Liner and final cover: Visual evaluation, in-situ and laboratory testing. b. Landfill Gas: Well head monitoring, boundary gas monitoring well evaluation, surface emission monitoring on the landfill's intermediate and final cover surface.	*Monitoring data enables the PRP to have greater insight into the landfill's operations for independent auditing. Redvale Landfill's PRP has this role.*

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RC #	PC #	Consent	Section Title	RC wording	Comment
				c. Groundwater: Surface water and Leachate level monitoring in accordance with the conditions of these consent. d. Monitoring of land movement. e. General: A summary of failures or events contrary to the Landfill Management Plan and the actions taken to alleviate the consequences (including but not limited to fires, slope failures, liner failures or damage, dumping of toxic or hazardous wastes, failures or blockages of the leachate collection and gas extraction systems).	
AQ.1	-	Air discharge consent	Air discharge general conditions	All discharges of contaminants into air arising within the Site boundary are the responsibility of the Consent Holder. Any person responsible for operations and discharges to air associated with the process or site shall be made aware of the relevant conditions of this consent.	*Contractors on site must not cause breaches of the consent.*
AQ.2	-	Air discharge consent	Air discharge general conditions	All processes on Site shall be operated, maintained, supervised, monitored and controlled to ensure that emissions authorised by this consent are maintained at the minimum practicable level.	*This requires effects are minimised as far as practicable – standard for all air discharges.*
AQ.3	-	Air discharge consent	Air discharge general conditions	Except as authorised by this consent, beyond the boundary of the site, there shall be no hazardous air pollutant, caused by discharges from the site, which is present at a concentration that causes, or is likely to cause adverse effects to human health, ecosystems or property.	*This sets a limit for HAPs to appropriately avoid significant effects.*

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RC #	PC #	Consent	Section Title	RC wording	Comment
AQ.4	95	Air discharge consent	Air discharge general conditions	There shall be no burning of waste material on site.	*Required by NES:AQ.*
AQ.5	96	Air discharge consent	Dust	Beyond the boundary of the site there shall be no dust caused by discharges from ~~the landfill operations on~~ the site which, in the opinion of an ~~suitably qualified and experienced~~ enforcement officer, is noxious, offensive or objectionable.	*Recommended wording of the GPG:Dust. Enforcement Officer is defined in RMA s38.*
AQ.6	97	Air discharge consent	Dust	Effective dust control procedures shall be implemented at the site including, but not limited to: a. Watering of unpaved internal access and manoeuvring areas during dry periods. b. Maintenance of all access and manoeuvring areas to the satisfaction of the Auckland Council in order to reduce the creation of dust and to prevent the deposition of ~~significant~~ dirt or other material onto public roads. c. Maintenance of a permanent water supply <u>of sufficient capacity</u> on the site to control dust at the working face, to dampen down unsealed access roads, and for fire control.	*Proposed dust management condition* *Deposition of any dirt onto SH1 would be inappropriate.*
AQ.7	121	Air discharge consent	Odour	Beyond the boundary of the site, there shall be no odour caused by discharges from the landfill which, in the opinion of an ~~suitably qualified and experienced~~ enforcement officer when assessed in accordance with the ~~Best~~ *<u>Good</u> Practice Guide for Assessing and Managing Odour* (Ministry for the	*Enforcement Officer is defined in RMA s38. Link to assessment method in GPG:Odour is appropriate – similar*

RC #	PC #	Consent	Section Title	RC wording	Comment
				Environment, 2016) is noxious, dangerous, offensive or objectionable.	*may be included in dust limit condition.*
AQ.8	122	Air discharge consent	Odour	Effective odour control procedures shall be implemented at the site including, but not limited to: a. Keeping the working surface of the daily refuse cell to a practicable minimum in accordance with condition LU.66. b. Applying daily cover in accordance with condition LU.67. c. Managing known odorous wastes in accordance with specific procedures in the Landfill Management Plan, including but not limited to: • Waste acceptance and pre-treatment criteria; • Restrictions on the hours of delivery; • Procedures for excavations and immediate covering of placed waste. d. Ensuring equipment and materials for application of odour neutralising sprays are available for use and utilised as~~, if~~ required.	*Suitable PC; suggest odour neutralising sprays should always be available on site.*
AQ.9	98	Air discharge consent	Landfill gas	Prior to the deposition of 200,000 tonnes of refuse, the Consent Holder shall install and operate a gas extraction system in accordance with the requirements of the *Resource Management (National Environmental Standards for Air Quality) Regulations 2004* and in a manner which ensures that the rate of extraction of landfill gas is maximised, while minimising the risk of landfill fire due to over extraction.	*Suitable overall goal for LFG management. However, NES:AQ requires this system to be in place for all landfills with >200,000 tonnes of waste.*

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RC #	PC #	Consent	Section Title	RC wording	Comment
AQ.10	99	Air discharge consent	Landfill gas	All extraction wells shall be connected to the gas extraction system as soon as practicable and in any case not longer than ~~12~~ 6 months after placing wastes within the radius of influence of the wells. Passive flares with flame arresters shall be allowed to burn the gas venting from the wells prior to connection to the gas extraction system. The passive flares shall have the following minimum specifications: (a) Flame arrester and backflow prevention devices, or similar equivalent system (b) Continuous automatic ignition system (c) Automatic isolation systems to ensure that there is no discharge of unburnt landfill gas from the flare in the event of flame loss.	*Whitford Landfill has a 6 month requirement to better minimise fugitive LFG.* *Passive flare specifications are suitable.*
AQ.11	100	Air discharge consent	Landfill gas	The gas extraction and treatment system shall be restored as soon as practicable in the event of a malfunction or fault. The Consent Holder shall maintain a standby diesel generator or equivalent on site for the purposes of restarting gas extraction blowers as soon as possible in the event of a mains power failure. The procedures for reducing emissions to air during a mains power failure including the operation of the generators, flare and standby diesel generator and during routine maintenance shall be documented in the Landfill Gas Management Plan (LGMP) (refer to Condition LU.154).	*Suitable PC.*

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RC #	PC #	Consent	Section Title	RC wording	Comment
AQ.12	119	Air discharge consent	Landfill gas	The landfill gas extraction system, leachate collection system, low temperature leachate evaporation unit and all associated ducting and pipe work shall be maintained in good condition and be free of gas or liquid leaks.	*General maintenance requirement to minimise risk of leaks across whole system, not only LEU.*
AQ.13	101	Air discharge consent	Landfill gas	All extracted landfill gas shall be combusted in a flare(s) or generator(s) in accordance with the following requirements: a. Any landfill gas flare(s) shall comply with the requirements of the *Resource Management Act (National Environmental Standards for Air Quality) Regulations 2004* for a principal flare, and shall have the following minimum specifications: i. flame arrester and backflow prevention devices, or similar equivalent system, ii. continuous automatic ignition system; iii. automatic isolation systems to ensure that there is no discharge of unburnt landfill gas from the flare in the event of flame loss; iv. minimum temperature of 750°C and retention time of 0.5 seconds; v. a permanent temperature indicator at half a diameter from the top of the flare with a visual readout at ground level; vi. a minimum stack height of 9 m above ground level;	*Requirement of the NES:AQ.* *Generators also require stack testing ports.* *Generators are to discharge through stacks 10 m high, while the flares are 9 m high.*

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RC #	PC #	Consent	Section Title	RC wording	Comment
				vii. Adequate sampling ports to enable emissions testing to be undertaken; and viii. Provision for safe access to sampling ports while any emission tests are being undertaken b. The landfill gas powered generator shall comply with specifications a(i, ~~) and a~~(iii, vi to viii) above. c. Any landfill gas emergency flare shall comply with specifications a(i) to a(iii) above.	
AQ.14	102	Air discharge consent	Landfill gas	No more than 12 generators shall be operated at any one time for the purposes of landfill gas combustion.	*Scope of application*
AQ.15	103	Air discharge consent	Landfill gas	There shall be no visible emission, other than water vapour, light, heat haze, or steam, from a landfill gas destruction device.	*Suitable PC*
AQ.16	104	Air discharge consent	Landfill gas	Each generator engine shall be tuned at least once every six months to comply with a maximum concentration of 550 mg/m^3 Nitrogen Oxides (NO_X) in the exhaust gas.	*Suitable PC*
AQ.17	105	Air discharge consent	Landfill gas	The concentration of methane at the surface of landfill areas with intermediate or final cover shall not exceed 0.5% (5000 ppm) by volume.	*NES:AQ requirement; % and ppm equivalent for clarity.*
AQ.18	106	Air discharge consent	Landfill gas	The concentration of methane in sub-surface gas migration monitoring probes outside the landfill footprint shall not exceed 5% by volume.	*Suitable PC*

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RC #	PC #	Consent	Section Title	RC wording	Comment
AQ.19	107	Air discharge consent	Landfill gas	The residual nitrogen content of landfill gas in all extraction wells shall not exceed 20% by volume.	*Suitable PC*
AQ.20	120	Air discharge consent	Leachate evaporator	The temperature of leachate in the low temperature leachate evaporation unit shall not exceed 95°C. The temperature shall be continuously monitored and recorded. The records shall be marked with the correct time and date.	*Suitable PC*
AQ.21	108	Air discharge consent	Monitoring: Fugitive landfill gas	A walkover site inspection within the landfill footprint shall be undertaken no less frequently than weekly. The walkover site inspection shall utilise Remote Optical Sensing techniques for detecting fugitive landfill gas emissions. Any evidence of actual or potential landfill gas leaks, such as odour, cracks in the landfill surface, gas bubbles, leaks in the gas extraction system or vegetation damage shall be investigated. Where necessary, remedial action shall be undertaken as soon as practicable to minimise fugitive gas discharges.	*Remote Optical Sensing is a practical enhancement of visual inspections, enabling the technician to scan landfill surfaces for cracks, as described in section 7.3.3.*
AQ.22	109	Air discharge consent	Monitoring: Fugitive landfill gas	A Flame Ionisation Detector (FID) or equivalent shall be used to carry out surface methane emission monitoring over the entire surface of the landfill on at least a 30 m by 30 m grid basis excluding the working face at least once every ~~three months~~ month.	*Redvale's LFG management improved since SEM was conducted monthly.*
AQ.23	110	Air discharge consent	Monitoring: Fugitive landfill gas	If monitoring carried out in accordance with Condition AQ.22 demonstrates that the surface methane gas concentration limit specified in Condition AQ.17 is exceeded, then remedial action shall be carried out and the concentrations re-tested within 14 days. If this is not practicable, the Consent Holder	*Suitable PC – flexibility required for enacting repairs. Alter '14 days' to '10 working days' for consistent reference to*

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RC #	PC #	Consent	Section Title	RC wording	Comment
				shall obtain the approval of Auckland Council for a proposed programme of remedial action, including a timetable, within ~~14~~ 10 working days of the exceedance. The proposed programme shall be implemented to the satisfaction of Auckland Council within the proposed time period.	*working days throughout consent.*
AQ.24	111	Air discharge consent	Monitoring: Fugitive landfill gas	Methane concentrations shall be measured and recorded using hand-held landfill gas analysis instruments on a monthly basis in each of the sub-surface gas migration monitoring probes outside the landfill footprint to demonstrate compliance with Condition AQ.18.	*Suitable PC*
AQ.25	112	Air discharge consent	Monitoring: Landfill gas extraction	Landfill gas shall be monitored at each extraction wellhead or, if more appropriate, at manifold points, on a monthly basis. Monitoring shall be carried out using calibrated instruments. The following parameters shall be measured and recorded: a. Gas flowrate (m^3/hour); b. Composition (methane (%v/v), oxygen (%v/v), carbon dioxide (%v/v), carbon monoxide (ppm), hydrogen sulphide (ppm)); c. Residual nitrogen (% v/v) shall be calculated as the balance of gas measured in clause (b) to demonstrate compliance with Condition AQ.19; d. Gas temperature (°C); e. Ambient temperature (°C); f. Gas pressure (mb);	*Suitable PC*

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RC #	PC #	Consent	Section Title	RC wording	Comment
				g. Barometric pressure (mb).	
AQ.26	113	Air discharge consent	Monitoring: Landfill gas extraction	The total landfill gas flow rate (m^3/hour) shall be monitored and recorded continuously at the Renewable Energy Centre. The flow meter shall be calibrated annually.	*Suitable PC*
AQ.27	114	Air discharge consent	Monitoring: Landfill gas extraction	Landfill gas (blended) shall be monitored at the Renewable Energy Centre on a six monthly basis. The following parameters shall be measured and recorded: a. Gas flowrate (m^3/hour); b. Composition (methane (%v/v), oxygen (%v/v), carbon dioxide (%v/v), carbon monoxide (ppm)); c. Gas temperature (°C); d. Ambient temperature (°C); e. Gas pressure (mb); f. Barometric pressure (mb); g. Hydrogen sulphide (ppm); h. Total non-methane organic compounds (ppm).	*Suitable PC*
AQ.28	115	Air discharge consent	Monitoring: Generator stack testing	Emission testing shall be undertaken on the generator exhaust stacks to demonstrate compliance with condition AQ.16 (NO_X) and determine fine particulate matter ($PM_{2.5}$), Total non-methane organic compounds and sulphur dioxide emission concentrations. Emissions shall be averaged over all	*Monitoring for $PM_{2.5}$ and NMOCs required as well as NO_X and SO_2 given the potential effects. Redvale has $PM_{2.5}$ monitoring. Monitoring for NMOCs provides*

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RC #	PC #	Consent	Section Title	RC wording	Comment
				test results measured for each pollutant, from each generator tested. These tests shall: a. Be conducted for nitrogen oxides, $PM_{2.5}$ (measured as total filterable particulate), Total non-methane organic compounds and sulphur dioxide; b. Be conducted within one year after the first generator is installed and thereafter at least once every three years. Once there are two or more generators installed, at least two representative generators shall be tested on each sampling occasion. Once there are four or more generators installed, different generators shall be tested on each consecutive sampling occasion; c. Be conducted in accordance with: • ISO 10849:1996 or US EPA Methods 7 or 7E (nitrogen oxides); • AS4323.2-1995, ISO 9096:2003 or USEPA Methods 5 or 5I ($PM_{2.5}$); • USEPA Method 18 (non-methane organic compounds); • ISO 7935:1992, ISO 7934:1998, USEPA Method 6 or 6C (sulphur dioxide);and/or • other equivalent methods to the satisfaction of the Auckland Council d. Be carried out by a company with ~~International Accreditation New Zealand (IANZ)~~ suitable independent accreditation for the method(s) required by I above;	*evidence of the LFG destruction efficiency.*

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RC #	PC #	Consent	Section Title	RC wording	Comment
				e. Be conducted during normal process conditions that will give rise to maximum emissions; f. Comprise not less than three separate samples for each type of emission test undertaken at each generator.	
AQ.29	-	Air discharge consent	Monitoring: Odour	The Consent Holder shall implement monitoring measures that enable identification of all vehicles entering the site such that if malodorous loads are received at the working face, these wastes can be tracked to their source and subsequent loads from the source shall only be accepted in accordance with the special odorous waste procedures detailed by the LMP.	*Adopted from Whitford to enable odour controls.*
AQ.30	-	Air discharge consent	Monitoring: Odour	Regular odour field inspections shall be undertaken around the landfill site. The field inspections shall: a. be carried out at least weekly by a representative of the consent holder whenever refuse is being received to the Site; b. be conducted in general accordance with the methodology detailed by the *Good Practice Guide for Assessing and Management Odour* (Ministry for the Environment, 2016) and set out in the LMP. The consent holder shall investigate the cause of any odour detected by these odour field inspections in accordance with the conditions of this consent and the LMP and shall remedy any faults located. A record of each field inspection shall be maintained including weather conditions, the location of any	*Adapted from the Redvale land-use consent to enable adequate monitoring of odour.*

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RC #	PC #	Consent	Section Title	RC wording	Comment
				odours identified, the intensity, duration and character of the odour and the findings of any investigation. These records shall be provided to Auckland Council as part of the Annual Air Discharge Report. The records shall also be made available to the CLC, Kaitiaki Forum, PRP or an Enforcement Officer if requested.	
AQ.31	-	Air discharge consent	Monitoring: Hazardous air pollutants	The Consent Holder shall undertake monitoring to measure the concentrations of volatile organic compounds (VOC) in ambient air in at least three locations within the vicinity of the Landfill (including one location at or near to the Site boundary) using passive samplers or similar techniques. The monitoring shall be conducted over a period of not less than 30 days, with monitoring rounds occurring within five years of the commencement of the landfill and repeated at least once every ten years thereafter. A report detailing the monitoring and comparing the results against relevant ambient air quality assessment criteria shall be included as part of the Annual Air Discharge Report for that year.	*As detailed in section 6.5.6, the passive monitoring undertaken at Whitford Landfill has been useful to monitor the potential health risks from fugitive NMOC discharges.*
AQ.32	116	Air discharge consent	Monitoring: On-site weather	The Consent Holder shall maintain a meteorological monitoring station that accurately records weather conditions representative of the landfill, free from obstructions. The data shall be recorded continuously at a minimum ten-minute resolution. The monitoring station shall be calibrated by a suitably qualified and experienced technician at least annually. ~~On-site weather conditions shall be measured and recorded at least every 30 minutes.~~ The parameters measured and recorded shall include:	*This condition expands on the PC to specify a suitably located and calibrated meteorological monitor is required for the weather monitoring.*

RC #	PC #	Consent	Section Title	RC wording	Comment
				a. wind velocity b. wind direction c. barometric pressure d. rainfall e. temperature.	
AQ.33	-	Air discharge consent	Monitoring: Landfill fires	Remote monitoring of the Landfill shall be undertaken to alert site staff and Emergency Organisations to conditions indicative of a landfill fire. The remote monitoring shall include temperature and infra-red scanning cameras and shall be constantly monitored.	*Recommended to minimise air discharge risks.*
AQ.34	117	Air discharge consent	Reporting: Air discharges	The Consent Holder shall maintain a log of all monitoring data, inspections, investigations and actions taken with regard ~~for landfill gas~~ to air discharges ~~in accordance with Conditions 108-115~~. The log shall be made available to the Auckland Council upon request.	*All air discharge records are required to be logged, not only those related to LFG.*
AQ.35	118	Air discharge consent	Reporting: ~~Landfill gas~~ Air discharge annual report	The Consent Holder shall submit a summary of landfill gas, odour and air discharge monitoring results to Auckland Council annually. The summary shall include; a. the average volume of landfill gas extracted (m^3/hr); b. a summary of air discharge monitoring undertaken, including stack testing, ambient air quality monitoring, surface emission monitoring, and field odour inspections; c. a comparison of the actual landfill gas ~~production~~ generation and extraction rates with that predicted.	*The LFG Annual Report should be expanded to an air discharge report, so that details regarding all air discharges (most notably LFG & odour) are reported. GHG emissions are to be reported given the focus of the NES:AQ in*

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RC #	PC #	Consent	Section Title	RC wording	Comment
				Revised predictions shall be included where significant discrepancies are identified, as well as an explanation for the discrepancies. The reported landfill gas generation and extraction rates shall be accompanied by a summary of greenhouse gas emissions calculated in accordance with the regulations promulgated under the *Climate Change Response Act 2002* or subsequent act; d. The current state of the landfill gas control system, including a map of existing extraction wells, generators and flares installed. e. The mass of waste deposited to the landfill, including an estimate of average waste composition.	*minimising these discharges.*
AQ.36	-	Air discharge consent	Reporting: Significant discharges	The council shall be notified as soon as practicable in the event of any significant discharge to air, which results or has the potential to result in a breach of air quality conditions or adverse effects on the environment. The following information shall be supplied: a. Details of the nature of the discharge; b. An explanation of the cause of the incident; and c. Details of remediation action taken.	*Compliance Monitoring Officers must be kept abreast of significant air discharge incidents.*
AQ.37	-	Air discharge consent	Review: Air discharges	The consent holder shall engage an independent consultant experienced in landfill gas (LFG) and odour management to prepare a report to be submitted to Council, the CLG and the PRP at least once every two years. The report shall:	*Independent biennial auditing to ensure adequate controls and remedy effects. This RC is adapted from the*

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RC #	PC #	Consent	Section Title	RC wording	Comment
				a. Review monitoring data related to odour field inspections and LFG collection and control recoded in accordance with the conditions of this consent over the past two years; b. Review the results of any stack testing and/or ambient air quality monitoring undertaken for hazardous air pollutants over the past two years; c. Review all odour complaints received over the past two years; c. Review the response to odour complaints; d. Review the landfill's air discharge management practices including waste acceptance and placement, extent and management of the open tipping face, placement of intermediate cover (including extent, physical nature and thickness), the extent and operation of the LFG collection and extraction system including its effectiveness at minimising LFG discharge through the intermediate cover and the open face; e. Recommend any changes to landfill odour and LFG management practices, including placement and maintenance of intermediate cover and collection and extraction of LFG.	*Redvale LUC (annual odour review) and ensures the on-going efficacy of the LFG and odour control systems.*
AQ.38	-	Air discharge consent	Review: Air discharges	In 2038 and 2045, the consent holder shall submit a report assessing the landfill gas control system and air discharges from the Renewable Energy Centre against the Best Practicable Option (BPO) for minimising air quality effects.	*A BPO review condition provides council with information that may be useful for initiating a*

RC #	PC #	Consent	Section Title	RC wording	Comment
				The BPO Report shall be prepared by an independent consultant experienced in landfill gas (LFG) management and shall review all data relevant to the efficacy of the LFG control system and evaluate this system against systems at comparable landfills (national and international).	*s128 review of the consent, or for the consent holder to ensure emissions are being minimised as far as practicable.*
LU.149	149	Land-use consent (Operations)	Landfill Management Plan	The consent holder shall develop and implement an overall Landfill Management Plan (LMP) for the duration of this consent. The LMP shall be held on site at all times. The overall objective of the LMP shall be to set out the practices and procedures to be adopted to achieve compliance with the conditions of consent.	*I recommend further Management Plan requirements relevant to air quality, as below.*
LU.150	150	Land-use consent (Operations)	Landfill Management Plan	At least six months prior to the landfill commencement date (acceptance of waste at the site), the LMP shall be submitted to the PRP for review and expert commentary. All recommendations of the PRP shall be considered by the consent holder and the revised LMP and PRP's commentary shall be submitted to Auckland Council for certification, to confirm that the activities undertaken in accordance with the LMP will achieve the objectives of the Plan and compliance with the relevant consent conditions.	*The PRP has a role to guide the preparation of the Management Plan; as is the case for Whitford Landfill.*
LU.151	151	Land-use consent (Operations)	Landfill Management Plan	The LMP shall address how the following matters will meet any requirements, limits or restrictions set out by the consent conditions: • Height and timing of visual screening. • The stages and order of landfill development. • Construction and testing of the lining system.	*I recommend further Management Plan requirements relevant to air quality.* *I note that there is no stand-alone Odour Management Plan, as at Redvale Landfill. I*

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RC #	PC #	Consent	Section Title	RC wording	Comment
				• Gas, leachate and water management and monitoring. • Types of waste to be accepted and those that are prohibited. • Waste acceptance control and methodology of monitoring types of refuse accepted. • Sampling methodology for special wastes, including differentiation between routine, consistent, and well-characterised waste and variable waste sources • Methods of placing refuse. • Methods of handling special wastes, including biosolids. • Landfill working face and cover management. • Noise and vibration management. • Nuisance control procedures. • Dust management. • Pest and weed control. • Monitoring procedures. • Emergency procedures. • Contingency plans. • Odour management including best practice methods to manage odour. • <u>Monitoring and maintenance of the Landfill gas collection system, generators, flares and low-temperature leachate evaporator.</u> • Complaints response procedures ~~for odour effects~~. • The method for odour field inspections.	*consider this acceptable provided that detailed odour management measures are included in the main LMP.*

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RC #	PC #	Consent	Section Title	RC wording	Comment
				• Emergency management and response measures. • Record-keeping. … • After-care.	
LU.154	154	Land-use consent (Operations)	Landfill Management Plan	The LMP shall be subject to review annually from the date the landfill commencement date (unless the requirement for review is waived by the Auckland Council), such review to include assessment of the performance of the practices and procedures specified in it. Any amendment required by the Auckland Council arising out of this review or requested by the PRP arising out of their role ~~in design and construction of the lining system~~ shall be incorporated into the LMP without delay and submitted to the PRP for review and Auckland Council for certification that the LMP meets the requirements of Condition LU.150. The consent holder shall lodge a copy of the certified approved LMP with the Auckland Council, PRP, CLC and Kaitiaki Forum and a hard copy shall be made available at the Landfill during office hours ~~for use by the CLG~~. Auckland Council may waive the annual review requirement for that year if no amendments are required by the PRP and Auckland Council.	*The PRP and CLC groups should be supplied with the Management Plan. The PRP has a role in reviewing the LMP to ensure it remains effective. Any revision of the LMP must be certified by Council.*
LU.156	156	Land-use consent (Operations)	Site Emergency Management Plan	The consent holder shall prepare and maintain a Site Emergency Management Plan (SEMP), as part of the Landfill Management Plan. The SEMP shall be provided to the PRP for review and Auckland Council for certification as part of the LMP certification process. Advice of the existence of this Plan, and information on how to obtain a copy, shall be provided by	*All LMP sub-plans must also be certified as part of the overall LMP; a stand-alone condition*

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RC #	PC #	Consent	Section Title	RC wording	Comment
				the consent holder to the Auckland Council and other appropriate organisations such as Fire and Emergency New Zealand and the Auckland Regional Public Health Service ~~District Health Board~~. The SEMP shall include procedures to manage the risk from and contingency measures for: • Landfill fire • Wildfire • Forecast extreme weather event • Flooding	*may better reflect this requirement.*
LU.157	157	Land-use consent (Operations)	Landfill Gas Management Plan	The Consent Holder shall maintain a Landfill Gas Management Plan (LGMP), as part of the Landfill Management Plan. The purpose of the LGMP is to record all management and operations procedures, methodologies, and contingency and emergency plans necessary to comply with the conditions of this consent. The LGMP shall include the following information: • Landfill Gas System – Design and Construction • Landfill Gas System – Operation • Landfill Gas Monitoring • Landfill Gas Contingency • Landfill Gas control devices monitoring and maintenance measures The LGMP shall include measures to monitor for elevated temperatures, and provide trigger levels and contingency actions. The measurements shall include monitoring the CH_4:CO_2 ratio and landfill gas temperatures, with CH_4:CO_2	*The LGMP must be a detailed record of how LFG discharges are to be minimised as far as practicable.*

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RC #	PC #	Consent	Section Title	RC wording	Comment
				ratio of <0.6 being the trigger to investigate any higher temperatures, possible causes and possible remedial works.	

8.4 Recommended advice notes relevant to air quality

I recommend the following specific advice notes to be inserted immediately beneath the RCs noted in [square brackets]. Many of these recommended advice notes are based on my experience in compliance monitoring for Redvale and Whitford Landfills, where I initially found the reasons for submitted reports such as the monthly gas extraction wellhead monitoring results unclear. Advice notes will assist monitoring officers understand the submitted information and the significance of any reported exceedances.

- *To minimise fugitive landfill gas emissions, methane concentrations above the landfill surface are measured by the monthly surface emission monitoring required by Condition AQ.22. If this monitoring identifies an exceedance of the above threshold, remedial actions are required to be implemented or approved by Council within 10 working days as per Condition AQ.23. [RC AQ.17]*

- *Potential sub-surface migration of landfill gas is monitored on a monthly basis under Condition AQ.24. Any exceedance of the above threshold should be immediately investigated and remediated, including advising the PRP and Council. [RC AQ.18]*

- *The residual nitrogen content within landfill gas extraction wells is indicative of air being drawn into the landfill, leading to conditions conducive to sub-surface fire. As per condition AQ.9, the landfill gas extraction system is to be regularly tuned to maximise gas extraction while not drawing air into the waste. The monthly monitoring of wells required by Condition AQ.25 tests for nitrogen content and other parameters (notably temperature, carbon monoxide and oxygen) to maintain this balance and reduce the risk of sub-surface fires. [RC AQ.25]*

- *The approval of the council for an alternate method for source emissions testing will be based on a demonstrated advantage or equivalence of the method over the specified method for the accuracy and precision of results. [RC AQ.28].*

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I recommend the following general advice notes relevant to air quality matters to be included at the end of the consent:

- *The council may at any time undertake or require source emission testing and/or any other monitoring to ensure compliance with the conditions of this consent. The consent holder is advised that they will be required to pay for the costs of this monitoring required pursuant to section 36(5) of the RMA.*

- *The council acknowledges that the Management Plans are intended to provide flexibility both for the consent holder and the council for the management of the environmental effects of the landfill. Certification of the Management Plans by the council relates only to those aspects of the management plan that are relevant under the RMA. The certification does not amount to an approval or acceptance of suitability by the council of any elements of the management plan that relate to other legislation, for example, but not limited to, the Building Act 2004 or the Health and Safety at Work Act 2015.*

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9 Definitions

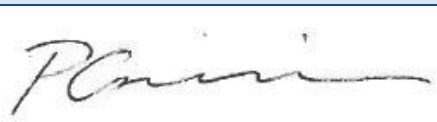
AAAQT	Auckland Ambient Air Quality Targets, scheduled in Table E14.3.1 of the AUP(OP)
AAQC	Ambient air quality assessment criteria
AAQS	Ambient Air Quality Standards, scheduled by the NES:AQ
AEE	Assessment of Environmental Effects (*Auckland Regional Landfill: Assessment of Environmental Effects*, Tonkin & Taylor, 30/05/2019)
AP42	United States Environmental Protection Agency (US EPA) AP-42: Compilation of Air Emissions Factors
AQR	Air Quality Report *(Auckland Regional Landfill: Air Quality Assessment*, Tonkin & Taylor, 30/05/2019)
AUP(OP)	Auckland Unitary Plan (operative in part, 19 November 2016)
BPO	Best Practicable Option, as defined in section 2 of the RMA
Council	Auckland Council
GPG:Dust	*Good Practice Guide for Assessing and Managing Dust*, Ministry for the Environment, 2016
GPG:Industry	*Good Practice Guide for Assessing Discharges to Air from Industry*, Ministry for the Environment, 2016
GPG:Odour	*Good Practice Guide for Assessing and Managing Odour*, Ministry for the Environment, 2016
HAP	Hazardous air pollutant
HRA	Health Risk Assessment (*Auckland Regional Landfill: Human Health Risk Assessment*, Tonkin & Taylor, 20/08/2019)
LEU	Low-temperature leachate evaporator unit
LFG	Landfill gas
LMP	Landfill Management Plan
Landfill Guidelines	*New Zealand Technical Guidelines for Disposal to Land,* WasteMINZ, 2018

MGLC	Maximum ground level concentrations (as predicted by the dispersion model)
NES:AQ	Resource Management (National Environmental Standards for Air Quality) Regulations 2004 and all amendments
NMOC	Non-methane organic compound (see VOC)
NO_X / NO_2	Nitrogen oxides (largely nitrogen oxide, NO) / Nitrogen dioxide
PC / RC	Proposed conditions / Recommended conditions
$PM_{2.5}$ / PM_{10}	Fine particulate matter less than 2.5 µm / 10 µm in aerodynamic diameter
RMA	Resource Management Act 1991 and all amendments
RMR	Risk Management Report (*Auckland Regional Landfill: Risk Management Assessment*, AECOM, 23/05/2019)
VOC	Volatile organic compound, a hydrocarbon compound with a vapour pressure greater than 0.27 kPa at 25°C
WMNZ	Waste Management NZ Ltd, the applicant

10 Review

10.1 Memo and technical review prepared by:

Paul Crimmins
MSc(Hons), BA
Senior Specialist

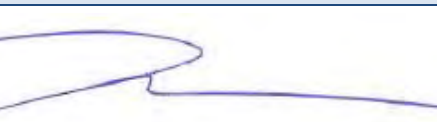


Contamination, Air & Noise | Specialist Unit | Resource Consents

Date: 9 September 2020

10.2 Memo reviewed by:

Jared Osman
BSc(Hons)
Team Leader



Contamination, Air & Noise | Specialist Unit | Resource Consents

Date: 10 September 2020

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Auckland Council
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21 September 2020

Our Ref: 190234-B
Reissue of: 190234-A

Attention: Mr Warwick Pascoe

Dear Mr Pascoe

REVIEW OF DAM SAFETY ASPECTS PROPOSED STORMWATER PONDS AUCKLAND REGIONAL LANDFILL

1.0 Introduction

The following report has been prepared by Don Tate. Don's qualifications are BE (Civil), a fellow of Engineering New Zealand and a chartered professional engineer. Don has over 30-years' experience as a civil and geotechnical engineer with dam engineering a specialist area of expertise. Don has reviewed a significant number of resource consent applications for dams particularly within the Auckland region.

Riley Consultants Ltd (RILEY) has completed a review of the dam safety aspects of the application. It is proposed to construct a series of ponds as part of the overall landfill development. The purpose of the ponds is to treat stormwater runoff from the landfill site. The ponds will be formed by a series of dams across the existing stream below the landfill.

The key information reviewed is contained in two reports prepared by Tonkin + Taylor Ltd (T+T). The first report (dated December 2019) addressed Section 92 (S92) queries under the following main headings:

- Potential Impact Classification (PIC).
- Geotechnical assessment and associated design elements.
- Dam preliminary design.
- Outline of proposed construction.
- Long-term management of dam safety.
- Regulatory compliance and quality assurance.

This initial S92 request related to demonstrating that all dam safety hazards have been identified and that the proposed dam design addresses these hazards.

The second report (August 2020) discusses a specific site investigation with particular reference to geotechnical hazards to the dams and ponds. The specific investigation included a walkover of the site by an experienced geologist, inspection of aerial photographs, and drilling of a series of hand auger boreholes in the vicinity of the proposed dams. Further information was also provided with respect to the PIC assessment, in particular, assessing an alternative cascade failure scenario and downstream environmental consequences.

A discussion on specific dam safety aspects covered in these reports follows.

2.0 Discussion on Dam Safety Aspects

2.1 General

Five main stormwater ponds are proposed over the life of the landfill. Ponds 2, 3, and 4 are the focus of the T+T reports as these are the largest and thus most important from a dam safety perspective. The general concept is an earth embankment constructed from locally sourced soils, with internal drains for seepage control.

Floods are managed by a primary spillway consisting of a drop manhole connecting to an outlet pipe, and an auxiliary spillway formed by an open channel.

2.2 Potential Impact Classification

The PIC assessment was carried out in accordance with the New Zealand Society of Large Dams New Zealand Dam Safety Guidelines (2015) (NZDSG). This publication represents industry best practice in New Zealand. A PIC assessment involves identifying the consequences of a hypothetical dam failure on the downstream environment (i.e. people, property and the environment). A computer simulation is used to produce inundation maps of the downstream area. The overall conclusion is that all three dams have a PIC of low, i.e. only minor effects downstream and no dwellings are affected. We agree with this conclusion.

2.3 Geotechnical Assessment

Key points in the T+T reports include the following:

- No active geological faults are mapped in the site area.
- Seismic hazard is relatively low in the New Zealand context, however, dams will be designed to the seismic design criteria within the NZDSG.
- Extensive geotechnical investigations have been carried out across the proposed landfill site, but not along the proposed dam alignments.

In response to a S92 request, T+T carried out further site specific investigations, the key points from these investigations include:

- The site is underlain by Pakiri Formation sedimentary rocks of the Waitemata Group.
- The boreholes encountered surficial soils comprising alluvium, residual soil, and completely weathered material.
- Several potential slope instability hazards were identified in the aerial photographs, which could affect the dams, although no evidence of recent slope instability was noted in the site walkover.
- The report discusses management of the slope instability hazard, and in particular how slope instability could affect the dams and an outline of options to mitigate the instability hazard if it is confirmed (avoid, remedy or mitigate).
- Additional investigations and assessments are recommended in the detailed design phase, to confirm the extent, depth and ‘activity’ of the identified probable landslide features.

In our opinion the geotechnical assessments have met the expectations of the NZDSG for this stage of the project.

2.4 Preliminary Design

Key points and design features include:

- A flood routing model was used to size the dams as well as the primary and auxiliary spillways.
- A maximum design flood of a 1 in 1,000-year event was adopted (within the range recommended in NZDSG).
- The dam geometry, levels and spillway dimensions were tabulated for each dam.
- 1:3 batter slopes for the dam embankment.
- Foundation cut-off to mitigate internal erosion.
- A central or upstream low-permeability core.
- Internal drains adopted for control of seepage and internal erosion.

All of these details are subject to detailed design. Overall, these concepts are considered reasonable and in line with accepted practice. T+T also outline a preliminary assessment of potential failure modes and proposed mitigation.

2.5 Proposed Construction

A list of measures to mitigate the risk of failure during and following construction is outlined. These typically follow the recommendations within the NZDSG, some key points include:

- Importance of a contractor who has experience in the construction and commissioning of similar dams.
- An experienced dam engineer should be involved at several key stages.
- A suitable flood diversion method should be developed.
- Geotechnical tests should be undertaken throughout the construction period to confirm the specified requirements are met.

2.6 Long-Term Management of Dam Safety

The key elements of a dam safety management system is described, which include:

- Operation, maintenance and surveillance.
- Emergency preparedness.
- Intermediate and comprehensive safety reviews.
- Identifying and managing dam safety issues.

These are sound practices in dam safety management and are consistent with the NZDSG.

2.7 Regulatory Compliance

T+T note that three of the dams are defined as large dams (over 4m height and 20,000m^3 stored volume of water) and thus, will require a building consent under the Building Act 2004. This is a separate process to the consents required under the Resource Management Act. The building consent process ensures that the dam has been designed to current standards and practices, and a code of compliance at completion also provides another level of quality assurance oversight.

2.8 Summary

Overall, we are satisfied that the level of information provided by the applicant is sufficient and all our queries have been addressed.

3.0 Consent Conditions

The applicant has provided suggested conditions covering dam safety aspects (Conditions numbered 83, 246, 247). These cover:

- Construction quality procedures (83)
- Dam Safety Management Plan (246, 247)

These conditions are considered appropriate. We would recommend, however, that conditions cover the design aspect (which is not covered in the above). As a building consent will be required for the large dams, these need not be extensive. A suggested condition in italics follows:

> *Prior to construction of any of the dams a detailed design including drawings and design report shall be submitted to Auckland Council. The design shall be signed off by a suitably experienced dam engineer (CPENG)*

4.0 Limitation

This report has been prepared solely for the benefit of Auckland Council as our client, with respect to the brief. The reliance by other parties on the information or opinions contained in the report shall, without our prior review and agreement in writing, be at such parties' sole risk.

Yours faithfully
RILEY CONSULTANTS LTD

Prepared by:

Don Tate
Director, CPEng

Reviewed and approved for issue by:

Scott Vaughan
Managing Director, CPEng

Memo

To: Warwick Pascoe – Principal Project Lead,

From: Steve Cavanagh –, Regulatory Engineering

Subject : Regulatory Engineering (RE) Assessment for Municipal Landfill

Date: Friday, September 4, 2020

Application BUN60339589
Applicant Waste Management New Zealand (WMNZ)
Address 1232 State Highway 1 Wayby Valley

1. Introduction

1.1. On the fifteenth of August 2019 Regulatory Engineering input was requested from the Principal Planner Auckland Council to assess the general Engineering aspects of creating a new Municipal Landfill to serve the Auckland region. . Various plans and reports were provided for assessment. The content in this report is in general a summary overview of the Stormwater and access, particularly in regard to the effects of installation and operation of infrastructure proposed for a landfill and the association with the ongoing forestry operation. Assessment criterion will predominantly refer to the Tonkin & Taylor (T&T) report and plan set provided, reference 1005069 and subsequent plans, details and correspondence.

1.2. A site visit has been carried out for this application on the 17th of October 2019 for the Dome Valley site and the 8th of July 2020 to the Redvale Landfill. The latter to view an example of an operational Landfill by WMNZ.

1.3. A Section 92 response was provided on the 20th of September 2019. It focused on Access, site Roads, Principal culverts, 1% AEP, Stockpiles, Methodology and earthworks volumes. Specific detail was requested in the form of a long section demonstrating the process in establishing and further changes to the operation through its various stages.

1.4. Response to Section 92 was made on the 11th of November 2019. These responses and discussions from both the Applicant and Regulatory Engineering to the applicant have been ongoing to the present. The last information received and checked, at the time of writing, is the long section noted above. It is understood this need to be amended and provided to Council.

2. Discussion/ Specific Engineering Details

2.1. Access, Egress, Parking & traffic effects

2.1.1. This feature is principally reviewed by the Expert Specialist and representatives from the respective RCA's. I have raise comment do to better clarification of the descriptions of "access roads" and "Site Roads". To summarise the response; these were defined in the S92 and comments provided (March 20) as basically Permanent (Access Roads) to be sealed, and; Temporary (Site Roads) to be unsealed, the latter will need to be noted as to a greater level of dust controls will be required on an ongoing basis.. The word temporary here looks to be defined be any haul road associated with the working landfill floor or possibly area for stripping and stockpiling of materials required in formation of the landfill.

2.1.2. Road drainage; as the surrounding ground is particularly steep and the effects may not be less than minor clarity was sought from the applicant.. I note particularly the cross-sections provided. A detailed plan identifying collection and disposal points is required and although some information on this has been provided, in my view a greater level of detail needs to be provided to enable clear direction for monitoring staff at construction and operational stages. This could be covered under their Engineering Approval Plans post issue of Consent.

2.1.3. Traffic effects; this has been covered by others and internal traffic movements should be covered by methodology (CMP) and come under the Health and Safety in Employment Act. Any

2.2. Principal Culvert (in the overland current flow path under the proposed fill site)

2.2.1. In lieu of requested long section small scale plans were provided demonstrating the sequence of SW controls at various stages. Additional clarity was also provided by T&T's Mr. Tony Bryce. In addition sketch plans have been provided. In discussion with Mr. Bryce; there is a principal pipe that discharges to pond 4 and as the works progress a secondary (smaller) pipe above that drains the catchment. I understand that the principal under fill pipe will be decommissioned and the secondary pipe will take flows for the catchment over the top of the (now) capped landfill. And yes there will be a steep drainage structure required to transport the SW for the catchment down slope to pond 4. In my view this is a constructional issue and will need a high level of scrutiny in design and implementation stages. This pipe will be required to; provide attenuation for the entire upstream catchment and creates a need for a high level of control for the change in direction of flow vertically (i.e. from capped floor to pond 4) and the same for energy dissipation where the flow meets pond 4.

2.2.2. Some staged Long sections were requested (and provided on the 17th of August 20, Note at the time of writing the drawing is in error as it shows the outlet to the pond series to "be removed prior to… phase 1". This would look to jeopardise the premise of separating leachate from clean water. Mr. Bryce (T&T) has confirmed this (3/9/20) and offered a new drawing. The section provided still omits the proposed lines above the initial and principal SW line. I have requested this omission be included on the section from T&T.

2.3. Culvert under flow path in Access (From Entry point to Landfill proper)

2.3.1. A long culvert is proposed near the entry to the site. It is 140m long and 1200mm in diameter and as shown on drawing; Eng. 30, incorporating a large amount of fill. This position was sighted at the time of site visit. There was some confusion as to whether a bridge or culvert was to be constructed. Depending on the grade, depth, degree of access etc. it is not common to construct a culvert where a bridge can be more easily implemented. I particularly note here the extent of the earthworks and particularly the large volume of fill required. The effects (from observation on site) looked to be more than minor. On closer scrutiny the culvert is 70m to 104m long dependent on the option selected. Blockage due to upstream logging operations would be a distinct concern and the effects of such in this terrain could result in a large volume of fill being transported downstream. As there is active and ongoing forestry operations upstream the risk of blockage to me looks high, particularly the migration of slash. Apart from a small scale pipe denoted on the plan there is little detail. It is not shown on the cross-section. It looks as though there is a catchment of approximately around 10-12 ha. Further detail should be applied at the construction phase to minimise both the effects of the installation of the culvert (Earthworks on grade, depth of cut, works in a flow path, silt sedimentation controls etc. all of which are more challenging due to the terrain locale) and the prevention and maintenance required to avoid the culvert blocking on an ongoing basis. I recommend an application for Engineering Approval to construct as part of the conditions.

2.3.2. Initially it appears a bridge was proposed and there was some discussion with WMNZ who confirmed this on site. Further discussion with T&T identified that preferred option was the culvert described in 2.3.1 above. Both options were provided in the documents however a cost analysis by T&T suggests a culvert is less expensive. In my opinion a bridge allows greater opportunity in design for freeboard/clearance to avoid obstruction, which is a concern when dealing with a culvert in an ongoing forestry operation – which will be continuing, as confirmed on site by WMNZ. . I have sought a comparison with a recognised industry bridge supplier and there looks as though there could be some disparity between with the figures and assessment of affects between a culvert and a bridge as provided by T&T.

2.4. Earthworks and Geotechnical

2.4.1. Earthworks are principally covered by other Specialists. I have commented on dust control and access grades. These can be covered by conditions, and particularly CMP.

2.5. Flooding

2.5.1. **T**he Application states that they do not cover the 1% AEP. This has been raised with the Applicants Agent (T&T). The response to date is that all temporary SW drainage will be designed to the 1 in 10 year storm. The permanent to the 1% AEP. I have advised that the temporary drains – particularly those intercepting runoff from the upstream catchment are critical and should be designed to the 1% AEP as I consider the effects to be greater than minor as it could overtop and introduce excess runoff into the landfill floor. They have confirmed that the principal pipe beneath the landfill is designed to the 1%AEP. This design needs to be checked by (Quantitative) Stormwater Specialist to ensure the batter drains on the perimeter of the landfill to ensure there is no overtopping in peak storms to the landfill floor, and subsequently to the surrounding environment.. I have recommended a condition for Engineering Approval.

2.6. **Utilities (Water/Wastewater)**

2.6.1. For the purposes of this report, wastewater refers to any effluent created from the utilities provided by WMNZ for staff operating the site. The site is large enough to accommodate wastewater treatment devices and disposal fields. A building consent would be required prior to operation.

2.6.2. Water supply is to be by rain harvesting from ancillary buildingds. Again this would be incorporated in any building consent to construct buildings on site.

3. Summary

3.1. Noting there are some minor clarifications outstanding at the time of writing, We consider in Principle that the effects of the construction of a landfill in locale identified, that the general Engineering effects are less than minor. This is of course subject to the receipt, review and approval of specific detailed design of the Engineering components of landfill, prior to its establishment.

4. Conditions

4.1. I have viewed the conditions as provided. While a lot of the conditions we (RE) would apply have been covered by others I make the following comments:

4.1.1. Construction of large culverts, what is the mechanisim for counstruction oversight?

4.1.2. , Creation of Access Egress or other infrastructure, by WMNZ to be Vested to Auckland Council/ Auckland Transport.. This is normally covered by Engineering Approval

4.1.3. Departments that will be responsible for specific construction plans and methodologies; I raise this as specialist inpit is normally required in the establishment of major facilities.

4.2. Noting the above we recommend an Engineering approval (an example is shown below) is applied.

4.2.1. (engineering plans) The engineering works required by this consent shall comply with the Council's "Standards for Engineering Design and Construction" as may be amended from time to time. Engineering Plans, as specified in the "Standards", shall be submitted to the Consents Engineer, and approval thereto received in writing, prior to the commencement of any works on the site.

Any variation or changes to the approved engineering plans shall be submitted for approval as an Amendment and approval received thereto prior to construction of the varied works.

The term 'engineering works' includes, but is not limited to:

- Earthworks and drainage works
- The formation of roads, including intersections, cul-de-sac heads or the like.
- The laying of pipes and other ancillary equipment to be vested in the Council for water supply, drainage or sewage disposal;
- Street lights, landscaping or structures on land vested, or to be vested, in the Council;
- The installation of gas, electrical or telecommunication reticulation including ancillary equipment;
- Any other works required by conditions of this consent or outlined in the plans and details provided.

Note: The plans required under this condition are separate to, and do not form part of, any Building Consent that may be required on the subject site.

Yours Faithfully,
Steve Cavanagh
SteveCavanagh

Chief Economist Unit | Auckland Council
Te Kaunihera o Tāmaki Makaurau

S42a Report Input – Review of economic assessment of proposed Auckland Regional Landfill and submissions

To:	Warwick Pascoe & Ryan Bradley
From:	Shyamal Maharaj & Shane Martin, Chief Economist Unit
Date:	1/09/2020

1. APPLICATION DESCRIPTION

Application and property details

Applicant's Name:	Waste Management NZ Limited (WMNZ)
Application number:	BUN60339589 and Private Plan Change 42
Activity types:	Resource consent and private plan change request from WMNZ
Description:	Resource consent for the construction and operation of a new regional landfill in the North of Auckland between Warkworth and Wellsford. Private plan change request to add a precinct to the Auckland Unitary Plan that sets up a consent pathway for the Auckland Regional Landfill.
Site address:	1232 State Highway 1, Wayby Valley

2. MEMO DESCRIPTION

2.1. This technical memo provides an economic review of the "Assessment of Economic Effects" report provided as part of the applicant's resource consent application. No further information on the economic case for the private plan change has been provided, so this review relies on information provided in the resource consent application/private plan change request and responses to the s.92/Cl.23 questions on that application/request. A full description of the proposal is provided in the Assessment of Environmental Effects (AEE) for the application prepared by Tonkin & Taylor Ltd for Waste Management NZ Ltd and dated May 2019.

3. EVALUATION OF THE ECONOMIC ASSESSMENT REPORT

3.1. The applicant identifies and assesses the economic impacts of the proposed location, construction and operation of the Auckland Regional Landfill (ARL) in their report. This report uses an economic impact assessment (EIA) methodology. This technical memo details the Chief Economist Unit's (CEU) feedback on the report and the s.92/Cl.23 responses prepared by Mike Copland from Brown Copland & CO Ltd on behalf of the applicant (WMNZ).

3.2. **CEU's understanding of the applicant's evidence:**

There are two separate but related processes underway by WMNZ. The first is an application for resource consents to locate, develop and operate a new regional landfill serving mainly the Auckland Region in the Wayby Valley between Warkworth and Wellsford. The second is a private plan change request to include a precinct in the Auckland Unitary Plan to set up a consent pathway for a landfill. Both these processes rely on the same economic assessment information and therefore our comments below relate to both the resource consent application and the private plan change request.

The applicant has identified that a landfill must be developed in the North of Auckland given the wind down and eventual decommissioning of its Redvale landfill. We understand their argument to be the following:

3.2.1. Auckland will need a new landfill to meet the demands of a growing population and associated waste disposal because Redvale will reach capacity by 2028.

3.2.2. In its current form, Hampton Downs landfill will not be able to accommodate Auckland's growing landfill requirements, as Hampton Downs will also require extensions to their consent for increasing capacity which is uncertain and where current capacity will not satisfy Auckland's needs.

3.2.3. For the purposes of the economic evaluation, the criteria used to select the proposed site is sufficient in order to ascertain a reasonable counterfactual to help inform the evaluation of the economic costs and benefits of the proposed Wayby Valley site.

3.3. **Recommendations and Reservations**

We agree that, if Redvale landfill is approaching capacity and there is no new significant technological or other solution to dispose of waste available, then a new landfill is needed for Auckland and that an alternative outside of Auckland is not likely to result in a better outcome for Aucklanders. Our conclusion rests on the assumption that a new landfill is needed and the practical and economic considerations in locating it in the Auckland region (costs to serve, distances to travel with resultant emissions etc), rather than the applicant's economic evidence. We have several reservations about the economic evidence submitted. Our concerns are based on the issues we raised in our s.92/Cl.23 questions for the applicant, which have not yet been fully addressed.

3.3.1. There are limitations in the applicant's economic analysis that mean the results are not as credible as they would be if a best-practice Cost benefit analysis (CBA) methodology was adopted.

3.3.2. CBA methodology requires that non-financial or non-monetary effects be recognised as best as possible so they can be taken into account along with financial costs or benefits – see the NZ Treasury guidance for example, or Auckland Council's *Guide to weighing benefits and costs*.

A cost benefit analysis should weigh up all these economic effects against each other to enable a balanced decision. Response 4F states that it is double counting if all effects are included in the

CBA, in contrast to those highlighted in the broader AEE document. This is not necessarily the case. A CBA considers all economic effects (which definitionally includes social, cultural, and environmental effects – all effects that affect welfare/utility).

These non-financial impacts should at least be described or proxied if a dollar value cannot be ascribed when tabulating the net benefits/costs of the project so as to complete a meaningful evaluation. Some of these effects are described in the Costs and Benefits table provided in the s.92/Cl.23 response, so this indicates that the author has considered this to some extent, but our view is that a better sense of scale should be provided.

3.3.3. Only direct economic effects should be counted in a standard best practice CBA, not indirect or induced impacts. Further, the RMA does not endorse the measurement of indirect impacts. As such, multipliers should not be used in the analysis, as this does not fit with international best practice for weighing up costs and benefits, and is more an approach used for economic impact analysis (EIA), which doesn't help decide whether a course of action is appropriate or not.

3.3.4. The net impact on employment presupposes that the counterfactual site would be outside Auckland. If this is the case, then it follows that keeping the landfill in Auckland would protect jobs here. However, if a reasonable alternative site exists inside Auckland, these jobs would largely be displaced from one location to another. While one location may benefit from new jobs, another part of the region would lose, and economic impacts generally rely far more on where money is spent (usually near someone's home) than where it is earned. Given that this landfill is ostensibly replacing the Redvale landfill, there should be no net regional change in jobs, except changes in how the landfill operates. It is likely more automation rather than less would be adopted in a brand-new landfill, so it is hard to expect that new additional jobs would be added.

3.3.5. The applicant has provided their rationale for the selection of the site based on criteria to help inform their decision. This balanced a range of trade-offs based on primary, secondary and tertiary constraints. Nevertheless, at face value, any new landfill site is going to be associated with environmental, social and potentially cultural challenges. Thus, the question at hand isn't whether the new site will create challenges, but whether the proposed site is one that would minimise these impacts and how that site is compared against a reasonable counterfactual.

3.4. Assessment of submissions

3.4.1. The Chief Economist Unit reviewed the submissions that are relevant to the economic assessment, i.e. those relevant to the evaluation of the economic costs and benefits of the proposed landfill. This means that a set of submissions that mentioned impacts on the environment, transport network, social dynamic, cultural issues and financial impacts were reviewed across those in support, neutral or in opposition to the proposed landfill site.

3.4.2. Any site for a landfill is going to have some detrimental impacts on the nearby environment. The question is simply whether in choosing a site those impacts have been minimised relative to the benefit to Aucklanders of providing waste management services.

3.4.3. Submissions in favour of the proposed landfill tended to be those focused on the economy. They recognised that the Auckland region is growing and will continue to grow, and that waste is an inevitable by-product of growth. Infrastructure and building work will also produce waste (despite waste minimisation practices and on-going research into concepts like the circular economy). Furthermore, it follows that the Wellsford area that the landfill is expected to operate in could be a catalyst for industrial and commercial activity, which could provide other benefits to the community. These need to be thoroughly measured.

3.4.4. Other submissions focused on some of the typical challenges associated with a landfill.

3.4.4.1. The use of technology to mitigate the adverse impacts of a landfill operating near an urban population due to concern over externalities like leachates or other toxic chemicals spilling over into neighbouring rivers, or streams.

3.4.4.2. Traffic safety, congestion, adverse impacts of trucks using dangerous/busy roads to transport waste.

3.4.4.3. Environmental damage as a result of operations including toxins in the rivers, lakes and waterways that supply the urban population's drinking water.

3.4.4.4. The release of greenhouse gases.

3.4.4.5. Impacts on Auckland's access to reliable and quality supplies of water, especially given the current drought.

3.4.5. Given that any landfill will have some environmental, financial, or social costs, the real question is whether the proposed site is one that will minimise theses costs compared to alternative sites. The applicant has provided limited information on how they evaluated alternatives for a landfill to the north/north-west. Their analysis, not all of which we have been privy to, purports to show that, once their self-identified primary, secondary and tertiary constraints have been considered, the proposed site is the best option for a new landfill in the north/north-west.

4. REVIEW

Memo prepared by:

Shyamal Maharaj

Economist, Chief Economist Unit, Auckland Council

1/09/2020

Shane L. Martin, PhD

Senior Economist, Chief Economist Unit, Auckland Council

1/09/2020

Technical memo reviewed and approved for release by:	
David Norman	
Chief Economist, Auckland Council	
Date:	**1/09/2020**

Technical Memo – Specialist Unit

To:	Mark Ross – Planning Consultant (Sentinel Planning), Processing Planner
From:	Mark Lowe – Streamworks Consultant (Morphum) to the Earth, Streams and Trees team, Specialist Unit, Resource Consents
Date:	21 September 2020

1.0 APPLICATION DESCRIPTION

Application and property details

Applicant's Name:	Waste Management NZ Ltd
Application number:	LUS60339672 (BUN60339589)
Activity type:	Streamworks
Description:	The applicant, Waste Management NZ Ltd (WMNZ), is seeking to obtain resource consents for the construction and operation of a new regional landfill facility within the Wayby Valley area, between Warkworth and Wellsford.
Site address:	1232 State Highway 1, Wayby Valley

2.0 SCOPE, QUALIFICATIONS, PROPOSAL, SITE AND LOCALITY DESCRIPTION

2.1 Scope of Technical Memo

1. This Technical Assessment considers the application with regards to actual and potential effects on freshwater ecology resulting from the proposed activities in, on under or over the bed of rivers streams and wetlands, with reference to chapter E3 of the Auckland Unitary Plan: Operative in Part (AUP:OP). The Technical Assessment also considers the proposed 'effects management package' including measures to avoid, remedy, mitigate, offset and compensate adverse effects.

2. The following are assessed by a separate Council Specialists:

- Construction methodology for streamworks, effects of sediment discharge, and the proposed erosion and sediment controls.

- The effects of surface water diversion, with reference to chapter E7 of the AUP:OP.
- The effects of contaminant discharge, including industrial trade activities and stormwater, from the ongoing operation of the landfill.
- Effects on terrestrial ecology, including on wetland avifauna and herpetofauna.

3. I undertook site visits on 7th and 21st of March 2019.

2.2 Qualification and Experience

4. My full name is Mark Ian Lowe. I am a Principal Environmental Scientist at Morphum Environmental Limited (Morphum). I have worked at Morphum since May 2013.

5. I am a consultant to Auckland Council providing specialist input to resource consent processing on matters of streamworks, freshwater ecology, terrestrial ecology and vegetation removal, and biodiversity offsetting.

6. I hold the qualifications of Bachelor of Science (Ecology) and Masters in Science (Conservation Biology) from Massey University.

7. I am a Certified Environmental Practitioner (CEnvP) and have completed the 'Making Good Decisions Course'.

8. I have 13 years' experience as a professional ecologist and environmental scientist. My work experience includes undertaking ecological assessments; preparing and peer reviewing Ecological Impact Assessments and Ecological Restoration Plans; providing technical advice to support district and regional plan changes; the development of non-statutory guidance documents and practice notes; the development of technical ecological tools to support ecological assessments and management decisions; and, providing strategic advice for district and regional councils on ecological and stormwater matters.

9. I have provided expert evidence on ecological matters at numerous hearings, including Council and Environment Court hearings.

2.3 Proposal Relevant to this Consent Only

10. The applicant is seeking regional streamworks consent for works involving the culverting and reclamation of streams and wetlands including (approximately):

- A culvert 105 m in length (with approximately 20 m of that in Natural Stream Management Area (NSMA) Overlay) to facilitate the construction of the access road (Southern Block).
- 13,915 m of stream reclamation including 7,724 m of intermittent stream and 6,191 m of permanent stream.
    - This calculated quantum of reclamation includes installing a number of culverts in the Southern and Western Blocks. While consent is being sought for the new culverts, in terms of assessing effects and quantifying offset and/or compensation measures, the application has considered these culverts as reclamation.

- This quantum of reclamation excludes the area of stockpile 2 (approximately 1.3 km of stream) which has been removed from application though design changes subsequent to the original application[1].

- 1.37 ha of wetland reclamation. Including the following areas as identified in the application material:
  - 0.7 ha of indigenous wetland.
  - 0.64 ha of exotic wetland.
  - 0.03 ha of kahikatea pukatea forest, which was confirmed as meeting the RMA definition of a wetland (s92 response tranche 5) and the updated extent of impact confirmed in s92 outstanding terrestrial responses.

2.4 Relevant Documents

11. A description of the proposal relevant to the streamworks application is provided in the following application documents and s92 responses:

- Auckland Regional Landfill: Assessment of Environmental Effects. Prepared by Tonkin & Taylor Ltd. Dated 30 May 2019. (Herein referred to as the AEE).
- Auckland Regional Landfill: Assessment of Aquatic and Terrestrial: Ecological Values and Effects. Prepared by Tonkin & Taylor Ltd. Dated 30 May 2019. (Herein referred to as the EcIA).
- DRAFT Off-site Stream Compensation Plan. Prepared by Tonkin & Taylor Ltd. Dated 18 December 2019. (Herein referred to as the OSSCP).
- Memorandum: Auckland Regional Landfill s92 responses. Attention Warwick Pascoe. Prepared by Tonkin & Taylor Ltd. Dated 6 December 2019.
- Memorandum: Auckland Regional Landfill s92 responses - Tranche 3. Attention Warwick Pascoe. Prepared by Tonkin & Taylor Ltd. Dated 20 December 2019. (Herein referred to as the s92 response tranche 3).
- Memorandum: Auckland Regional Landfill s92 response - Tranche 5. Attention Warwick Pascoe. Prepared by Tonkin & Taylor Ltd. Dated 21 February 2020. (Herein referred to as the s92 response tranche 5).
- Memorandum: Response to outstanding Freshwater Ecology section 92 questions. Attention Warwick Pascoe. Prepared by Tonkin & Taylor Ltd. Dated 6 August 2020. (Herein referred to as the s92 outstanding freshwater responses).
- Memorandum: Response to outstanding Terrestrial Ecology section 92 questions. Attention Warwick Pascoe. Prepared by Tonkin & Taylor Ltd. Dated 14 August 2020. (Herein referred to as the s92 outstanding terrestrial responses).
- Memorandum: Removal of Stockpile 2 from the Auckland Regional Landfill resource consent application BUN60339589. Attention Warwick Pascoe. Prepared by Tonkin & Taylor Ltd. Dated 14 August 2020.

[1] Memorandum: Removal of Stockpile 2 from the Auckland Regional Landfill resource consent application BUN60339589. Attention Warwick Pascoe. Prepared by Tonkin & Taylor Ltd. Dated 14 August 2020.

- Auckland Regional Landfill: Terrestrial and Wetland Biodiversity Offsets and Compensation Framework. Prepared by Tonkin & Taylor Ltd. Dated August 2019.

12. Further information is also provided in the following documents:

- Auckland Regional Landfill: Water Quality Baseline Monitoring Report. Prepared by Tonkin & Taylor Ltd. Dated 30 May 2019.
- Auckland Regional Landfill: Engineering Report. Prepared by Tonkin & Taylor Ltd. Dated 30 May 2019.
- Auckland Regional Landfill: Sediment and Erosion Control Assessment. Prepared by Tonkin & Taylor Ltd. Dated 30 May 2019. (Herein referred to as the ESC Report).
- Auckland Regional Landfill: Stormwater and Industrial and Trade Activity. Prepared by Tonkin & Taylor Ltd. Dated 30 May 2019.

2.5 Site Description

13. The legal descriptions of the land parcels effected by the proposal are provided in table 1.1. of the AEE. The overall site area is approximately 1,020 ha (Subject Site), with the landfill footprint occupying approximately 60 ha of the Subject Site (Project Footprint). Section 4 of the AEE and section 2 of the EcIA provides a description of the wider site including the watercourses and wetlands within.

14. The descriptions of the site in the application material are considered appropriate and adequate to make an informed assessment of the proposed streamworks.

3.0 REASON FOR CONSENT – STREAMWORKS

3.1 Reasons for consent

15. The AEE identifies the following reasons for consent:

- E3.4.1 (A19) Diversion of a river or stream to a new course and associated disturbance and sediment discharge – **Discretionary.**
- E3.4.1 (A33) Culverts or fords more than 30m in length when measured parallel to the direction of water flow outside of an overlay – **Discretionary.**
- E3.4.1 (A33) Culverts or fords more than 30m in length when measured parallel to the direction of water flow within an overlay – **Non-complying.**
- E3.4.1 (A49) New reclamation or drainage, including filling over a piped stream – **Non-complying.**

16. Through s92 responses (tranche 3) the applicant confirmed, for the avoidance of doubt, to enable the enhancement of wetlands using felled logs, the following is also considered a reason for consent:

- (E3.4.1) A5 (Depositing any substance for the purposes of habitat enhancement or scientific research – **Restricted Discretionary.**

17. In undertaking this assessment, it is understood that:

- Any stormwater outfalls will meet the permitted activity standards associated with E3.4.1 (A39). Should consent be granted and subsequent detailed design identifies an area where the permitted activity standards cannot be met, consent would be sought separately. This has been confirmed by the applicant ins s92 Response (tranche 3).
- Any culverts that measure less than 30m in length when measured parallel to the direction of water flow are not considered to be permitted activities as they are considered to not comply with the progressive encasement standard (E3.6.1.14 (c)). It is understood that a precautionary approach has been applied to the effects of culverting where all stream culverts (including any that may be less than 30 m in length, with the exception of the 105 m culvert within the NSMA (Southern Block), have been assumed to have an SEV impact score (i-I) of 0 when assessing effects and quantifying offset and/or compensation measures. Similarly, culverts within wetlands have been treated as full loss or reclamation.
- Removal of culverts and removal or replacement of bridges will be undertaken within the relevant permitted activity standards. Should consent be granted and subsequent detailed design identifies an area where the permitted activity standards cannot be met, consent would be sought separately.

18. It is noted that any consents that may be required for offsite compensation works proposed by the OSSCP, including, but not limited to, E3.4.1 A5 (Depositing any substance for the purposes of habitat enhancement or scientific research) are unable to be granted at this stage as the location of the compensation sites are not known and the effects of the activities cannot be assessed.

4.0 TECHNICAL ASSESSMENT OF EFFECTS

19. The EcIA, forming part of the application, provides an assessment of the ecological values of the stream and wetland environments within the Subject Site, as well as, an assessment of the actual and potential effects on these values resulting from the proposed activities. The EcIA also outlines the proposed means to manage any actual or potential adverse effects through a combination of avoidance, mitigation, offset and compensation measures.

20. This Technical Memorandum provides an assessment of the application relevant to the proposed streamworks, including the:

- Applicants assessment of existing stream and wetland values within the Subject Site (section 4.1 below);
- Applicants assessment of the actual and potential effects on stream and wetland values (Section 4.2 below);
- Applicants proposed measures to manage actual and potential adverse effects on stream and wetland values (Section 4.3 below).

21. **Note:** Several inconsistencies in reporting are noted within the application EcIA. For completeness, clarification regarding the inconstancies were sought through requests for further information. The majority of these inconsistencies were clarified though the various s92 responses. The remaining inconsistencies are not of sufficient scale to fundamentally change

the opinion and conclusions of this Technical Assessment. These outstanding inconsistences are predominantly differences between referring to ecological values in a general sense and ecological values reported as part of a technical assessment using the EIANZ Ecological Impact Assessment Guidelines[2]. In addition, it is noted that the s92 outstanding terrestrial response confirms a 'high' ecological value for indigenous wetland and a 'moderate' magnitude of effect, following effects management. Using the EIANZ Ecological Impact Assessment Guidelines, this should correspond to a 'high' overall level of effect, rather than the 'moderate' level of effect reported.

4.1 Existing Stream and Wetland Values

4.1.1 Stream Classification and Wetland Delineation

15. The EcIA classifies the watercourses within the Subject Site against the definitions within the AUP:OP. A combinations on methods were used to determine the presented classifications, including predictions using the catchment area and subsequent ground truthing.

16. Several stream classifications within Valley 1, the Southern Block and the Fill Site 2 (Waiteraire Tributary Block) were reviewed in the field as part of the Auckland Council site visit. This review of the modelled classifications in the field confirmed that the methodology applied by the applicant is appropriate.

17. The EcIA delineates and maps both the exotic and native wetlands (both SEA and non-SEA) on site. The exact methods used to delineate wetlands on the ground are not outlined in the application material, it is not clear to what extent these delineations have followed the Landcare Wetland Delineation Protocols[3]. However, mapped wetland extents were reviewed in the field as part of the Auckland Council site visit. This review provided confidence that the mapping of existing wetlands presented as part of the application material has sufficiently captured the wetlands on the Subject Site to a level sufficient to understand the level of adverse effects on wetlands through reclamation.

4.1.2 Streams and Wetland Values

18. The EcIA outlines the methods used to assess the existing ecological values of streams and wetlands, as well as, the results of that assessment.

19. The methods used to assess the existing ecological values of the streams and wetland within the Subject Site are considered appropriate and the reported results are considered transparent, accurate and a fair representation of the on-site values.

20. The adverse effects associated with stream reclamation and culverting predominantly occur within the Southern and Eastern Blocks. The EcIA reports the streams within these areas as having 'very high' ecological values. Stream Ecological Valuation (SEV) scores for the Eastern Block range from 0.71 – 0.83 (N=7, Average 0.78), while SEV scores for Southern Block range from 0.77 – 0.93 (N=6; Average 0.83).

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[2] Roper-Lindsay, J., Fuller S.A., Hooson, S., Sanders, M.D., Ussher, G.T. 2018. Ecological impact assessment. EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems. 2nd edition.

[3] Clarkson, B.R (2018) Wetland delineation protocols.

4.2 Assessment of Effects on Stream and Wetlands

21. The assessment of effects followed the Ecological Impact Assessment Guidelines produced by EIANZ. The use of this process and the applicant's application of the process is considered appropriate in relation to the effects considered by this Technical Assessment.

4.2.1 Streams

22. The EcIA summarises the actual and potential effects on streams and freshwater ecology, in relation to the activities considered by this Technical Assessment, as:

- Injury and/or mortality to native fish during reclamation;
- Reduced fish passage;
- Loss of stream ecological function and habitat area from activates over the bed of the stream.

23. The descriptions of these effects in the EcIA is considered accurate and appropriate. However, it is noted that table 6.2 of the EcIA states that the NSMA in the Southern Block is outside the project footprint. This is not the case as approximately 186 m^2 of NSMA area, including 20 m of stream length are proposed to be affected by the access road (s92 response tranche 3).

4.2.2 Wetlands

24. The EcIA summarises the actual and potential effects on wetlands, in relation to the activities considered by this Technical Assessment, as:

- Injury and/or mortality to fauna including native fish during reclamation;
- The loss of habitat and vegetation from activates over the wetland;
- The increase of edge effects and habitat fragmentation, and the loss of opportunity for wildlife corridors.

25. The EcIA does not appear to have considered the effects of wetland reclamation on the loss or reduction in ecosystem services provided by the wetlands such as carbon sequestration and contaminant storage. Additionally, it is also considered that the installation of structures within the wetland areas has the potential to impact the provision of fish passage.

4.3 Assessment of Proposed Management of Adverse Effects on Streams and Wetlands

4.3.1 Avoidance

4.3.1.1 Policy

26. Objective E3.2(1) seeks that Auckland's lakes, rivers, streams and wetlands with high natural values are protected from degradation and permanent loss seeks, also objective E3.2(2) seeks that Auckland's lakes, rivers, streams and wetlands are restored, maintained or enhanced. Objective E3.2(6) seeks that reclamation and drainage of the bed of a lake, river, stream and wetland is avoided, unless there is no practicable alternative.

27. Policy E3.3(13) seeks to avoid the reclamation and drainage of the bed of lakes, rivers, streams and wetlands; unless certain conditions are met, including there is no practicable alternative method for undertaking the activity outside the lake, river, stream or wetland; and for the

operation, use, maintenance, repair, development or upgrade of infrastructure; or to undertake mineral extraction activities.

28. Similar Policies and Objectives are included within the Regional Policy Statement, namely, Objectives B7.3.1(2) and (3) and Policy B7.3.2 (4).

29. However, the introduction to chapter E3 of the AUP:OP acknowledges that there is a balance to be struck between the need to provide for the ongoing growth of urban Auckland, including the requirements of infrastructure, and the protection, maintenance and enhancement of lakes, rivers, streams and wetlands.

30. The Natural Stream Management Area (NSMA) overlay includes objectives to avoid structures and activities in natural stream management areas that disturb, damage, remove or replace the natural bed and course of the river or stream (D4.3(4)); but also provide for infrastructure where there is a functional or operational need and there is no practicable alternative (D4.3(5)).

4.3.1.2 Site and Location Selection

31. The AEE considers that the proposed layout and design of the landfill minimises stream loss as far as practicable.

32. It is outside the expertise of this Technical Assessment to comment on the engineering and design constraints that lead to the proposed layout for the existing site. Approximately 0.7 ha of a total 12.1 ha of indigenous wetland is impacted (5.8%), 0.64 ha of a total of 4.4 ha of exotic wetland impacted (14.5%) and 0.03 ha of a total of 17.2 ha of kahikatea pukatea forest (0.17%). It can therefore be considered, for the purposes of this assessment, that the proposed layout has largely avoided reclamation impacts on the wetlands on site; with the larger areas with higher ecological value avoided.

33. However, the proposal does results in stream loss which has been identified as having high ecological value. Approximately 11.5 km of the 13.9 km of proposed reclamation occurs in catchments identified with high current ecological values (Southern, Eastern and Waitareraire Blocks).

34. There are concerns, from a freshwater ecological perspective, regarding the appropriateness of the site for undertaking the proposed activity, as well as, and the level of avoidance of adverse effects on freshwater ecological values that has been applied in selecting the Subject Site. The Site Selection Process Report limits consideration of ecological constraints in selecting the site location to the use of existing AUP:OP overlays such as SEAs, NSMAs and WMAs.

35. It is noted that the Technical Guidelines for Disposal to Land[4] state that initial investigations should include an assessment of the sensitivity of biota and fauna at the site and downstream. Additionally, noting that careful siting of a landfill is fundamental to protect the environment from potential adverse effects associated with the disposal of waste materials.

[4] WasteMINZ, Technical Guidelines for Disposal to Land, August 2018.

36. Only subsequent to the selection of the Wayby valley site were ecological field surveys undertaken that identified several 'at risk' freshwater species including, longfin eel, kakahi and inanga and the high ecological values as outlined in the EcIA.

37. The AEE (section 9.11.2.1 Freshwater fauna) states:

> *"to avoid potential effects on fauna, the design and layout of the landfill avoids as far as practicable the habitats within which native freshwater fauna are known or likely to be present. As a result of this design methodology, the freshwater systems within the WMNZ landholdings with the highest ecological value have been avoided*".

38. It is not clear how this conclusion has been drawn given that the Eastern and Southern Blocks where most of the stream impacts are occurring have the highest EPT taxa diversity for the site and 'very high' fish IBI scores.

39. The design layout has sought to avoid, as much as practicable, impacts within the NSMA overlay. However, the NSMA overlays were largely delineated as a desktop exercise[5] and defined solely based on the presence of predominantly indigenous riparian vegetation cover (See AUP:OP definitions) and only assumes instream habitat and fauna values.

40. Therefore, it is considered, that in determining appropriate avoidance of freshwater values, the on-site values should be considered; irrespective of the location of the NSMA overlay.

41. In determining the best practicable option for the crossing of the watercourse in the vicinity of the NSMA the applicant's conclusion focuses on relative costs and degree of encroachment of the NSMA of the different options proposed. It is considered that the freshwater ecological values including the relative loss or modification of streambed area and overall riparian vegetation removal are important considerations, irrespective of the location of the NSMA overlay.

42. Noting the 'very high' ecological value of the Southern Block stream, it is considered by this Technical Assessment that the provision of a bridge structure to cross stream in this location would confer a lower magnitude of effect on freshwater ecology than the culvert currently proposed.

43. It is acknowledged that since initial lodgement of the application stockpile 2 has been removed from the design[6]. This is a measure of avoidance that results in approximately 1.3 km less stream reclamation than the original proposal.

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[5] A natural stream management area may be determined from measurements taken from an aerial photograph or an accurately scaled plan. They are shown indicatively in the Natural Stream Management Areas Overlay on the planning maps (AUP:OP Chapter D4).

[6] Memorandum: Removal of Stockpile 2 from the Auckland Regional Landfill resource consent application BUN60339589. Attention Warwick Pascoe. Prepared by Tonkin & Taylor Ltd. Dated 14 August 2020.

4.3.2 Mitigation

44. Objective E3.3(5) seeks that activities in the bed of a river and wetland are managed to minimise adverse effects on streams and wetlands.

4.3.2.1 Sedimentation

45. Potential effects of the proposed streamworks activities include the potential for release of sediment laden water to the receiving environment and disturbance of retained streambed areas. Deposited sediment negatively affects aquatic biota by degrading in-stream habitats, associated resources and functions. Fine particulate sediment clogs the interstitial spaces between hard substrates such as wood and cobbles, altering habitat complexity resulting in restricted access to refugia. Deposited sediment high in organic matter can also reduce dissolved oxygen levels. Suspended sediment can also cause impacts on aquatic ecosystems. Suspended sediment can clog fish and macroinvertebrate gills, increasing disease susceptibility and mortality rates, as well as, altering behaviour for migration, feeding and reproduction.

46. These effects can be mitigated through an appropriate Erosion and Sediment Control Plan. The Erosion and Sediment Control Plan and Streamworks Methodology is not assessed as part of this memo and covered by a separate council specialist.

4.3.2.2 Fish Injury and Mortality

47. Direct injury or mortality of individual fish, as well as kakahi and koura, present at the time of works due to dewatering and other construction impacts associated with the proposed reclamation and culvert installations is a potential impact of the reclamation and culverting works.

48. The applicant has provided a draft Native Freshwater Fish and Fauna Management Plan (NFFFMP) (s92 response tranche 5). The applicant has outlined overarching principles for native fish salvage that are considered sound and reasonable.

49. The applicant has provided confidence that fish can be excluded (through summer temporal freshwater extent) or confidently salvaged from approximately 70% of the impacted streams (s92 tranche 3). A further 4.6 km of stream will have difficult access and up to 1.15 km of stream may not be able to be accessed.

50. Therefore, it is likely that the effects on injury and mortality of native fish though dewatering and other construction impacts is mitigated to the extent practicable, however, there is also likely to be some level of residual adverse effect not managed.

51. The draft conditions of consent address the finalisation and implementation of the NFFFMP. It is recommended that the conditions are strengthened to ensure this mitigation measure is implemented as anticipated following best practice and further provide clarity and measures for Council to certify the plan against. It is noted that the draft conditions make reference to capture and transport being undertaken in accordance with the New Zealand Freshwater Fish Sampling

Protocols[7]; these guidelines are for the representative sampling of fish populations, not for salvage, transport and relocation prior to physical works. It is recommended the conditions remove reference to this guidance and replace with reference to best practice procedures (at the time of implementation).

4.3.2.3 Fish Passage

52. Many native freshwater fish species (including those identified within the Subject Site) require migration up and downstream as part of their life cycle. Instream structures, such as culverts, can impact fish migration when adequate provision for fish passage is not provided. This can result in a reduction in the distribution and abundance of freshwater species.

53. The EcIA identifies the loss of fish passage including to the Waiteraire Stream, and upper Southern Block, and various parts of Western Block as a potential impact of the proposed works. Where freshwater fish habitat exists upstream of the proposed culverts mitigation to design culverts for fish passage has been proposed. Additionally, a bridge structure will be constructed on the Waiteraire Stream upstream of the confluence with S Stream in the Southern Block.

54. The majority of the culverts proposed for the construction of the access road in the Southern Block have been assessed as not requiring the provision of fish passage, with the exception of the 105 m long culvert on the main channel, due to the limited habitat available upstream. This assessment and conclusion are accepted.

55. The applicant proposes to install baffles in the base of the culvert to provide rest areas for fish. Fish baffles are typically used as a retrofit option to remediate existing culverts causing barriers to fish passage. Installing baffles at the time of installation to provide further redundancy in the provision of fish passage is accepted. However, it is considered that for new culvert best practice following the 'stream simulation' approach as outlined in the NIWA NZ Fish Passage Guidelines[8] is achievable and desired.

56. Additionally, culverts are required to enable the stockpile and borrow area access road within the Western Block. These culverts can be constructed in accordance with the NZ Fish Passage Guidelines.

57. Furthermore, while the applicant has not undertaken an exhaustive survey of fish passage barriers across the site, six existing barriers have been identified in the EcIA. the applicant has offered remediate these barriers as a further positive benefit of the proposed works not directly attributed to any of the proposed activities.

58. It is recommended that a condition of consent is included to ensure the positive effects of additional fish barrier remediation is implemented as anticipated following best practice.

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[7] Joy, M, David, B, Lake, M (2013). New Zealand Freshwater Fish Sampling Protocols. Part 1: Wadeable Rivers and Streams. Massey University.

[8] Franklin, P., Gee, E., Baker, C. & Bowie, S. (2018). NZ Fish Passage Guidelines for structures up to 4 metres.

4.3.3 Offset and Compensation

59. The management of effects under the RMA can be represented as a continuum of responses: avoidance, mitigation and remediation, offsetting, environmental compensation, and lastly other forms of compensation. This hierarchical approach to managing effects is further supported by the AUP:OP policies and objectives, including objective E3.2.3.

60. The continuum reflects that offsetting should only be considered after avenues to avoid, remedy, or mitigate have been exhausted; and environmental compensation only considered after offsetting options have been exhausted.

61. Compensation is considered the last resort as it carries the greatest risk for biodiversity outcomes. To improve outcomes from compensation actions, the offsetting principles should be followed as much as possible[6].

4.3.3.1 Effects Management Package

62. The applicant has offered an 'effects management package' including offset and compensation measures to address the residual adverse effects of wetland and stream reclamation and culverting.

63. The EcIA states that, in regard to the effects of stream reclamation and culverting, 23% (3,495 m) of the total stream length being reclaimed or culverted has been offset through quantified actions that meet the key principles of offsetting. The outstanding 77% (11,890 m) of stream loss is proposed to be addressed though environmental compensation means which do not demonstrate a no net loss (of ecological values) outcome. The proposed compensation includes a further (approximately) 9,250 m of riparian enhancement and / or protection actions undertaken on the Subject Site or identified sites nearby, as well as, a further approximately 30 km of compensation actions undertaken off-site at yet to be identified sites.

64. The updated table 4.22 provided in the s92 outstanding freshwater responses identifies that there is 15,105 m of identified enhancement and / or protection actions within and outside the applicant's landholdings. This is comprised of 4,215 linear m of offset actions (areas 2a, 2b, 2c and 2d) and 10,890 linear m of compensation actions.

65. With the subsequent design changes leading to the removal of stockpile 2 from the application, the length of stream being offset through quantified actions that meet the key principles of offsetting is 2,130 m (15.2%), being the impacts within the Southern Block. The outstanding stream loss of 11,890 m (84.8%) is still proposed to be addressed through a combination of onsite and offsite environmental compensation measures.

66. 1.37 ha of wetland reclamation is proposed, including 0.7 ha of indigenous wetland; 0.64 ha of exotic wetland and 0.03 ha of kahikatea pukatea forest. To offset the residual adverse effects of the loss of these wetland areas the following enhancement actions have been proposed:

- Planting of native wetland vegetation within all degraded exotic wetlands on Springhill Farm that are not affected by the project (4.63 ha);
- 10 m wetland margin plantings around SEA wetlands (9.03 ha) and 5 m wetland margin plantings around all non-SEA wetlands (6.15 ha) (total 15.18 ha of buffer planting area);

- Protection by covenant and pest control across all wetland habitats within the WMNZ landholdings (25.59 ha of wetland area, excluding buffer).

4.3.3.2 Technical Assessment

67. The appropriateness of the proposed 'effects management package' is considered in regard to Policy E.3.3(4) of the AUP:OP, where restoration and enhancement actions for a specific activity should:

- be located as close as possible to the Subject Site;
- be 'like for like' in terms of the type of freshwater system affected;
- preferably achieve no net loss or a net ecological gain in the natural values, including ecological values; and
- consider the use of biodiversity offsetting as outlined in Appendix 8 Biodiversity Offsetting.

68. The appropriateness of the proposed 'effects management package' is also considered in regard to the national guidance documents available for biodiversity offsetting[9,10].

4.3.4 Stream Offsetting

69. The EcIA claims that offsetting actions meeting the key principles of offsetting address 2,130 m (15.2%) of the total stream length being reclaimed or culverted. The stream offsetting component of the 'effects management package' is considered in regard to Policy E.3.3(4), appendix 8 of the AUP:OP and national guidance documents below.

4.3.4.1 Proximity

70. The offset and compensation package identified is in the immediate vicinity of the impact sites.

71. It is considered that the principle of proximity sought by objective E3.3(3) in regard to offset locations is achieved for the stream offsetting component of the 'effects management package' proposed.

4.3.4.2 Additionality

72. Stream offset enhancement works proposed are additional to any other enhancement that may be otherwise required.

73. It is considered by this review that the principle of additionality is achieved in regard to the stream offsetting component of the 'effects management package' proposed.

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[9] Maseyk, F., Ussher, G., Kessels, G., Christensen, M., & Brown, M. (2018) The Biodiversity Offsetting under the Resource Management Act Guidance Document.

[10] New Zealand Government et al. (2014). Guidance on Good Practice Biodiversity Offsetting in New Zealand.

4.3.4.3 Like for Like

74. A 'like for like' offset is based on the evaluation and comparison of the same environments and the same ecosystems, vegetation, and habitats, and species existing in them. The offset process requires that every reasonable effort is made to ensure that gains and losses are as comparable as possible both in ecological terms and from a conservation-priority perspective[11].

75. The EcIA acknowledges that "*the majority of the offset and compensation package includes streams which are permanent in nature, rather than intermittent. Further, the majority of the streams being impacted are narrow, while the offset and compensation sites are wider, including streams which are greater than 3 m in width*".

76. TR2016/23[12], states that "*the principle of 'like for like' could be compromised by managing environmental effects on permanent streams by undertaking environmental compensation activities on intermittent streams (and vice versa)"*. Furthermore, "*it is not recommended that intermittent and permanent streams SEV assessments are used interchangeably in the ECR calculations as offset compensation measures should reflect and enhance the features specific to intermittent streams".*

77. In addition to adverse effects on intermittent streams being offset on wider permanent streams, it is noted that the offsetting calculations undertaken to derive the Environmental Compensation Ratios (ECR) have used intermittent and permanent streams SEV assessments interchangeably.

78. In addition to the points made above, it is worth also noting the general differences between the impact and offset enhancement stream. The majority of the impacted streams, being those in the Southern and Eastern Blocks, are assessed as having 'very high' ecological value. Despite noting some sediment deposition from forestry activities, the streams are generally described in the application material of having areas of bed rock, high habitat values and diverse hydrological conditions, including pools and cascades. In contrast the offset sites, located on the flats in the western block, are described in the application material as highly modified. These offset streams are predominantly soft bottomed and show signs of impacts from current and historical land use including, potential straightening. These points highlight further the tension placed on the principle of like for like through the proposed exchange.

79. The principle of like for like sought by objective E3.3(3) is arguably not achieved in in regard to the stream offsetting component of the 'effects management package' proposed.

80. However, it is noted that while policy E3.3(4) and/or Appendix 8 of the AUP:OP seeks like for like offsets; offsets that are in close proximity, and offsets that demonstrate additionality; neither E3.3(4) and/or Appendix 8 provide more or less weight to each of these outcomes. The applicant has chosen to place more weight on the principles of proximity and additionality than the principle of like for like in considering this offset action.

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[11] MfE (2014) Guidance on Good Practice Biodiversity Offsetting in New Zealand.

[12] Neale, M W., Storey, R G and Quinn, J L (2016). Stream Ecological Valuation: application to intermittent streams. Prepared by Golder Associates (NZ) Limited for Auckland Council. Auckland Council technical report, TR2016/023.

4.3.4.4 No Net Loss

81. Offsetting requires a transparent, explicit and robust measurement and balancing of biodiversity predicted to be lost and gained, resulting in a no net loss (or net gain) outcome[13, 14]. The application has provided an assessment of the ecological functional values to be lost (at the impact sites) and gained (at the offset sites) to achieve no net loss. This assessment has been provided in the form of the SEV and associated ECR method (TR2011/009)[15].

82. The SEV / ECR calculations provided as part of the application to support the transparent quantification of offsets to achieve a no net loss of ecological function outcome have been reviewed. Notwithstanding that intermittent and permanent streams SEV assessments have been used interchangeably to derive the ECR values (as noted above and contrary to the guidance in TR2016/23); the review of the SEV / ECR calculations concluded that the calculations are appropriate.

83. It is noted that the SEV method does not assess the habitat provision or biodiversity values of frogs. Therefore, the stream offset proposed by the applicant through the use of the SEV / ECR calculations do not explicitly address offsetting the effects of the loss of frog habitat. The positive benefits on frog biodiversity and habitat provisions achieved through the stream offsetting, and compensation, actions are dependent on the nature of the streams enhanced, including their ability to provide appropriate habitat and the connectivity to existing populations. An assessment of the effects on frog populations and habitat and the management of effects is provided by a separate Council specialist.

84. It is noted that potential SEV score (SEVi-P) for the impact sites within the Southern Block were assumed to be the same as the current SEV values (SEVi-C). This approach was taken by the applicant due to the current SEV scores being sufficiently high that little ecological gain could be reliably demonstrated with additional enhancement actions through the SEV method. Further clarity and justification for this his approach proposed by the applicant was sought through s92 requests for further information. The s92 response (s92 Tranche 3) demonstrated that while small increases in SEV scores for SEVi-P could be demonstrated, with a corresponding increase in the ECR, the resulting offset quantum proposed as part of the application did not change. This was due to the outcome sought by the SEV method to achieve enhancement stream length at least equal to that of the impact, and the fact that following the SEV / ECR methods a short fall in stream length resulted under each scenario. The approach proposed by the applicant is therefore accepted in this particular case.

85. The time it takes to generate biodiversity gains is an ecological impact in itself. The longer it takes to achieve an equivalent replacement, the greater the gains generated by the offset need to be to compensate for the time-lag[16]. The draft conditions require that the offset actions are

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[13] MfE (2014) Guidance on Good Practice Biodiversity Offsetting in New Zealand.

[14] Maseyk, F., Usser, G., Kessels, G., Christensen, M., Brown, M. (2018). Biodiversity Offsetting under the Resource Management Act: A guidance document.

[15] Storey, R.G., Neale, M.W., Rowe, D.K., Collier, K.J., Hatton, C., Joy, M.K., Maxted, J. R., Moore, S., Parkyn, S.M., Phillips, N. and Quinn, J.M. (2011) Stream Ecological Valuation (SEV): a method for assessing the ecological function of Auckland streams. Auckland Council Technical Report 2011/009.

[16] Maseyk, F., Ussher, G., Kessels, G., Christensen, M., & Brown, M. (2018) The Biodiversity Offsetting under the Resource Management Act Guidance Document.

undertaken within three years of the initial construction and enabling works being completed (RC 249). No supporting evidence has been provided outlining why this outcome cannot be achieved within one year. It is therefore recommended that this condition be revised to achieve offset actions within one year of the initial site construction works being completed, as is standard practice within Auckland.

4.3.4.5 Permanence

86. The ecological offset should be managed to secure outcomes, preferably in perpetuity, but at least as long as the impact duration. Where the impact is reclamation, the activity results in the permanent modification of the stream system, as such the offset action should be secured in perpetuity[17].

87. The applicant proposes to protect the stream offset sites through the use of covenants.

88. It is considered by this review that the principle of permanence is achieved in regard to the stream offsetting component of the 'effects management package' proposed.

4.3.5 Stream Compensation

89. As noted above, 84.8% (11,890 m) of stream loss is proposed to be addressed though environmental compensation means which do not demonstrate a no net loss (of ecological values) outcome. The proposed compensation includes a riparian enhancement actions undertaken on the Subject Site (including protection and/or enhancement planting), as well as, a compensation actions undertaken off-site (as outlined in the OSSCP and draft conditions).

90. This Technical Assessment identifies areas of concern regarding the proposed compensation actions offered as part of the 'effects management package'. These can be summarised as:

- The use of ecological compensation measures to manage a 'very high' level of residual adverse effect.
- Uncertainty regarding the level of residual adverse effects that have been addressed and the magnitude of residual adverse effects remaining following the implementation of the effects management package.
- The appropriateness of providing compensation through protection mechanisms alone.
- The level of confidence in achieving the proposed compensation quantum.
- The time lag between the occurrence of the impact and the implementation of the compensation actions.

91. Each of these concerns are discussed further below.

[17] Maseyk, F., Ussher, G., Kessels, G., Christensen, M., & Brown, M. (2018) The Biodiversity Offsetting under the Resource Management Act Guidance Document.

4.3.5.1 Compensation Measure to Address 'Very High' Residual Adverse Effects

92. The EIANZ Ecological Impact Assessment Guidelines outlines that effects in the 'very high' level of effect category are unlikely to be acceptable on ecological grounds alone (even with compensation proposals) and that activities having 'very high' adverse effects should be avoided (Roper-Lindsay *et al*. 2018; Page 84). Furthermore, the EIANZ Ecological Impact Assessment Guidelines outline that where a 'very high' level of adverse effects cannot be avoided, a net biodiversity gain would be appropriate (Roper-Lindsay *et al*. 2018; Page 84).

93. With regards to this application, it is considered by the applicant that there are 'high' to 'very high' freshwater ecological values (reflected in the MCI, IBI and SEV results, as well as, the presence of 'at risk' species) and a 'very high' magnitude of impact (13,915 m of stream reclamation) (table 4.21 of the EcIA).

94. Therefore, following the EIANZ Ecological Impact Assessment Guidelines, given the assessed ecological values and magnitude of effects associated with the proposed stream reclamation, the effects should be avoided in the first instance. Should avoidance not be possible, a net biodiversity gain though demonstratable offsetting would be appropriate.

95. As acknowledged by the application material (EcIA) the proposed effects management package does not seek to achieve a no net loss of ecological value outcome, nor a net gain, with respect to managing the effects of stream reclamation.

4.3.5.2 Potential for Remaining Residual Adverse Effects

96. Compensation measures inherently carry a greater level of uncertainty regarding the positive ecological outcomes when compared to offsetting. Improved outcomes though compensation measures can be achieved by following the key principles of offsetting as much as possible[18]. This is somewhat achieved through the draft OSSCP where there is a preference (emphasis added) for: compensation sites in close proximity to the impact; the ecological values being achieved are similar to those being lost; and, the enhancements are protected in perpetuity. The fact that the proposed framework sets out a preference only, leaves some level of uncertainty as to the outcomes.

97. The EcIA acknowledges that the principle of 'no net loss' of ecological function is not being achieved. No confidence is provided in the application material that the compensation actions proposed are commensurate to the adverse effects, or what degree of residual adverse effects remain following the implementation of the compensation measures. The compensation actions proposed by the applicant have not been presented with a clear transparent accounting framework that demonstrates the level of adverse effect that have been addressed.

98. The s92 outstanding freshwater response references, for comparison, the environmental compensation ratios resulting from the SEV and ECR calculations used in the Te Ahu a Turanga Manawatu Tararua Highway Project. This Technical Assessment considers that such comparisons provide little value or insight in relation to the current application. Such

[18] Maseyk, F., Ussher, G., Kessels, G., Christensen, M., & Brown, M. (2018) The Biodiversity Offsetting under the Resource Management Act Guidance Document.

comparisons require understanding the relative ecological values of both the project-specific impact and offset sites.

99. It is therefore the opinion of this reviewer that it is likely that residual adverse effects remain following the application of the proposed 'effects management package'. Notwithstanding while enhancement actions are proposed, the activity results in the irreversible loss of 13,915 m of watercourse and the associated habitat.

4.3.5.3 Compensation Through Protection Alone

100. While Maseyk et al. (2018) outlines averted loss offsets through protection as a means to provide offset benefits, it is coupled with the provision that the protection would prevent future loss of biodiversity that would occur if it were not for the management action.

101. As a compensation action, the application proposes to protect in perpetuity the main channel through the NSMA in the Southern Block (area 2f). The area concerned is subject to the existing provisions provided by the NSMA overlay and following the proposed activity would not appear to be at a credible risk of removal or substantial loss.

102. Therefore, attributing the 1.8 km stream length here towards the 1:3 quantum of compensation offered is not considered appropriate.

103. It is also noted that the compensation offered though protection of area 2h (3,560 m) only includes one bank (Western) of the Waiwhui Stream and does not include any pest control or enhancement planting actions. Similarly, the compensation offered though protection of area 2g (1,660 m) downstream of the landfill footprint does not include any pest control or enhancement planting actions.

104. Therefore, 7,020 m of the 10,800 m (65 %) of compensation offered onsite is thought protection alone

105. Base Enhancement Options (BEOs) 6 and 7 offered in the OSSCP also offer positive benefits through protection measures. The application of these BEOs would need to be considered on a case-by-case basis, taking into account the exiting levels of protection and the credible risk of loss to ensure the ecological gain from the protection is appropriate.

4.3.5.4 Confidence in Securing Compensation Sites

106. The draft conditions state that at least 1.5 km of stream enhancement will be provided each year (until the required ratio proposed has been achieved).

107. Without having secured the compensation sites there is uncertainty that the consent holder will be able to comply with this condition (within the rate of enhancement proposed or to the total level of enhancement proposed) as it relies on third partly land owner approval for fencing, planting and legal protection of land. This is a concern when considering both the ability of the consent holder to comply with the proposed condition, but also the certainty in the anticipated ecological gains which are proposed to compensate for the residual adverse effects.

108. The approach of consenting stream reclamation with uncertainty in the location and nature and of offset and/or compensation sites has been consistently resisted by council specialists given the difficulty consent holders have faced in terms of securing suitable sites. This approach also

allow for the loss of freshwater ecological values with no guarantee that the consent holder can find a suitable offset and/or compensation site.

109. Furthermore, the draft conditions refer to in-stream habitat enhancement. It can also be safely assumed that some compensation sites will require the removal of pest vegetation within the riparian margins. Both of these actions may require additional resource consents. Therefore, the proposed compensation measures may be reliant on third partly landowners obtaining resource consents. However, it is acknowledged that any such consents should generally be assumed to be granted given the intent of the proposed activity.

4.3.5.5 Time Lag

110. Impacts usually occur before enhancement activities are implemented, meaning that there is a time lag between when biodiversity is lost and when biodiversity gains are fully delivered. The time it takes to generate biodiversity gains is an ecological impact in itself.

111. The draft conditions states that at least 1.5 km of stream enhancement will be provided each year (until the required ratio proposed has been achieved). Assuming approximately 30 km of compensation is to be provided (under the draft conditions and OSSCP), it could be concluded that some of the compensation actions may not be implemented until 20 years following the initiation of adverse effects associated with stream reclamation and culverting.

112. It is acknowledged that reclamation of watercourses is proposed to be staged. However, the application material does not provide confidence that the implementation of the compensation actions will be undertaken at a rate that is commensurate with the adverse effects of reclamation and culverting. Furthermore, the relocation and exclusion of fish from Valley 1 prior to forestry works means that while the stream reclamation may be staged, the area will not be available as fish habitat from the initiation of works, as fish will be permanently excluded from this area.

4.3.5.6 Technical Concerns with OSSCP

113. A draft OSSCP was is provided as part of the s92 responses (s92 Tranche 3). Several requests for further information regarding this draft document have been made, the responses provided are considered to adequately address the initial concerns.

114. However, the responses make reference to proposed updates to the OSSCP. These items include:

a. The OSSCP will be updated to reflect that the area of wetland enhancement that contributes to the stream compensation length is limited to the wetland area itself being enhanced and protected.

b. The OSSCP will be updated to include BEO4 with BEO6 and BEO7, being those BEOs that can comprise no more than 20% of the final compensation configuration.

115. Additions to the draft conditions of consent are recommended to ensure these updates are incorporated into the OSSCP.

4.3.6 Wetlands Offsetting

116. To offset the residual adverse effects of the loss wetland areas the applicant has proposed enhancement of degraded wetland on site, buffer planting around wetlands onsite and protection by covenant and pest control across all wetland habitats within the WMNZ landholdings.

4.3.6.1 Proximity

117. The proposed wetland offset identified is in the immediate vicinity of the impact sites and is within WMNZ landholdings.

118. It is considered by this review that the principle of proximity sought by objective E3.3(3) in regard to offset locations is achieved for the offsetting component of the 'effects management package' proposed.

4.3.6.2 Additionality

119. All wetland offset enhancement works proposed are additional to any other enhancement that may be otherwise required.

120. It is considered by this review that the principle of additionality is achieved in regard to the wetland offsetting component of the 'effects management package' proposed.

4.3.6.3 Like for Like

121. The indigenous wetlands that are impacted by the proposed activity include, kahikatea pukatea forest, as well as, manuka fernland and raupo reedland marsh systems. It is considered feasible to enhance the existing degraded wetlands on the Subject Site with vegetation assemblages that are similar to the impacted wetlands thought site-specific enhancement plans that respond to the wetland hydrology and substrate.

122. Furthermore, the native wetlands on site that are proposed to be retained are predominantly comprised of similar hydrological conditions and vegetation assemblages to those being impacted. Therefore, the enhancement action of enhancing the buffers of these retained wetlands can be considered, to a degree, like for like.

123. The principle of like for like sought by objective E3.3(3) is considered to be achieved in in regard to the wetland offsetting component of the 'effects management package' proposed.

4.3.6.4 No Net Loss

124. Offsetting requires a transparent, explicit measurement and balancing of biodiversity predicted to be lost and gained, resulting in a no net loss (or net gain) outcome[19], [20]. The application has provided an assessment of the ecological values to be lost (at the impact sites) and gained (at

[19] MfE (2014) Guidance on Good Practice Biodiversity Offsetting in New Zealand.

[20] Maseyk, F., Usser, G., Kessels, G., Christensen, M., Brown, M. (2018). Biodiversity Offsetting under the Resource Management Act: A Guidance Document.

the offset sites) to achieve at least a no net loss outcome relating to wetland habitat. This assessment has been provided in the form of the Biodiversity Offset Accounting Model[21].

125. The Biodiversity Offset Accounting calculations provided as part of the application to support the quantification of offsets to achieve a no net loss of ecological outcome have been reviewed.

126. The application of the Biodiversity Offset Accounting Model has been applied in a fairly limited capacity with respect to the number and nature of attributes used. The Biodiversity Offset Accounting Model has applied a single aggregated attribute of 'Biodiversity Value' for the wetland indigenous biodiversity model. The issue with applying aggregated values in this manner is that it increases the risk of concealed losses and does not explicitly enable the transparent identification of 'gains' and 'losses' of various attributes that make up the 'Biodiversity Value'.

127. However, in somewhat mitigating the aggregated attribute approach taken by the applicant, the predicted ecological gains are considered by this reviewer to be appropriately conservative.

128. An error in the wetland pest control calculations is noted where the report states a conservative assumption of 50% - 75% confidence of success has been applied, however, the calculations have confidence set to 75-90%.

129. The application of the Biodiversity Offset Accounting Model has not considered the potential value of the exotic wetlands impacted on the Subject Site.

130. As noted previously, it is considered appropriate to consider the potential values of wetlands in considering the effects. This is supported by the AUP:OP policy framework that seeks the enhancement of degraded freshwater systems (E3.2(2). E3.3(3); B7.2.1(2), B7.3.1(1)) and existing case law[22, 23]. E3.8.1 (matters for discretion) includes consideration of potential ecological value. While, the application is for a non-complying activity, the restricted discretionary matters for discretion provide a reasonable initial framework for undertaking an assessment. Furthermore the NPS:FM (2020) refers to the potential values of streams and wetlands, and the definition of the effects management hierarchy refers to managing the adverse effects of an activity on the extent or values of a wetland or river (including cumulative effects and loss of potential value).

131. In reviewing the Biodiversity Offset Accounting Model calculations, this reviewer undertook independent calculations to assess if the offset actions offered were sufficient to achieve a no net loss outcome relating to wetland habitat if the potential value of the exotic wetland were considered. To achieve this the confidence error noted above was corrected and the value of the exotic wetlands was adjusted to the extremely conservative assumption that the potential value would be equal to that of the benchmark value.

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[21] Maseyk, F., Maron, M., Seaton, R., and Dutson, G. (2015). A Biodiversity Offset Accounting Model for New Zealand.

[22] Long Bay-Okura Great Park Society Incorporated v North Shore City Council Decision No. 078/2008 – The Court accepted that current poor stream health associated with current poor management of streams is not a valid baseline against which to determine environmental effects.

[23] Hawkes Bay Regional Council v Ngati Kahungunu Iwi Inc NZEnvC 50 & 18/2015) - J Thomson 'having a suboptimal present is not an excuse or failing to strive for an optimal future).

132. The outcome of this assessment is that despite taking an extremely conservative approach to considering wetland potential, the proposed offset measures would achieve a net positive ecological value outcome with respect to wetland biodiversity within 10 years.

133. It is also noted that the area applied to the biodiversity offset calculations for the benefit of wetland buffer actions is entered into the calculations as the buffer area itself (15.18 ha). This is more appropriately assessed as the area of wetland (25.59 ha), as this is the area receiving the benefit and the habitat type subject to the offset. The result of this means that the ecological gain calculation from proposed buffer area enhancement actions will be higher than calculated in the application material.

134. The offset calculations apply a commensurate and conservative ecological benefit value for the wetland buffer planting actions (10%). However, it is considered by this reviewer that, the widths of the proposed wetland buffers if increased would realise further ecological benefit. The limited extent of the 5 m wide buffers proposed around non-SEA wetlands is of particular concern as a buffer of this width is likely to require ongoing management to control weeds and maintain vegetation integrity. A 5 m buffer is also less resilient to the impacts of the proposed ongoing adjacent forestry activities and is unlikely to provide meaningful habitat values.

4.3.6.5 Permanence

135. The applicant proposes to protect the wetland offset sites through the use of covenants.

136. It is considered by this review that the principle of permanence is achieved in regard to the stream offsetting component of the 'effects management package' proposed

4.3.7 Planting Plans and Success Monitoring

4.3.7.1 Planting Plans

137. The application lacks site-specific details regarding the enhancement actions including weed control and planting proposed for the stream and wetland offset and compensation measures.

138. Notwithstanding that vegetation removal within 20 m of a wetland and 10 – 20 m of a stream (depending on zoning) requires a consent; it is considered that when riparian weed control is not sufficiently considered or inappropriately implemented it can cause adverse effects to stream ecological functional values (for example, loss of shading or increase in stream bank erosion).

139. Furthermore, any proposed riparian planting should consider the existing stream bank erosion susceptibility of the stream and the existing levels of downcutting and bank angles. In some situations, riparian planting along may not be sufficient to prevent further stream bank erosion from occurring and further erosion may lead to failure of the enhancement planting. For these reasons it is considered necessary that any proposed enhancement actions that form the stream or wetland offsetting or compensation are submitted to Council in the form of site-specific management plans prior to implementation for certification.

4.4 Summary

140. The methods used to assess the existing ecological values of the streams and wetlands within the Subject Site are considered appropriate and the reported results are considered transparent, accurate and a fair representation of the on-site values. The streams within the Southern and Eastern Blocks are considered to have 'very high' ecological values.

141. Similarly, the assessment of effects is also considered appropriate in relation to the effects considered by this Technical Assessment. The overall level of residual adverse effect relating to the loss of watercourse is considered to be 'very high' when considering the ecological value and magnitude of effect.

142. The applicant has proposed a range of mitigation measures to reduce the severity and magnitude of adverse effects relating to the potential for injury or mortality to fish, kakahi and koura; and, barriers to fish passage. It is recommended to strengthen the wording of conditions to ensure these mitigation measures are implemented as anticipated and following best practice. However, it is noted that there is likely to be some level of residual adverse effect on the injury or mortality of native freshwater fish that is not mitigated.

143. There are concerns, from a freshwater ecological perspective, regarding the appropriateness of the site for undertaking the proposed activity, as well as, and the level of avoidance of adverse effects on freshwater ecological values that has been applied in selecting the site.

144. The loss and modification to wetlands has been demonstrated to be offset to achieve at least a no net loss of ecological value outcome.

145. In regard to the effects of stream reclamation and culverting, 15.2% (2,130 m) of the total stream length being reclaimed or culverted has been offset through quantified actions that meet the key principles of offsetting.

146. The stream offset component of the 'effects management package' is generally considered appropriate, however, it is noted that the principle of like for like sought by objective E3.3(3) is arguably not achieved.

147. The outstanding 84.8% (11,890 m) of stream loss is proposed to be addressed though environmental compensation means which do not demonstrate a no net loss (of ecological values) outcome. The proposed compensation includes a riparian enhancement actions undertaken on the Subject Site (including protection and/or enhancement planting), as well as, compensation actions undertaken off-site.

148. The EIANZ Ecological Impact Assessment Guidelines outlines that effects in the 'very high' level of effect category are unlikely to be acceptable on ecological grounds alone (even with compensation proposals) and that activities having 'very high' adverse effects should be avoided. Furthermore, the EIANZ Ecological Impact Assessment Guidelines outline that where a 'very high' level of adverse effects cannot be avoided, a net biodiversity gain would be appropriate as part of an offsetting proposal.

149. The application material acknowledges that there are significant residual adverse effects on the freshwater environment and that the proposed effects management package does not seek to achieve a no net loss of ecological value outcome, nor a net gain, with respect to managing the effects of stream reclamation.

150. No confidence is provided in the application material that the compensation actions proposed are commensurate to the adverse effects, or what degree of residual adverse effects remain following the implementation of the compensation measures. The compensation actions proposed by the applicant have not been presented with a clear transparent accounting framework that demonstrates the level of adverse effect that have been addressed.

151. Further concerns regarding the proposed compensation measures include:

- The appropriateness of providing compensation through protection mechanisms alone and the fact that 65 % (length of stream) of the proposed onsite compensation measures are through protection only.
- The level of confidence in achieving the proposed compensation quantum, including the reliance on third part agreements, as well as, the lack of specific identified offsite sites and a proposed framework that only seeks a preference for like for like and close proximity sites.
- The time lag between the occurrence of the impact and the implementation of the compensation actions.

152. Should consent be granted, it is considered necessary to ensure that the proposed offset and compensation actions are appropriate on a site-specific level. Due to a lack of site-specific detail provided as part of the application material, it is considered appropriate to require this detail be submitted to Council as conditions of consent for certification.

153. It is the opinion of this reviewer that it is likely that residual adverse effects remain following the application of the proposed 'effects management package'. Notwithstanding while enhancement actions are proposed, the activity results in the irreversible loss of 13,915 m of watercourse and the associated habitat.

5.0 Submissions

154. The resource consent application was publicly notified, and a large number of submissions have been received (>750), the vast majority of submissions oppose the application in whole or in part. I have reviewed the submissions relevant to the matters considered in this Technical Assessment.

155. The submissions relating to aspects of this Technical Assessment can be predominantly summarised into the following themes:

- Noting the presence of streams that are directly impacted by the proposed activity, some assessed in the application material as having high ecological value.
- Noting the presence of wetlands that are directly impacted by the proposed activity.
- Noting the presence of springs on the subject property.
- Noting the loss of streams and wetlands and the associated adverse effects on habitat availability, and the retained downstream environment.
- Impacts on, and of loss of, freshwater species.
- Inconsistency with policy (including aspects of the RMA, NPS-FW and AUP:OP).
- Concerns with the proposed measures to address residual adverse effects, including a lack of offsetting to achieve a no net loss outcome for ecological function.
- A lack of transparency regarding the consideration of alternative sites for the landfill.
- Concerns with the adequacy of the freshwater ecological assessment, including wetland mapping and surveys of macroinvertebrates to species level.
- Inadequate conditions of consent, including conditions that defer finalising actions to address adverse effects to post granting consent, and conditions that lack measurable criteria.

156. Several submissions mention the presence of springs on the Subject Site, however, do not identify the locations of the springs. The presence of springs has the potential to alter the permanence and surface flow classification (permanent, intermittent or ephemeral (AUP:OP)) of streams. However, this Technical Assessment is satisfied the methods used to identify watercourses, as well as, the reporting of stream locations and flow classification allows for the quantum of adverse effects on streams to be adequately understood. Similarly, this review is satisfied that identification, delineation and mapping of wetlands on the subject property has been undertaken to an adequate and appropriate level to understand the magnitude of reclamation and modification proposed.

157. Forest and Bird (ID 9920) raises concerns with the adequacy of the ecological assessment, specially noting the application does not provide:

- an adequate analysis of freshwater macroinvertebrates at the impact sites: "there is no list of species present and no determination of their threat status against DOC's 'Conservation status of New Zealand freshwater invertebrates, 2018".
- an analysis of native freshwater plants at the impact sites and whether they will be affected, and what their threat status is.
- actions to avoid, mitigate or remedy adverse effects on those invertebrates or plants.
- eDNA testing in the streams or analysis of modelled predictions of fish species presence.
- a dedicated survey for the presence/absence of kakahi.

158. DoC (ID9975) also raises concerns around the application being based on a limited amount of baseline data collection which in turn reduces the data available to identify the values present.

159. This review generally considers the level of assessment undertaken by the applicant is adequate to understand the effects of the proposed activity; and where uncertainty remains a precautionary approach to managing the adverse effects can be adopted. Identifying macroinvertebrates to species level is not routinely undertaken for assessments to support consent applications. The level of detail provided as part of the application is sufficient to understand that some of the impacted streams have high ecological values and high macroinvertebrate community values; particularly in the Eastern, Southern, and Waiteraire Blocks.

6.0 STATUTORY CONSIDERATIONS

6.1 Streamworks

6.1.1 Objectives and Policies of the Auckland Unitary Plan: Operative in Part (AUP:OP)

160. The relevant streamworks objectives and policies are found in Chapter E3 of the AUP:OP; Objectives 1, 2, 3, 4, 5, 6, and Policies 1, 2, 3, 4, 5, 6, 8, 10, 11, 12, 13, 15. These objectives and policies seek to ensure that streamworks are undertaken in a manner that protects people, the environment, and that adverse environmental impacts are avoided and mitigated and significant residual impacts are offset accordingly. Note policies related to streams are also located in chapter E1 and E38. Furthermore, the objectives and policies in chapter D4 are appropriate to consider for the works proposed within the NSMA overlay.

6.1.2 Other Statutory documents

161. The following statutory documents are considered relevant to the planner's assessment of the application:

- **AUP:OP Regional Policy Statement.**

162. Chapter B7, Natural Resources of the AUP: OP Regional Policy Statement is considered relevant as the objectives and policies in section B7.3 seek to ensure the enhancement of degraded freshwater systems, freshwater system loss is minimised and that any adverse effects are avoided, remedied or mitigated. Section 7.4 seeks to maintain water quality in freshwater bodies and coastal waters which have good water quality, and to enhance the water quality in degraded systems.

- **National Policy Statement: Freshwater Management 2014 (amended 2017) (NPS-FM).**

163. As the application relates to works within and around streams, the NPS Freshwater Management is considered relevant to this application. Objectives of the NPS Freshwater Management centre on safeguarding the life supporting capacity, ecosystem processes and indigenous species of water bodies in terms of water quality and quantity.

- **National Policy Statement: Freshwater Management 2020 (NPS-FM)**

164. During the processing of the application the a new NPS for freshwater management became operative. The NPS-FW (2020) includes provisions to safeguard ecological values and maintain or improve water quality, including:

- Freshwater is managed in a way that gives effect to Te Mana o te Wai
- Freshwater is managed through a National Objectives Framework to ensure that the health and well-being of degraded water bodies and freshwater ecosystems is improved, and the health and well-being of all other water bodies and freshwater ecosystems is maintained […]
- There is no further loss of extent of natural inland wetlands, their values are protected, and their restoration is promoted.
- The loss of river extent and values is avoided to the extent practicable.
- The habitats of indigenous freshwater species are protected.

- **New Zealand Coastal Policy Statement 2010 (NZCPS).**

165. As the application relates to works and discharges to a stream which ultimately flows into the marine environment, the NZCPS is considered relevant to this application. Objectives of the NZCPS centre on safeguarding the integrity, form, functioning and resilience of the coastal environment along with sustaining its ecosystems.

7.0 RECOMMENDATION AND CONDITIONS

7.1 Adequacy of information

166. The above assessment is based on the information submitted as part of the application. It is considered that the information submitted is sufficient to enable the consideration of the above matters on an informed basis as:

a) The level of information provides a reasonable understanding of the nature and scope of the proposed activities as they relate to the AUP:OP

b) The extent and scale of the adverse effects proposed are able to be assessed.

7.2 Recommendation

167. It is the opinion of this reviewer that there is reasonable uncertainty that the 'effects management package' proposed as part of the application material will provide positive effects that are proportionate and commensurate to the residual adverse effects resulting from the reclamation and culverting of streams. Notwithstanding the activity would result in the permanent loss of over 13 km of watercourse, it is considered likely that residual adverse effects remain following the application of the 'effects management package'. Additionally, there is uncertainty that the proposed compensation measures are practically able to be achieved as per the draft conditions of consent and the OSSCP. This has the potential to result in the loss of freshwater ecological values with no guarantee that the consent holder can find suitable offset and/or compensation sites.

168. For the reasons outlined in this Technical Assessment, and in regard to the matters considered by this Technical Assessment, it is recommended that resource consent be refused.

169. Notwithstanding the recommendation above, should consent be granted on the balance of outcomes, recommended amendments and additions to the draft conditions of consent have been suggested below to ensure that the mitigation, offset and compensation offered by the applicant is implemented in full and as anticipated.

7.3 Conditions

170. The application material provides draft conditions of consent (25 August 2020). Should consent be granted on the balance of outcomes, recommended amendments and additions to the draft conditions of consent have been suggested below to ensure that the mitigation, offset and compensation offered by the applicant is implemented in full and as anticipated.

171. These suggested amendments are summarised below with proposed additional text shown as underlined and proposed deletions shown a ~~strike through~~.

172. Numbering from the draft conditions supplied, 25 August 2020, has been used. Only those conditions relevant to the scope of this Technical Assessment are included below. Where no amendments are recommended, the condition is accepted by this Technical Assessment as written.

173. In addition to the suggested amendments noted below, it is noted that the draft conditions requires macroinvertebrate monitoring at 6-monthly intervals (RC 233). While this Technical

Assessment support this, there does not appear to be any adaptive management in response to this monitoring, as there is with water quality parameters and sediment.

Culvert design

79 Where practicable, fish passage shall be provided through culverts unless deemed unnecessary or impractical by a suitably qualified freshwater ecologist, who has assessed the fish passage requirements in accordance with New Zealand Fish Passage Guidelines for structures up to 4 metres (NIWA, 2018). Where fish passage is deemed unnecessary or impractical, appropriate data and rationale for this decision shall be provided with the design drawings to Auckland Council for certification. This requirement does not apply to culverts entering or discharging from Ponds 1 to 5.

80 Culvert design shall:

a Be designed to accommodate the 1 per cent annual exceedance probability flood without materially increasing flood levels upstream or downstream of the structure;

b Fish passage elements shall be informed by the 'New Zealand Fish Passage Guidelines for structures up to 4 metres' (NIWA, 2018); and

c Incorporate energy dissipation and erosion control to minimise the occurrence of bed scour and bank erosion in receiving environments.

Advice note: Conditions 65 and 66 do not discharge the consent holders' responsibilities under any other Act.

Fish Passage

X.1 Within one (1) year of Initial Site Construction Works being completed, the existing identified fish passage barriers, shown on Figure 3 of the Assessment of Aquatic and Terrestrial: Ecological Values and Effects. Prepared by Tonkin & Taylor Ltd. Dated 30 May 2019, shall be remediated to provide fish passage unless deemed unnecessary or impractical by a suitably qualified freshwater ecologist, who has assessed the fish passage requirements in accordance with New Zealand Fish Passage Guidelines for structures up to 4 metres (NIWA, 2018). Where fish passage is deemed unnecessary or impractical, appropriate data and rationale for this decision shall be provided Auckland Council for certification. Remediation design shall be informed by the 'New Zealand Fish Passage Guidelines for structures up to 4 metres' (NIWA, 2018).

The consent holder shall notify Council of the completion of the remediation actions within 20 working days of completion.

Vegetation Covenants

81 Within one (1) year of Initial Site Construction Works being completed the consent holder shall enter into covenants in favour of Auckland Council. The covenants shall:

- Protect [111.9ha] of indigenous/native forest and [25.59ha] of wetlands from development;
- Protect any riparian planting undertaken on the WMNZ landholdings as a requirement of the conditions of this consent that is required to be protected in perpetuity; be drafted and submitted to the council's nominated Solicitor for certification at the consent holder's cost; and
- be registered against the Computer Register(s) (certificate(s) of title) to the affected land by the consent holder at their cost; and

- require the consent holder to:

a. be responsible for all legal fees, disbursements and other expenses incurred by the council in connection with the covenant; and

b. reimburse the council for costs, fees, disbursements and other expenses incurred by the council as a direct or indirect result of the council being a party to this covenant.

82 A copy of the updated Computer Register (certificate of title) showing that the covenant has been registered shall be provided to the Council Within one (1) year of Initial Site Construction Works being completed. ~~[timing of covenants to be further discussed, where practicable these covenants will be in place prior to the landfill accepting waste].~~

Construction Ecological Management Plan

83 The consent holder shall develop a Construction Ecological Management Plan (~~FMP~~ CEcoMP), prepared by an appropriately qualified ecologist/s. The ~~FMP~~ CEcoMP shall be submitted to Auckland Council at least three months prior to the construction commencement date. The ~~FMP~~ CEcoMP shall describe the measures to address effects on fauna and their habitat during construction of the project. The ~~FMP~~ CEcoMP shall be comprised of the following sub-sections (described in conditions 52 - 58):

a Bats;

b Avifauna (birds);

c Lizards;

d Hochstetter's frogs;

e Native fish and kōura;

f Invertebrates (peripatus, snails); and

g Vegetation clearance;

By 1 December of each year of the initial construction period, an appropriately qualified ecologist(s) shall certify that fauna relocations have been carried out in accordance with the approved ~~FMP~~ CEcoMP, and shall provide details of any species removed or relocated to the Council's ecologist.

Fish and kōura

89 At least three months prior to the construction commencement date, the consent holder shall provide for the certification of Auckland Council a Native Freshwater Fish and Fauna Management Plan (NFFFMP). The NFFFMP shall be prepared in general accordance with the draft NFFFMP. The purpose of the NFFFMP is the recovery and relocation of fish, kōura and kākahi (if present) in the sections of waterways affected by instream works, prior to instream works occurring. The NFFFMP shall include and in reference to the CEMP and streamworks methods required contained within Auckland Regional Landfill s92 responses - Tranche 3. Attention Warwick Pascoe. Prepared by Tonkin & Taylor Ltd. Dated 20 December 2019by conditions XX and XX:

a The timing and duration of fish capture, taking into account the timing of construction and forestry works to ensure capture occurs before Initial Site Construction Works, including vegetation removal ~~works~~;

b The methodologies used to ensure all fish are captured and transported in accordance with best practice ~~the New Zealand Freshwater Fish Sampling Protocols;~~

e. Placement of appropriate fish screens on the inlets of any pumps used;

c Specific measures for ensuring fish upstream and downstream in the catchment do not enter

the works area;

d Specific measures to provide for passage past the works area (if required), ~~and,~~

e Fauna relocation sites, including an assessment of habitat quality and capacity, and;

h. Euthanasia methods for diseased or pest species.

90 A suitably qualified freshwater ecologist shall oversee the streamworks for the project and specifically to conduct the freshwater fauna relocation as per the NFFFMP.

The consent holder shall provide a report on the results of the native fish relocation within 20 working days of implementing the NFFFMP.

Advice note: Condition 77 does not discharge the consent holders' responsibilities under any other Act.

Ecological and Landscape Enhancement and Restoration Plan

244 An Ecological and Landscape Enhancement and Restoration Plan (ELERP) shall be prepared and provided to Council for certification at least three months prior to the construction commencement date. The objectives of the ELERP is to meet the conditions of this consent, to describe forest, wetland, and riparian and wetland margin revegetation. The focus of the ELERP is the replacement/replanting of plant species that have been affected by the project and the optimisation of ecological benefits through improving ecological connectivity between habitat types and protecting significant habitat types through buffer/margin plantings. The ELERP shall be consistent with and complementary to the Ecological Enhancement Pest Management Plan required by condition 187.

The planting areas shall be in general accordance with those shown in the Ecological Values and Effects Report by Tonkin + Taylor, date May 2019:

a Enhancement and/or protection of 14 km of stream within or as close as practicable to the WMNZ landholdings.

b Planting of 9.9 ha of native terrestrial vegetation within WMNZ landholdings. c Long term pest control on WMNZ landholdings and Sunnybrook Reserve.

d Protection of 111.9 ha native forest areas within WMNZ landholdings by covenant.

e Planting and protection of 4.63 ha of degraded wetlands within the Western Block that are not affected by the project.

f Planting of wetland buffers of 10 m or 5 m around SEA and non-SEA wetlands within the Western Block, approximately 15.18 ha.

g Protection of all native wetland habitats by covenant, approximately 25.59 ha.

In addition to the above, the planting shall be based on the conceptual layouts of the Mitigation Plans depicted in Appendix 3 of the Boffa Miskell Ltd document entitled "Landscape and Visual Assessment, May 2019".

Advice Note: Consideration of the conceptual layouts of the Mitigation Plans depicted in Appendix 3 of the Boffa Miskell Ltd document entitled "Landscape and Visual Assessment, May 2019" is to be for the purpose of improving outcomes through coordinated and contiguous enhancements. However, ecological mitigation and offset shall clearly demonstrate that the actions are additional to those required for landscape mitigation purposes.

246 The details of this plan shall include:

a Confirmation of the areal extent and spatial configuration of plantings proposed.

b Description of the objectives of the mitigation, offset and compensation planting / landscape treatment, including the ~~mitigation~~ intent of each of the planting areas and how this will be fulfilled over time as the plants develop and age, including details of how the anticipated outcomes used in the SEV calculations and Biodiversity Offset Accounting Model (where relevant) will be achieved;

c Identification of areas of existing vegetation to remain or be removed and the methodology for managing, and supplementing this vegetation where necessary in a timely manner to maintain the ~~mitigation~~ objectives;

d Site preparation (if required), e.g. fencing, weed or animal pest management and habitat enhancement (e.g. deployment of felled logs in revegetation sites).

e Timing of plantings.

f Schedules of planting, including plant species composition, plant sizes, plant densities, measures of stock condition (e.g. health of plant stock) the use of growth enhancement measures where required (e.g. fertiliser tablets or stock guards). Where available, plants will be eco-sourced native species from the same ecological district. Planting plans for stream riparian margins and wetland areas shall be in accordance with the Auckland Regional Council Riparian Zone Management Strategy for the Auckland Region, Technical Publication 148, June 2001 (TP148) and Appendix 16 of the Auckland Unitary Plan 'Guideline for native revegetation plantings'.

g Plant maintenance methods for ensuring successful establishment and long-term persistence of plantings, including the duration of maintenance for a period of at least the duration of the landfill operation, methods for ongoing control of weed or animal pests and infill planting.

h Monitoring and reporting requirements, including at a minimum annual reporting to Council for a period of no less than 5 years or until canopy closure is achieved.

i Covenanting/encumbrance details.

j. A site-specific assessment of the risk of stream bank erosion and the likely successful establishment of proposed riparian planting where relevant.

247 Should the actual area of habitat impacted by the project be reduced through detailed design, the consent holder shall have the ability to demonstrate, using best practice transparent and quantified accounting methods ~~through use of a mitigation/compensation model~~ prepared by a suitably qualified ecologist, that the required area of ecological restoration has been reduced. This is subject to the consent holder providing sufficient evidence of the actual area of clearance and demonstrating to Auckland Council that the area of clearance is less than the consented area. The consent holder shall then submit an updated EERP based on the revised restoration planting area.

248 All plantings from the Myrtaceae family of species shall be sourced from a nursery that is a signatory to Myrtle Rust Nursery Management Declaration V6, 11 October 2017 that certifies that the plant producer has implemented the New Zealand Plant Producers Incorporated Myrtle Rust Nursery Management Protocol (Myrtle Rust Nursery Management Protocol – V6, 11 October 2017).

249 All restoration planting described in the ELERP shall be completed within one (1) year of Initial Site Construction Works being completed ~~three years of the initial construction and enabling works being completed.~~ Written confirmation shall be provided to the Auckland Council within 30 days of the works being completed confirming that all planting and habitat enhancement works have been completed in accordance with the ELERP.

250 A monitoring and maintenance plan for the duration of the landfill operation shall be developed and implemented to ensure plant densities and 90% survival rate are maintained.

Monitoring shall be undertaken at times that avoid transient conditions, such as flood events. ~~In relation to wetlands,~~ monitoring shall include site photographs to demonstrate that a compliment of facultative wetland species at a density and a planting survival rate of at least 90% that is in accordance with the ELERP referenced in condition XXX. Any plants that die should be replaced the following planting season. The findings of the monitoring shall be reported to Auckland Council on a two-yearly basis.

Off-Site Stream Compensation Plan

260 An Off-Site Stream Compensation Plan (OSSCP) shall be prepared and provided to Council for certification within six months of the construction commencement date. The OSSCP shall be prepared in general accordance with the draft OSSCP contained within Auckland Regional Landfill s92 responses - Tranche 3. Attention Warwick Pascoe. Prepared by Tonkin & Taylor Ltd. Dated 20 December 2019. The OSSCP shall include performance measures, actions, methods, trigger levels and monitoring programmes designed to achieve the below objectives. The objective of the OSSCP shall be to describe the principles by which the consent holder shall provide compensation for residual adverse effect on ecological values associated with the project. The OSSCP shall set out methodologies and processes that will be used to achieve these objectives and shall include habitat enhancement ~~restoration/offset~~ on the following basis: a 3:1 restoration ratio for residual stream length affected which has not been fully offset in accordance with condition 180 (i.e. to achieve a total 42.3 km stream length including on-site measures, if the loss of permanent and intermittent streams is equal to 14.1 km). The OSSCP provisions for stream restoration shall include the following:

a Overarching principles for the identification of restoration sites including a preference for sites within the Hoteo Catchment, and in close proximity to the location of development, where this will result in the best ecological outcome.

b Process for the consent holder informing landowners within the Hoteo Catchment, including criteria for selection and the establishment of a group comprising mana whenua and community representatives and land-owners to provide suggestions on restoration sites.

c The ecological values being achieved through the enhancement ~~offset~~ are the same or similar to those being lost.

d Provisions to protect restored areas in perpetuity.

e A monitoring and maintenance plan for a period of five (5) to ensure plant densities and 90% survival rate are maintained. Any plants that die should be replaced the following planting season. Replacement planting and planting maintenance shall continue beyond year 5 until 90% survival and canopy closure is achieved. The 5 year period shall commence once all the compensation works describe within a SCWP have been completed.

The final OSSCP will reflect that the area of wetland enhancement that contributes to the stream compensation length is limited to the wetland area itself being enhanced and protected and not any buffer area. Additionally, the final OSSCP will be include BEO4 with BEO6 and BEO7, being those BEOs that can comprise no more than 20% of the final compensation configuration.

261 Should the actual length of intermittent and/or permanent streams impacted by the project be reduced through detailed design or further ground-truthing, the consent holder shall have the ability to recalculate the required length of stream restoration. This is subject to the consent holder providing sufficient evidence of the actual length of stream impacted and demonstrating to Auckland Council that the length of intermittent and permanent stream is less than the consented area. The consent holder shall then submit an updated OSSCP based on the revised restoration planting area.

262 The consent holder shall undertake the compensation described in the OSSCP in a staggered manner, providing at least 1.5km of stream enhancement each year until the required restoration ratio has been achieved.

263 Commencing within six months of the construction commencement date, a Stream Compensation Works Plan (SCWP) shall be prepared and provided to Auckland Council for certification every 5 years in accordance with the OSSCP, and will:

a describe the proposed compensation to occur within the next 5 planting seasons, including identification of compensation site(s);

b describe the proposed enhancement (e.g. riparian planting, stream habitat creation, in- stream habitat enhancement, fencing and stream protection) for the Compensation Sites, the purpose of which is to enhance the Compensation Sites' condition;

c provide a site-specific assessment of the risk of stream bank erosion and the likely successful establishment of proposed riparian planting.

d provide details regarding how compensation sites shall be protected in perpetuity ~~(where practicable)~~ by land covenant or consent notice(s) or similar, placed on the subject area of the land's title and provide evidence that this protection is sufficient for the purpose of this consent.

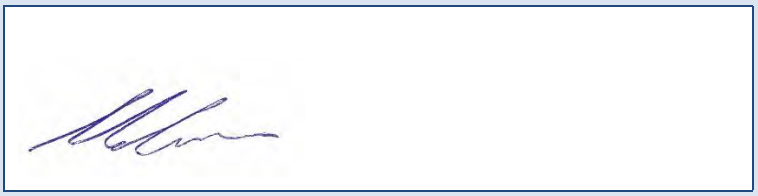
~~264 A monitoring and maintenance plan for a period of five (5) to ensure plant densities and 90% survival rate are maintained. Any plants that die should be replaced the following planting season. Replacement planting and planting maintenance shall continue beyond year 5 until 90% survival is achieved. The 5 year period shall commence once all the compensation works describe within a SCWP have been completed.~~

265 By 1 December every 5th year, the consent holder shall provide a report to Auckland Council, prepared by an appropriately qualified person, confirming that the requirements of that period's SCWP have been achieved.

8.0 REVIEW

Memo prepared by:

Mark Lowe



Streamworks Consultant to the Earth, Streams and Trees team, Specialist Unit, Resource Consents

Date: 21 September 2020

Technical memo reviewed and approved for release by:

David Hampson

Team Leader, Earth, Streams and Trees
Specialist Unit, Resource Consents

Date: 21 September 2020

Memo

7/09/2020

To:	Mark Ross
cc:	Paul Klinac (ETS), Warwick Pascoe
From:	Ross Roberts
Subject:	Geotechnical Assessment – Dome Valley Auckland Regional Landfill Resource Consent
Project:	GEO00257 - Dome Valley Auckland Landfill RC and PPC
Status:	Final Version: 1
Document ID:	**AKLCGEO-1790012875-840**

1 Introduction

This memo presents the findings of my review of the resource consents that are being processed alongside Private Plan Change 42, Auckland Regional Landfill.

1.1 Scope

I have undertaken a review of the resource consent application on behalf of Auckland Council in relation to geotechnical effects. This memo is one of several reports that have been prepared on a range of technical topics relevant to the consent application. This review does not cover erosion and sediment control, dam safety, groundwater, drainage or contamination which are dealt with by other specialists. A separate memo (ref AKLCGEO-1790012875-803) covers the geotechnical review of Private Plan Change 42.

For this memo I have reviewed site specific geotechnical information and analysis made available by the applicant, information in the public domain, and undertook a site inspection on 6 March 2020 with a representative of the applicant.

1.2 Author

I am Auckland Council's Geotechnical and Geological Practice Lead. I have nearly twenty years' experience as an engineering geologist. I have a bachelor's degree in geology from the University of Edinburgh and a masters' degree in Engineering Geology from the University of Newcastle. I am registered as a Professional Engineering Geologist (PEngGeol ref 1013605) with Engineering New Zealand and as a Chartered Geologist (CGeol ref 1008376) with the Geological Society of London. I am chair of the New Zealand Geotechnical Society, and have lectured at the University of Auckland and UNITEC on geotechnical investigations and natural hazards. I am the New Zealand representative on the International Society for Soil Mechanics and Geotechnical Engineering Technical Committee 208 on Slope Stability.

1.3 Purpose and limitations

This memo is provided expressly for advising Auckland Council Resource Consents Places in regard to the consents related to Private Plan Change 42. It is not intended to be used or copied in whole or part for other audiences or purposes without the prior approval of Auckland Council Engineering and Technical Services.

2 References

In preparing this memo I have considered the following documents:

- Tonkin + Taylor. (August 2020). Auckland Regional Landfill Geotechnical Addendum Report.
- Tonkin + Taylor. (May 2019). Auckland Regional Landfill Assessment of Environmental Effects.
- Tonkin + Taylor. (May 2019). Auckland Regional Landfill Geotechnical Factual Report.
- Tonkin + Taylor. (May 2019). Auckland Regional Landfill Geotechnical Interpretive Report.

3 Description of the proposal

Waste Management NZ Ltd (WMNZ) has acquired approximately 1020 ha of land in the Wayby Valley area, north of Auckland. WMNZ is proposing to develop a municipal solid waste landfill on part of this land. The Auckland Regional Landfill will provide a new solid waste management and disposal facility to replace the Redvale Landfill which currently provides for disposal of approximately 50% of Auckland's solid waste.

4 Site area

The proposed landfill is adjacent to the Wayby Valley to the north of State Highway 1 (SH1), ~13 km northwest of Warkworth and ~6 km south-east of Wellsford. There are a number of valleys present within the WMNZ landholdings. Initially only one valley with a total area of approximately 100 ha has been identified for development for landfilling purposes, named in reports as 'Valley 1', with a second valley ('Valley 2') identified for potential future landfilling.

The project footprint comprises steep and undulating terrain, predominantly vegetated with pine forest, with areas of dense native bush, and localised areas of gorse and low-growing vegetation.

5 Key issues

The geotechnical issues I consider to be important in regard to the proposal are:

- Land stability in steep terrain
- Availability of suitable local sources of capping and lining material

6 Applicant's assessment

6.1 Hydrogeology

The applicant notes in the Assessment of Environmental Effects report that, "*The bedrock and residual soils generally have low permeability, which should provide good natural containment. The site is not close to the coast, or any active faults and does not overlie Karst geology or high permeability sand and gravel … Additional engineering controls will need to be provided as part of the landfill design to provide additional containment and protection to the surrounding environment where the WMNZ landholdings are underlain by fractured rock..*"

Because this aspect will be addressed in the report by the groundwater specialist I will not address it further in this memo.

6.2 Slope stability

The applicant reports in the Assessment of Environmental Effects report that, "*Some pockets of historic land instability have been identified within the proposed precinct boundary, including a couple of potential historical areas of landslips within Sub Precinct A. This will need to be assessed and managed during detailed design and consenting of the landfill when applied for under the precinct provisions. The Geotechnical Assessment concludes that this risk can be appropriately managed through design and construction measures.*"

In the Geotechnical Interpretative Report this is expanded upon as follows, "*We consider that the primary slope instability hazard is likely to be associated with instability associated with groundwater seepage at the soil and rock interface (item ii above) Failure mechanisms in the proposed Pakiri Formation rock cuttings are likely to involve failure on preexisting defects in the rock (joints and bedding) that form unstable sliding blocks and wedges. Probable historic landslide features are evident in the vicinity of BH13 on the access road alignment and below BH1 in the landfill footprint (Figures 5.1 and 5.2 below). These appear to be translational landslides located at, or in close proximity, to the soil / rock interface and in association with groundwater seepage. We have not observed any evidence of more deep seated slope instability within the Pakiri Formation bedrock. Clay seams and some polished defects were observed in boreholes BH12 and BH13 at, or near, the soil bedrock interface.*"

These findings are supported in the later Geotechnical Addendum Report, which incorporates findings from more detailed ground investigations.

An assessment of the calculated factors of safety for a representative sample of slopes was presented by the applicant in the Geotechnical Interpretive Report section 7.2.2.

6.3 Material availability

The applicant reports in the Assessment of Environmental Effects report that, "*The rock and soil materials available on site are generally suitable for liner construction and landfill operation.*"

The Geotechnical Interpretive Report includes further details summarising testing undertaken on proposed material for the clay liner and cap. This report noted, "*The results from these tests indicate that the existing site soils derived from weathering of Pakiri Formation are probably suitable for use as clay liner material but that there are potential risks in terms of compaction and erodibility. It is likely that the allophanic soils will be suitable for clay liner construction, perhaps with mixing with other soils. Additional investigations have been undertaken within the Western Block in order to locate additional clay liner and cap material. The investigations encountered silt/clay material 1.4 to 3.5 m thick overlying Northland Allochthon material, which we anticipate will be suitable for liner and cap construction. To specifically assess how these materials will behave as liner and cap materials it is recommended that further sampling and testing be undertaken at the time of detailed design.*"

7 Assessment of geotechnical effects

7.1 Slope stability

It is apparent from the evidence presented, from the site walkover, and from other available data sources including aerial photography that the proposed site is subject to geotechnical instability. The available evidence strongly suggests that this instability is limited to the surficial soils and does not extend into the bedrock. The findings of the geophysical investigation in BH-15 are particularly relevant, demonstrating that bedding (which is a common sliding surface in the region) dips gently to the south and east, which means that sliding on these surfaces is unlikely as it would have to involve an element of uphill movement. This is supported by the visible expression of the instability, which is consistent with relatively shallow movement.

Shallow instability has the potential to be an issue during construction, when excavation into the slopes will steepen some areas. An example of this is shown in the cross section below, which shows the proposed liner level. In some areas the excavation removes the unstable shallow soils entirely, which would be expected to improve stability, while in others it cuts into and steepens these materials, reducing their overall stability.

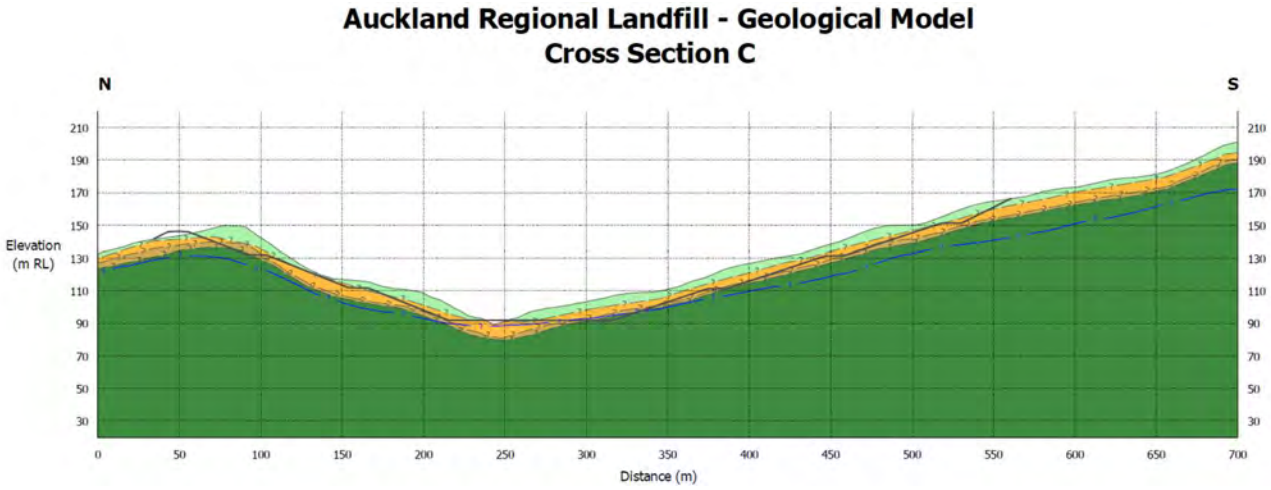


Figure 1: Cross Section C from the Addendum Geotechnical Report, showing the proposed liner level (black line) relative to the potentially unstable surface deposits (pale green and yellow)

In some areas the stability of the shallow material will be reduced. This is an expected condition of civil works in this environment and can be managed effectively during construction. Examples of the types of measures needed to manage this scale of instability are presented in the Geotechnical Addendum Report section 7.3.

As the landfill is progressively filled, the additional mass at the toe of the slopes will, over time, increase the stability of the slopes and would be expected to result in a more stable slope than currently exists. I therefore consider that the reduction in slope stability applies only during the construction of the landfill.

7.2 Material availability

Based on the evidence presented it is likely that the majority of the materials required for constructing the liner subgrade and cap will be available within the site. Because of the relatively limited testing to date there is some risk that additional material may need to be brought to the site if the in-situ material is more variable than predicted.

8 Conclusions

8.1 Slope stability

I conclude that slope stability hazards exist on the site but can be managed with conventional geotechnical engineering techniques. The proposed conditions of consent are generally appropriate to manage this risk.

The applicant notes in their Geotechnical Addendum Report that, "*Additional geotechnical investigations, ground modelling and slope stability analyses will be required to support detailed final design of stable engineered and natural slopes, in particular to confirm the extent, depth and 'activity' of the existing probable landslide features*". I concur with this assessment, and do not believe that a specific condition is required to mandate this as it will form a part of the design process required to meet conditions 46 to 50.

8.2 Material availability

I believe that it is likely that most of the fill materials required will be available on site, but that some import of material may be required as the quantity of testing required to confirm this is not likely to be completed until detailed design. I do not believe that there is a need for specific conditions of consent to manage this as the specification for liner material is incorporated into condition 94. I have proposed an addition to this condition to better manage this issue.

9 Conditions

I have reviewed the Draft Key Conditions of Consent (31 July 2020) and provided specific feedback as tracked changes on the document. My main recommended changes are:

- Wherever a review or approval is required by "*a Chartered Professional Engineer practicing in geotechnical engineering or an experienced Engineering Geologist*" this should be replaced with "*a Chartered Professional Engineer practicing in geotechnical engineering or an Engineering New Zealand registered Professional Engineering Geologist*"

- Condition 48 should be made more robust with a description of the minimum details required in the assessment. Recommended additional wording is, "*A signed and dated record of each assessment shall be kept including a pictorial representation of the slope showing all relevant geotechnical and geological features, all unanticipated conditions, and including notes describing any recommended mitigation measures. This record shall be incorporated in the completion report (as required by Condition 49).*"

- Condition 94 should be made more robust by requiring that "*the specification for the selection, placement, compaction and testing of the lining soil/clay shall be presented to Auckland Council, prior to any lining clay being placed, for review and approval as part of the Landfill Management Plan (Condition 197). All lining soil/clay shall meet the requirements of the approved specification*".

10 Recommendations

I have proposed minor modifications to the conditions of consent. Based on the evidence presented I believe that, with these minor modifications, the conditions will be acceptable to manage the potential geotechnical effects.

11 Quality assurance

Reviewed and approved for release by

Reviewer	Paul Klinac has approved the release of version 1 of this document with the following comments: . This approval flow commenced 07/09/2020 08:47 PM and was completed 08/09/2020 08:25 AM.

This memo is satisfactorily completed to fulfil the objectives of the scope. I have reviewed, and quality checked all information included in this memo

Author	Ross Roberts, Geotechnical & Geological Practice Lead
File location	https://aklcouncil.sharepoint.com/sites/ets-geo/_layouts/15/DocIdRedir.aspx?ID=AKLCGEO-1790012875-840
Date printed	8/09/2020 8:44 am

Memo

To: Warwick Pascoe – Principal Project Lead, Premium Resource Consents

From: Joe Mills – Specialist Historic Heritage, Heritage Unit

Date: 28/08/2020

Subject: BUN60339589 Dome Valley Landfill.

1. Cultural Heritage Implementation Team's assessment

1.1. Thank you for requesting that the Cultural Heritage Implementation Team review resource consent application number BUN60339589.

1.2. A site visit has not been carried out for this application. As such, the applicant's Heritage Impact Assessment has been taken in good faith as accurate.

1.3. The proposed works, as described in the resource consent application and supporting document, do not affect scheduled archaeological sites in Schedule 14.1 (Schedule of Historic Heritage) in the Auckland Unitary Plan operative in part (August 2020) [AUP OIP]. Nor do the proposed works affect any unscheduled historic heritage sites or places. As a result, the risk to identified historic heritage is nil. There is a level of risk that unrecorded historic heritage material may be affected by the proposed works, however this risk can be mitigated by adherence to the AUP Accidental Discovery Rule (AUP ADR) [E12.6.1].

1.4. Archaeological sites are subject to additional rules to manage activities that have the potential to adversely affect archaeological values, such as land disturbance, or disturbance of the foreshore and seabed. The AUP OIP Accidental Discovery Rule provided for in E12.6.1 is there to protect presently unknown archaeological values that may be discovered when works or development is undertaken.

1.5. It is noted that despite any other rule in AUP OIP permitting earthworks or land disturbance or any activity associated with earthworks or land disturbance, in the event of discovery of sensitive material which is not expressively provided for by any resource consent or other statutory authority, the standards and procedures set out in this rule must apply.

1.6. For the purpose of this rule, sensitive material means:

a) human remains and kōiwi;
b) an archaeological site;
c) a Māori cultural artefact/taonga tūturu;
d) a protected New Zealand object as defined in the Project Objects Act 1975 (including any fossil or sub-fossil);
e) evidence of contaminated land (such as discolouration, vapours, asbestos, separate phase hydrocarbons, landfill material or significant order); or
f) a lava cave greater than 1m in diameter on any axis.

1.7. Although the effects of the proposed works on unscheduled archaeological sites can be managed by the obtaining of an Authority under the Heritage New Zealand Pouhere Taonga Act 2014, this does not negate the requirements of the Accidental Discovery Rule. The definition of sensitive material has a broader scope than the statutory requirements of the

Heritage New Zealand Pouhere Taonga Act 2014. As such, the standards and procedures set out in this rule must apply. Suggested wording for a consent condition is provided at section 2.2.1.

1.8. As the Accidental Discovery rule references the Protected Objects Act 1975, it is recommended that an advice note is included relating to this act should resource consent be granted. Suggested wording for the advice note is provided at section 2.3.2.

2. Response to Applicant's Proposed Conditions

2.1. Draft consent conditions from the applicant were provided on the 25th of August 2020 for comment by specialists. Conditions 32-36 are relevant to historic heritage issues and confirm adherence to the AUP ADR, as well as specifying additional controls related to tikanga Maori.

2.2. Previous draft conditions (provided 6th of August 2020) contained Accidental Discovery Protocols which may have conflicted with the AUP ADR. These conditions have since been updated to reflect comments provided. The most recent draft conditions (provided 25th of August 2020) are acceptable, due to their alignment with the AUP ADR.

3. Conditions and advice notes

3.1. If resource consent is granted under s104 of the RMA, the Cultural Heritage Implementation Team recommends that the condition and advice notes described in this section are specified in the resource consent.

3.2. The following consent conditions are recommended:

3.2.1. Accidental Discovery Rule

Should earthworks on the site result in the identification of any previously unknown archaeological site, the land disturbance – Regional Accidental Discovery rule [E12.6.1] set out in the Auckland Unitary Plan Operative in part (August 2020) shall be applied.

Any supplemental conditions in addition to the protocols of the Auckland Unitary Plan Accidental Discovery Rule (AUP ADR) must align with, and shall not override or replace any of, the baseline protocols contained within the AUP ADR.

3.2.2. Information Recovery

A copy of any documentation resulting from archaeological or historic heritage investigation as part of the proposed works should be forwarded to Auckland Council's Heritage Unit for inclusion within the Auckland Council Cultural Heritage Inventory. The consent holders project historic heritage expert shall prepare documentation suitable for inclusion in the Cultural Heritage Inventory and forward the information to the Team Leader (for the Manager: Heritage Unit, heritageconsents@aucklandcouncil.govt.nz) within one calendar month of the completion of work on the site.

In the event that any unrecorded historic heritage sites are exposed as a result of authorised work on the site, then these sites shall be recorded by the consent holder for inclusion within the Auckland Council Cultural Heritage Inventory. The consent holders project historic heritage expert shall prepare documentation suitable for inclusion in the Cultural Heritage Inventory and forward the information to the Team Leader (for the Manager: Heritage Unit, heritageconsents@aucklandcouncil.govt.nz) within one calendar month of the completion of work on the site.

3.3. The following advice notes are recommended:

3.3.1. **Heritage New Zealand Pouhere Taonga Act 2014** –

The Heritage New Zealand Pouhere Taonga Act 2014 (*hereafter referred to as the Act*) provides for the identification, protection, preservation and conservation of the historic and cultural heritage of New Zealand. All archaeological sites are protected by the provisions of the Act (section 42). It is unlawful to modify, damage or destroy an archaeological site without prior authority from Heritage New Zealand Pouhere Taonga. An Authority is required whether or not the land on which an archaeological site may be present is designated, a resource or building consent has been granted, or the activity is permitted under the Auckland Unitary Plan Operative in part (November 2016).

According to the Act (section 6) archaeological site means, subject to section 42(3) –

a) any place in New Zealand, including any building or structure (or part of a building or structure), that –

i. was associated with human activity that occurred before 1900 or is the site of the wreck of any vessel where the wreck occurred before 1900; *and*

ii. provides or may provide, through investigation by archaeological methods, evidence relating to the history of New Zealand; *and*

b) includes a site for which a declaration is made under section 43(1)

It is the responsibility of the consent holder to consult with Heritage New Zealand Pouhere Taonga about the requirements of the Act and to obtain the necessary Authorities under the Act should these become necessary, as a result of any activity associated with the consented proposals.

For information please contact the Heritage New Zealand Pouhere Taonga Northern Regional Archaeologist – 09 307 0413 / archaeologistMN@historic.org.nz.

3.3.2. **Protected Objects Act 1975** –

Māori artefacts such as carvings, stone adzes, and greenstone objects are considered to be tāonga (treasures). These are taonga tūturu within the meaning of the Protected Objects Act 1975 (*hereafter referred to as the Act*).

According to the Act (section 2) taonga tūturu means an object that –

a) relates to Māori culture, history, or society; *and*

b) was, or appears to have been –

i. manufactured or modified in New Zealand by Māori; *or*

ii. brought into New Zealand by Māori; *or*

iii. used by Māori; *and*

c) is more than 50 years old

The Act is administered by the Ministry of Culture and Heritage. Tāonga may be discovered in isolated contexts, but are generally found within archaeological sites.

The provisions of the Heritage New Zealand Pouhere Taonga Act 2014 in relation to the modification of an archaeological site should be considered by the consent holder if tāonga are found within an archaeological site, as defined by the Heritage New Zealand Pouhere Taonga Act 2014.

It is the responsibility of the consent holder to notify either the chief executive of the Ministry of Culture and Heritage or the nearest public museum (for Auckland this is the Auckland War Memorial Museum), which shall notify the chief executive, of the finding of the taonga tūturu, within 28 days of finding the taonga tūturu; alternatively provided that in the case of any taonga tūturu found during the course of any archaeological investigation authorised by Heritage New Zealand Pouhere Taonga under section 48 of the Heritage New Zealand Pouhere Taonga Act 2014, the notification shall be made within 28 days of the completion of the field work undertaken in connection with the investigation.

Under section 11 of the Act, newly found taonga tūturu are in the first instance Crown owned until a determination on ownership is made by the Māori Land Court.

For information please contact the Ministry of Culture and Heritage – 04 499 4229 / protected-objects@mch.govt.nz.

3. Contact for further information

Joe Mills
Specialist Historic Heritage – Cultural Heritage Implementation Team
+64 21 728 569

Statement of Qualifications
I am currently employed by Auckland Council as a Specialist Historic Heritage in the Cultural Heritage Implementation Team. I have worked in this role since November 2017. Prior to this role I have worked for Auckland Council in a Specialist Archaeologist role and in a consultancy capacity.

I received my Master of Arts (First Class) from the University of Auckland in 2015, specialising in New Zealand and Pacific archaeology. I have had eight years of experience working in the New Zealand historic heritage and archaeology industry in both private and public sectors. Through my work at Auckland Council I have provided specialist archaeological and historic heritage input on resource consents, Notices of Requirement, and Outline Plans of Work.

Memo **21 September 2020**

To: Mark Ross, Consultant on behalf of Auckland Council
Cc: Warwick Pascoe, Principal Project Lead

From: Sharon Tang, Senior Specialist Environmental Health, Specialist Unit, Resource Consents

Subject: 1232 State Highway 1 - Dome Valley – Proposed Auckland Regional Landfill (ARL)
Health risk assessment - BUN60339589, LUC60339672

1. Qualification and Experience

1.1 My full name is Sharon Tang. I hold a Bachelor of Medicine from West China University of Medical Science; Post Graduate Diploma – Environmental Health Sciences from Massey University; and Master of Public Health from University of Auckland. I have 32-years of work experience both overseas and in New Zealand in environmental science and public health fields, with particular expertise in water and wastewater quality, contaminated land, hazardous substances and health risk assessment.

1.2 I am currently a Senior Specialist in the Specialist Unit, Resource Consent Department of Auckland Council. I have been working at Auckland Council since 2000 and have been involved in providing specialist input into resource/building consents, notices of requirement, outline plan of works and plan changes in the areas of ground contamination, water quality, hazardous substances and health risk assessment for 11 years. I have also been involved in providing technical and policy advice, input into statutory/non-statutory processes and guidelines in my expertise areas.

1.3 I have been involved in the review and assessment of numerous applications and post consent reports relating to soil and water contamination investigations; asbestos contamination; health risk assessment relating to recreational and drinking water, ground gas, and hazardous substances; remediation and site management of contaminated land, and site validations following remediation works undertaken.

2. Scope of review

2.1 This memorandum is to set out my reply to the review of the documents outlined below. I understand there are some overlaps with my colleague and external consultants, who are reviewing the application under Chapter E14 - air quality and E13 – landfills respectively. To avoid duplications, this assessment does not intend to review the reports in detail but has a focus on identifying information gaps in the Human Health Risk Assessment (HHRA) report in terms of the sources of contaminants, exposure pathways and receptors, and accordingly, recommendations have been made to the proposed draft conditions.

2.2 Initially, the only two reports lodged in relation to human health risk were:

- *Auckland Regional Landfill - Assessment of Environmental Effects (T+T, May 2019)*
- *Auckland Regional Landfill – Risk Management Assessment (AECOM, 23 May 2019)*

The below Human Health Risk Assessment (HHRA) report and further information were reviewed following s92 requests:

- *Human Health Risk Assessment - Auckland Regional Landfill (T+T, August 2019) (HHRA)*
- *Auckland Regional Landfill s92 response – Tranche 3 (T+T, 20 December 2019)*
- *Draft Landfill management Plan included in Appendix A of Auckland Regional Landfill s92 response – Tranche 5 (T+T, 20 February 2020)*

- *Sediment, Stormwater, Waste Acceptance Criteria and Health Risk Assessment Additional s92 Responses (T+T, 14 August 2020)*
- *Further Stormwater and Health Risk Assessment s92 Responses (T+T, 25 August 2020)*

I have also read the following reports referred to in the HHRA report:

- *Stormwater and Industrial and Trade Activity -Auckland Regional Landfill (T+T, May 2019) (SITAR) (Technical Report P)*
- *Hydrogeological Assessment - Auckland Regional Landfill (T+T, May 2019) (Technical Report E)*
- *Assessment of Aquatic and Terrestrial Ecological Values and Effects - Auckland Regional Landfill (T+T, May 2019) (Technical Report G)*
- *Water Quality Baseline Monitoring Report - Auckland Regional Landfill (T+T, May 2019) (Technical Report F)*
- *The Risk Management Assessment (Technical Report S)*

2.3 The memorandum does not include evaluation of the following information in the HHRA report, which are assessed by other specialists:

- Waste acceptance criteria
- Landfill gas
- Toxicity assessment

3. Proposal

3.1 The details of the proposal are contained in the *Assessment of Environmental Effects -Auckland Regional Landfill (T+T, May 2019) (AEE)* and the Stormwater and Industrial and Trade Activity-*Auckland Regional Landfill (T+T, May 2019) (SITAR).*

3.2 In brief, the Waste Management NZ's proposal relates to establishing and operating a 25 Mm^3 municipal solid waste landfill facility for a period in excess of 35 years with a landfill footprint itself occupying approximately 60ha in Valley 1 in the Eastern Block and access road and bin exchange park in the Southern Block within the WMNZ landholdings (1020 ha) in Wayby Valley area. This new facility intends to replace the Redvale Landfill, which has almost reached its landfill capacity. The proposed Auckland Regional landfill (ARL) is a Class 1 landfill, which will receive waste from residential, commercial and industrial sites, construction and demolition works, which meets acceptance criteria.

3.3 The ARL includes a leachate management system including leachate storage, tanker loading facilities, leachate treatment facilities; landfill gas (LFG) treatment by flare and LFG to energy plant; bin exchange area near site entrance where road vehicles deposit waste bins; vehicle wheel wash, maintenance facilities for site plant and equipment including storage of hazardous substances, waste oil tanks, dangerous goods stores.

4. Site description and the surrounding environment and baseline water quality

4.1 The details of the site description and the surrounding environment is contained in Section 4 of the AEE and the Hydrogeology Assessment and the Baseline Monitoring Report (Technical Report F, Volume 2). The water quality of the Hōteo river is documented in *State of the Environment Monitoring: River Water Quality Annual Report 2017 (Buckthought, L. E. 2019)* and on the Land, Air, Water Aotearoa ('LAWA') website (https://www.lawa.org.nz/explore-data/auckland-region/river-quality/). The following is noted:

4.2 The landholding is zoned Rural Production zone in the AUP OP, located approximately 6 km southeast of Wellsford and 13 km northwest of Warkworth, where the population is anticipated to grow five-fold over the next three decades. The project footprint is bounded by native forest in the Sunnybrook Scenic Reserve in the south. A working Springhill Farm within the Western Block contains an existing dwelling as well as farm utility buildings and sheds.

4.3 The site to the northeast, east and south is dominated by plantation forestry. The site to the west and north-west are predominantly agricultural including dairy, beef and sheep farms and lifestyle blocks and a number of small business. Native bush is present within the wider area, including the Sunnybrook Scenic Reserve and the Dome Forest Stewardship Area.

4.4 The WMNZ landholdings contain a number of intermittent and permanent streams and tributaries including the Waiwhiu Stream and Waiteraire Stream, which discharge into a number of tributaries

flowing towards the north-west into the Hōteo River and ultimately flow into the Kaipara Harbour, a key snapper fish breeding ground. The project footprint is approximately mid-way down the Hōteo River.

4.5 Groundwater is encountered at significant depth beneath the proposed Sub-precinct A, separated from shallow groundwater by low permeability unweathered bed rock. The Baseline Monitoring Report shows that groundwater within the WMNZ landholdings is generally free from contamination with total iron and total manganese concentrations exceeding aesthetic drinking water standards. The sample of regional aquifer tested (TB01) records exceedances of aesthetic guideline values (turbidity and iron) in the *Drinking-water Standards for New Zealand 2005 (revised 2018) (MoH, 2018)*. The stream water quality is recorded as excellent within the WMNZ landholdings.

4.6 The Ecological report shows that the stream systems within the WMNZ landholdings are of high ecological value. Native fish including longfin eel, and shortfin eels, banded kōkapu, inanga, various bullies, koura, freshwater mussels, and shrimps are reported to be present within the catchment.

4.7 Watercare uses the Hōteo River upstream of the WMNZ landholdings, at 362 Wayby Valley Road, to supply potable water for Wellsford. Hōteo River has major cultural, spiritual and historic significance to local iwi.

4.8 Information on the LAWA website shows that the Hōteo River, as part of Auckland Council's routine monitoring sites, has a catchment of 26,730 hectares with predominantly rural land uses. The median *Escherichia coli (E. coli)* count at the Hōteo River (Gubbs site) is 116 *E.coli* /100ml over a 2014 to 2018 monitoring period. *The State of the Environment report ((Buckthought, L. E. 2019)* shows that the Water quality in the Hōteo River was reported by Auckland Council as 'good' in 2016, and 'poor' in 2017 due to increased phosphorus levels measured in the river. Escherichia coli (*E. coli*) counts over 2017 range from 56 -5172 cfu/100ml with a median concentration of 144 cfu/100ml.

4.9 The meteorological data from Auckland Council (Mahurangi Mews) and NIWA indicates that the Wayby Valley has the highest annual rainfall in the Auckland Region with greater peak intensities and longer durations compared to other areas in the Auckland region. The Hydrogeology Assessment states that the regional aquifer is expected to receive less recharge from rainfall since the topography and low infiltration capacity of the soils promote high surface runoff.

5. Regulatory requirements and guidelines for health risk assessment

5.1 The Resource Management Act acknowledges that people and communities are part of the environment (based on the definition of 'environment'). Therefore, when resource management decisions must be made, consideration of the potential effects of activities on the environment should also include, amongst other things, the likelihood of effects on people's health, safety and general wellbeing in the community. For an application such as this involving various contaminants on a large scale, a separate Health Impact Assessment (HIA) or a Human Health Risk Assessment (HHRA) report should be prepared.

5.2 Risk assessment is defined under *Environmental Health Australia* (2012) guidelines as a process of estimating the potential impact of a chemical, physical, microbiological or psychosocial hazard on a specified human population or ecological system under a specific set of conditions and for a certain time frame. Various international and national guidelines exist to assist a health risk assessment. The fundamental health risk assessment includes hazards identification, exposure and effect assessment and risk characterisation. It is a process to identify:

- sources of a stressor (any chemical, physical or biological entity that induces an adverse response) in a media material (e.g. air, water, soil, food, consumer products),
- exposure routes and estimating or measuring the magnitude, frequency and duration of exposure
- receptor locations and pathways by which they might be exposed, and
- integrating exposure and toxicity information to evaluate cumulative effects from multiple stressors from multiple exposure pathways, and
- evaluating the risk levels in specific population and discussion of uncertainties

5.3 Over time, risk assessment has shifted from evaluating relationships between exposure to a single chemical and an adverse health effect. A framework for cumulative risk assessment was developed by

U.S. Environmental Protection Agency (EPA) in 2003 (EPA, 2003). It defined cumulative risk as the combined risks from aggregate exposures to multiple agents or stressors. Cumulative risk assessment was identified distinctive from traditional assessment in the follow areas (EPA, 2003):

- It focuses on the combined effects of more than one stressor rather than evaluating stressors individually as if the others were not present;
- Since multiple stressors are affecting the same population, there is an increased focus on the specific populations potentially affected rather than on hypothetical receptors;
- Consideration of cumulative risk may generate interest in a wider variety of nonchemical stressors than do traditional risk assessments.

5.4 The harmonization of approaches to the assessment of risk from exposure to chemicals was facilitated by the World Health Organization (WHO), who in conjunction with other organizations developed a framework for the risk assessment of combined exposures to multiple chemicals (WHO, 2009).

6. Summary of Human Health Risk Assessment Report (HHRA)

6.1 The HHRA report was based on the risk assessment framework described in the *Environmental Health Australia guidelines (2012).* It adopted New Zealand-specific intake factors for the uptake of contaminants into home-grown produce recommended in the *Methodology for deriving standards for contaminants in soil to protect human health (Ministry for the Environment (MfE), 2011)* and data from the following reports summitted as part of the application:

- Engineering Report (Technical Report N)
- The Hydrogeological Assessment (Technical Report E)
- The Air Quality Assessment (Technical Report D)

Sources of contaminants (stressors)

6.2 The HHRA report summarised two previous HHRA reports for Hampton Downs and Redvale Landfill respectively. The risk assessment was noted only to be limited to exposure to contaminants in landfill gas. Both assessments concluded that the discharge of threshold compounds and non-threshold compounds did not pose an unacceptable risk to neighbouring residents.

6.3 Section 4 of the HHRA report discussed the issues associated with a landfill included leachate, landfill gas, surface water, dust and their receptor pathways. It concluded the key sources of contaminants were:

- leachate potentially seeping through a landfill lining system and the underlying soils into the deeper regional groundwater, and/or into the site stormwater system through leachate breakout on a landfill face to surface water;
- landfill gas in the form of fugitive or partially combusted landfill gas.

6.4 The HHRA report stated that metals and volatile organic compounds (VOCs) including benzene and chlorinated solvents were the common contaminants in leachate, which would reach the greatest concentrations at full development of the landfill. The highest annual rate of potential leakage from the landfill was estimated to be approximately $3m^3$, equivalent to an average of 8.2L/day.

6.5 The HHRA report indicated that there was the potential for leachate breakout through lower permeability waste and/or in event of a long period of heavy rain. Based on the typical ammonia concentration within leachate, the permanent water volume in the wetland, and the rainfall and associated discharge volume, the maximum volume of leachate discharged from the site into surface water through breakout was calculated as 5 L/day as a worst-case scenario.

6.6 The HHRA and the Stormwater and Industrial and Trade Activity report (SITAR) show that any surface water that drained onto the open working face and associated areas including the tipping pad will be treated as leachate. All surface water from other areas including workshop and gas plant will be collected and treated in stormwater ponds and a final engineered stormwater wetland prior to discharge into the receiving environment. Stormwater from the bin exchange area will be directed to raingardens prior to discharge into the receiving environment. The HHRA did not discuss the rationale for excluding

stormwater/surface runoff from the key sources of contaminants, which were discussed in Section 4 of the report.

6.7 The HHRA report considered that dust emissions from placement of contaminated material at the working face would be negligible beyond the immediate working area by implementing well-established controls such as the application of water, rapid mixing and cover with other waste materials as well as pre-acceptance checks to avoid dusty waste. Deposition of contaminants from combusted landfill gas and fugitive landfill gas on roof water supply and soil was considered in the HHRA.

6.8 The HHRA report showed that the acceptance criteria for daily cover material (minimum 150 mm) for the landfill adopted NES soil standards for recreational land use and industrial/commercial land use in the *Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites (MfE, 1999*), or the *Australian National Environment Protection Council (NEPC) Health Investigation Levels for recreational land uses* if there is no relevant value in the NES soil. The HHRA considered these values were protective of the public using recreational areas or workers in case of exposure to petroleum hydrocarbons. The HHRA considered that exposure to contaminants in dust was not a relevant pathway since contaminants in soils used for cover material were very unlikely to cause off-site effects.

6.9 The HHRA report referred to the *Risk Management Assessment (Technical Report S, Volume 2),* which identified a number of scenarios that could give rise to unplanned discharges and the below events were assessed as having a 'moderate' residual risk when controls were implemented. It considered that the risk was tolerable.

- lining system failing due to differential settlement, earthquake or other mechanism
- discharge of contaminated stormwater if stormwater pipe or swales fail/block, up-catchment stormwater cannot discharge, and dammed water accumulates resulting in interaction with waste, creating leachate
- air emissions associated with sub-surface landfill fire
- waste acceptance criteria not met and hazardous waste received, resulting in higher levels of contaminants in leachate or discharges to air

The HHRA report stated that exposure to contaminants in the event of a significant unplanned release would be short term and can be mitigated by temporary measures such as evacuation, or restrictions on collecting food from surface water. Therefore, it was not considered necessary for further quantification of the effects on people's health.

<u>Exposure assessment and receptors</u>

6.10 The HHRA report referred to the groundwater risk assessment included in the Hydrogeological Assessment (Technical Report E), which used Groundwater Services Inc. Risk-Based Corrective Action software package to predict leachate contaminants concentrations in groundwater, as well as groundwater as it entered surface water at potential points of exposure (POE).

6.11 The Hydrogeological Assessment (Technical Report E) identified 17 consented bores within 5km of the centre of Valley 1, which were indicated for domestic/municipal, stock and irrigation water supplies. This included one Watercare bore, which was confirmed as having been backfilled due to insufficient yield. The report also identified a couple of bores not listed in the Council records within the vicinity of the project area including an existing farm bore located at 1232A State Highway 1. The report considered that given the likelihood of low yielding aquifers, the probability of future groundwater takes in the vicinity of the site was low. It showed that the consented surface water takes in the surrounding area were largely from the Hōteo River, primarily for agricultural purposes, and in particular for irrigation.

6.12 The Hydrogeological Assessment report evaluated six potential points of exposure (POE) (receptors) to contaminants in leachate:

- POE#1 (360m downstream from the landfill footprint) - freshwater ecology receptors at Valley 1 and 2 stream confluence, where groundwater could reach surface water in the vicinity of the steam confluence
- POE#2 and POE#3 (2,100m west) - freshwater ecology and recreational users at Hōteo River – regional groundwater flows to the west towards the Hōteo River
- POE#4 and POE#5 (1,900m) - stock watering/irrigation and potable water respectively in an existing farm bore at 1232A State Highway 1

- POE#6 (1,000m) – freshwater ecology at Waiteraire Stream

6.13 The Hydrogeological Assessment identified the potential for seepage of leachate to cause health effects from eating fish in the Kaipara Harbour as an issue required to be specifically addressed. It considered that POE#1 immediately downstream from the landfill footprint represented the worst-case scenario for receptors, who collected food from the stream for human consumption. The assessment outcome from POE#1 could be inferred to the risk of consumption of food (fish or watercress where applicable) from further downstream and the Kaipara Harbour, where contaminant concentrations as a result of leachate seepage would be many orders of magnitude lower than in the stream confluence due to dilution.

6.14 The Hydrogeological Assessment report compared the predicted exposure concentrations from leachate with *Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000 (ANZECC)* for ecological effects and contact recreation and drinking water guidelines. It predicted that contaminant concentrations at all potential points of exposure would not exceed the relevant guidelines. It therefore concluded that the potential seepage of leachate through the landfill lining system was highly unlikely to have any adverse effects on the Valley 1 and 2 stream confluence, the Hōteo River, the Waiteraire Stream or the groundwater users of the farm bore.

6.15 Based on the Hydrogeological Assessment report and the Air Quality Assessment report, the HHRA summarised the potential source pathway exposure in Table 4.2. The HHRA report evaluated the following three representative receptor types and associated exposure pathways. The potential for health effects from a cumulative exposure to selected contaminants in leachate and landfill gas were considered for the first two receptors.

- Residential receptor (most sensitive residential receptor from dispersion modelling)
- Inhalation of airborne contaminants;
- Ingestion of drinking water supplied from roof collected water (deposition of airborne contaminants on roof from fugitive emissions or residual discharges from flares and generators) or the farm bore (POE#4) (whichever has more conservatively high intake values - drinking water from roof water was therefore chosen);
- Direct ingestion of soil (pica)
- Ingestion of home-grown produce from vegetable garden and eggs from chickens subject to aerial deposition of contaminants in soil and using farm bore (POE#4) for irrigation.

- Wild food collector (POE#1):
- Harvesting of wild eels and watercress from the confluence of streams from Valley 1 and 2 (noting that in reality site management would discourage people from coming onto the landholdings in this manner); and
- Incidental ingestion of a small quantity of surface water from the confluence of streams from Valley 1 and 2 during collection of eels or watercress.

- Public consumer eating beef or drinking cow's milk from a farm using either bore water (POE#4) within the WMNZ landholdings or from the confluence of streams from Valley 1 and 2 (POE#1) for stock watering.

6.16 The HHRA report stated that that surface water takes from the Hōteo River were unlikely to be used for potable water. Therefore, it only considered recreational use of Hōteo River (POE#3) as assessed in the Hydrogeological Assessment for a direct exposure to contaminants in leachate. However, exposure via contact recreation was not additive to the cumulative risk assessment.

6.17 The HHRA did not consider the use of water from the Hōteo River for irrigation of crops or stock watering as it stated that the predicted concentration of contaminants in groundwater entering the River were lower than in the farm bore. The report therefore considered the assessment of use of farm bore water for stock irrigation was more conservative. It should be noted that only contaminants from leachate were assessed.

6.18 The HHRA report considered that the risk of leachate being discharged via surface water was low since procedures and systems were proposed to minimise, monitor and identify potential leachate breakouts, and the Landfill Management Plan and Emergency Management Plan included contingency procedures to cease discharge if leachate breakout is identified. Nevertheless, the discharge of surface water containing low levels of leachate contamination (5 litres/day - below trigger levels) was included within the receptor pathways (POE#1).

6.19 Priority contaminants in leachate selected through a screening assessment were assessed further in the HHRA. Per- and poly-fluoroalkyl substances (PFAS), as emerging contaminants of concern, were assessed in consumption of eels, beef, and milk, chickens (drinking bore water) as well as incidental ingestion of surface water when fishing since the HHRA report considered these substances were the most sensitive contaminants in leachate given their mobility, environmental persistence, toxicity, and their known ability to bioaccumulate in animals. Arsenic was assessed in water cress consumption due to its high bioaccumulation in freshwater vegetation.

6.20 The report considered that uptake of PFAS by eels at the stream confluence representing the worst-case exposure via freshwater fish or seafood due to PFAS in eels being significantly higher than other fish species. Therefore, it considered that if the calculated risk is acceptable, it can be concluded that exposure from other fish species in the Hōteo River and Kaipara Harbour will also be acceptable by a significantly greater margin.

6.21 A description of the estimated concentrations of contaminants in medias (groundwater, surface water, air, soil (from deposition and irrigation) and roof drinking water), and exposure concentrations were contained in Section 7 and Section 8 and Appendix F of the HHRA and the SITAR. It was noted:

- The HHRA estimated that it would take 6-20 years for any leachate to reach groundwater under the landfill and there would be a further delay in transportation of contaminants to farm bores and the stream confluence. Landfill gas generation rates would reach its highest when the landfill is full. The HHRA calculations conservatively assumed that these occur simultaneously.

- The potential exposure for leachate in groundwater and surface water was considered over the period of full development of the site. The potential leachate leakage to groundwater was modelled over a 50-year period to represent full development of the site;

- Source concentrations adopted the maximum values in leachate at Redvale Landfill assuming the concentrations being consistent over the period of exposure;

- The long-term average mass of stormwater discharge during rain events was used to estimate contaminant concentrations in stream confluence (POE#1) based on rainfall data over the period 2014-2018 considering 50% dilution factor;

- Dilution factor at the point of discharge into the groundwater was not taken into account;

- The annual aerial deposition rate of contaminants in soil was based on the maximum rate of emissions of combusted landfill gas and fugitive landfill gas and assuming the concentration was consistent over 30 years of residential exposure.

Risk characterisation

6.22 The HHRA showed that the risk was expressed in terms of the hazards based on the hazard Quotient (daily intake/ Tolerable Daily Intake) associated with exposure to ‘threshold compounds’, the incremental lifetime cancer risk associated with exposure to non-threshold compounds (carcinogenic substances), as well as Hazard Index (sum of hazard quotient). Cumulative hazard from exposure to multiple contaminants was assessed by summing all hazard Indices across all exposure pathways.

6.23 The HHRA adopted the generally agreed acceptable increase in risk in New Zealand of 1 in 100,000 (or 10 in a million) (MfE, 2011). The findings of the risk assessment are summarised as below:

- The cumulative lifetime incremental cancer risk of 0.23 in a million for the genotoxic carcinogens at a residential receptor was well below the acceptable risk level of 10 in a million. The cumulative hazard Index of 0.0143 was below the acceptable risk/hazard level of 1.0. It therefore concluded there would be no appreciable health risk posed to the nearby residents. The HHRA stated that inclusion of substances evaluated at the Waste Acceptance Criteria limits would not alter the conclusion.

- The Hazard Index of 0.00219 for exposure to PFAS via ingestion of eels and incidental ingestion of surface water was well below 1.0. It therefore concluded that health effects were not likely to result from exposure by a person collecting and eating eels. Taking into account the significant dilution factor in the Hōteo River and the Kaipara Harbour, the HHRA

considered that exposure from other fish species in the river and the harbour would also be acceptable.

- The lifetime incremental cancer risk of 0.00227 in a million for exposure to arsenic via ingestion of watercress was well below the acceptable risk level of 10 in a million.

- PFAS in food (meat, milk and eggs) were well below the recommended trigger levels for further investigation in the Food Standards Australia New Zealand. Higher concentrations of PFAS were calculated in beef and dairy cattle being watered from the stream compared to the farm bore. The HHRA therefore considers that any health effects associated with eating these foods are not expected.

6.24 The HHRA therefore concluded that the cumulative hazard and risk estimates indicated that there would be no unacceptable hazards or risks for any of the contaminants or pathways considered for a representative residential receptor, exposure to other fish species and watercress further downstream or in the Kaipara Harbour or exposure to farm milk and animals. Overall, the report concluded there would be no unacceptable hazards or risks for any of the contaminants or pathways considered, both individually and cumulatively using a conservative screening approach.

7. Issues identified in the HHRA report

7.1 The HHRA report considers that the key sources of contaminants from the proposed landfill facility are leachate (seepage into groundwater and surface water – Valley 1 and Valley 2 steam confluence) and landfill gas. However, there is a lack of justification for why stormwater/surface water runoff from the project area is not considered as one of the key sources of contaminants. Stormwater is well recognised as a source of contaminants in an urban environment including industrial sites such as a waste disposal facility. A wider range of contaminant sources will be created as a result of the proposed landfill activity, including but not limited to:

- Dust
  No dust emission modelling or existing monitoring data is provided to support the statement in Section 4.5.1 of the HHRA report that dust emissions from placement of waste will be negligible beyond the immediate working area.

- Contaminants from daily cover
  The proposed acceptance criteria (recreational land use and industrial/commercial land use (petroleum hydrocarbon)) for daily cover material do not support the stated 'lightly contaminated soil' in the HHRA. In case of cyclone or heavy rainfall, there is the potential for contaminants in the daily cover to be blown or washed away from the tipping area into surface water in addition to the potential for leachate breakout.

- Roadways and wheel wash water
  The wheel wash water contains contaminants carried on wheels. The SITAR shows excess water from wheel wash and runoff from roads will be discharged into stormwater ponds.

- Contaminants from workshops and energy centre
  The proposed landfill facility will involve storage and/or use of extensive hazardous substances and wastes (Table 5.1 of the SITAR). These involve a 40,000L diesel tank, waste oil tanks, oil containers, dangerous goods store in workshop area; leachate collection tanks, a 30,000L oil tank and 6,000L waste oil tank for generator, transformers, a 2000L back-up diesel generator, and another dangerous goods store in the energy centre. Although there will be procedures to prevent and mitigate the effect of spills, contaminants discharging beyond these areas into stormwater/surface water cannot be discounted.

7.2 It is understood that the surface water runoff/stormwater discharge has been assessed by a specialist separately and the SITAR shows that the water will be treated to meet acceptable standards. It is noted from the s92 response letter (tranche 3) that the trigger levels for stormwater discharge have adopted the Default Guideline Values (DGV) in the ANZECC guidelines for the protection of 95% freshwater species except for arsenic, that a more stringent trigger level has been adopted to meet the Maximum Acceptable Value (MAV) in NZ drinking water standards. The s92 response letter (tranche 3) has also quoted the findings from a review of a long-term stormwater monitoring data, which shows that only copper concentrations elevated over the relevant ANZECC environmental guideline or trigger level for the protection of 95% freshwater species. The letter recognises that stormwater from the site is likely to contain typical urban stormwater contaminants, such as oils/greases and heavy metals like zinc and

copper, mainly from the use of motor vehicles on site. It states that since the site stormwater will be treated through a best practice treatment system, it is unnecessary to evaluate the potential for health effects related to stormwater discharges.

7.3 However, the purpose of health risk assessment is to take a holistic approach to assess and quantify the combined risks to health from multiple sources. The traditional risk assessment approach by evaluating stressors individually, presented as if the others were not present, has been discouraged by international guidelines. Cumulative risk assessment means *an analysis, characterization, and possible quantification of the combined risks to health or the environment from multiple agents or stressors* (EPA, 2003). Stormwater is a well-known key source of contaminants in an urban environment and should not be discounted in the cumulative risk assessment process. By omitting this important source of contamination, the outcomes of the health risk assessment are likely to be underestimated.

7.4 The HHRA has only considered part of the contaminant sources (leachate and landfill gas) in the evaluation of the potential for health effects from cumulative exposure for residents and food collectors. Contaminants from other sources listed in point 7.1 have not been taken into account. This is reflected as below:

- Contaminant concentrations in surface water (POE#1, POE#2) have only calculated contaminant concentrations from leachate and assumed the surface water was free from other sources of contamination.

- As a result of the calculations, only bore water irrigation for vegetable garden and stock-watering has been considered in the evaluation of the health risk to residential receptors (POE#1) since higher contaminant concentrations have been found in leachate in groundwater than in surface water. It is uncertain whether this result would be different if it also took into account contaminants from other sources. The surface water intake from the Hōteo River has been identified to be primarily used for agricultural purposes, in particular for irrigation. I therefore consider that the risk of irrigation from surface water or stock-watering has not been properly evaluated in the HHRA.

- Assessment of the risk of recreational use in the Hōteo River (POE#2) has only considered the impact from leachate migrated into the river. Although it is noted in the Hydrogeology Assessment report (Technical Report E) that the predicted leachate contaminant concentrations in the regional groundwater at the Hōteo River were well below the ANZECC recreational guideline values, other contaminant sources such as stormwater discharge/surface runoff, dust and airborne contaminants from flares and generators have been discounted. In addition, exposure via contact recreation in the river has been assessed individually and the risk has not been added into the cumulative assessment.

- Short-term effects from unplanned discharges have not been quantified. This may also relate to evaluations of the impact from acute toxic chemicals, non-chemical stressors, such as physical hazards, stress, microbiological stressors in the event of cyclone, flooding or landfill fire.

7.5 The HHRA report shows that except for genotoxic carcinogenic compounds and PFAS, a screening assessment of priority threshold compounds in leachate and landfill gas has been undertaken based on source concentrations and relative screening toxicity values to determine the potential contaminant of concern (PCOC). It is uncertain when taking into account contaminants from stormwater discharge and other sources, whether new PCOC would emerge for further assessment.

7.6 An inconsistent approach to the risk assessment is noted. For example, the HHRA has considered airborne contaminants from flares and generators depositing onto a roof and soil as exposure pathways but discounted the deposition onto surface water.

7.7 Identifying the locations of the receptors is considered as an integrated part of a health risk assessment (*Environmental Health Australia, 2012).* The HHRA report has not fully evaluated the point of exposure in the surrounding environment, particularly, the extent, purpose and locations of surface water use. Exposure assessment should include some discussions of the size, nature, and types of human populations exposed to the agent, as well as discussion of the uncertainties in the above information (EPA, 2019). Understanding of the potential use of the surrounding environment is the first step to determine the sensitivity of the environment in terms of human health risk so that the extent of information required for assessment can be justified. Otherwise, it is likely either that an assessment has been undertaken unnecessarily leading to an overestimated risk or key concerns of exposure have not been sufficiently addressed.

7.8 Unplanned discharge has been assessed in the Risk Assessment Report as 'moderate' residual risk following implementation of control measures. Although the effects appear to be short-term in nature, further quantitative assessment is considered necessary in particular for acute toxicants. As a minimum, the assessment should include evaluation of the frequency of the likely events and the extent of populations who are likely to be affected based on available data.

7.9 The HHRA has assessed that the health risk levels to the receptors are low with a wide margin of safety magnitude. It states the risk assessment results represent the worst-case scenarios based on the modelling results from the Hydrogeology Assessment and Air Quality Assessment. However, the HHRA has not fully evaluated the cumulative health effects of all sources of contaminants, which will be created from the proposed landfill facility. The key issue is the exclusion of surface water runoff/stormwater from the cumulative health risk assessment. The cumulative assessment has also not taken into account the risk from recreational use and the impact of airborne contaminants and dust on surface water. Omitting cumulative effects from sources other than leachate and landfill gas render the HHRA outcomes unconvincing and the assessed health risk is likely to be underestimated. In addition, there is lack of quantitative assessment of acute effects from unplanned release.

8. Further comments on issues raised from submissions

8.1 Submissions have been reviewed in an attempt to identify the land use in the surrounding environment relevant to human health. Some of the concerns have already been addressed in the application documents, and the aforementioned discussions in point 7 of this memo. The following themes of issues raised in the submissions were particularly noted:

- concern with the impact on drinking water supply source (Hōteo River and Regional Aquifer) for Warkworth and Wellsford
- concern with the impact on agricultural areas from flood events carrying leachates, contaminants in runoff including one Certified Organic farm where bore water is in use
- concern with the polluted river and harbour affecting recreational use
- concern with the overall water quality in the area, where water is relied on to refill a water tank in times of drought
- health risk of food sourced from water sources
- health risk of consumption of infected vegetable, fruit by bacteria, carcinogens, toxins in leachate and rubbish spread through the environment
- microplastics impact on waterways and the safety for water use either for drinking or irrigation

8.2 The key concern raised in Watercare's submission is to ensure that its northern water supply sources are protected and its ability to provide a reliable, safe and efficient municipal water supply to Warkworth, Wellsford and other northern towns now and in the future is not compromised. The following is particularly noted in Watercare's submission:

- Wellsford's municipal water is currently drawn from upstream Hōteo River and water supply for Warkworth is drawn from the Regional Aquifer.
- Additional drinking water sourced from the Regional Aquifer is required to supply Wellsford.
- The potential for contamination of the Regional Aquifer arising from the application cannot be determined based on the application documents reviewed.
- There is a lack of sufficient details on the parameters and details of the proposed monitoring, contingency planning in the event of contamination, procedures for notifying Watercare of any such incidents and other contamination breaches.
- Due to the information gaps, Watercare cannot be certain that the Application does not give rise to a risk of adverse effects on the Regional Aquifer.

- Watercare has sought further information and conditions to address the issues with regard to proposed monitoring, responses to breaches/incidents, consultation of contingency plan and notifications.

8.3 The inadequacy in the assessment of the current and further human use of the environment in the HHRA has been discussed in previous sections of this memo. It appears from the submissions that surface water is used for irrigation and refilling tanks in times of drought. The risk of irrigation using surface water has not been addressed by the HHRA.

8.4 It is uncertain whether the water intake is used for drinking by residents. The baseline water quality of streams is recorded as excellent within the WMNZ landholdings. However, this does not include microbiological data. The *State of the Environment Monitoring: River Water Quality Annual Report 2017 (Buckthought, L. E. 2019)* shows that the bacteria indicator: *Escherichia coli (E. coli*) levels in the river range from 56-5172 cfu/100ml over 2017 with a median concentration of 144 cfu/100ml. The levels exceed the safe drinking value of less than 1 cfu/100ml specified in the *Drinking-water Standards for New Zealand 2005 (revised 2018) (MoH, 2018).* This means that Hōteo River in the current status, without treatment, is not microbiologically safe for drinking.

8.5 The Hōteo River has significant recreational values for its whitebait fishery, possibly the only good whitebaiting spot in the Auckland region (Auckland Council, 2014). The levels of bacteria indicator (*E. coli*) detected in Hōteo River indicate that the River is intermittently not microbiologically safe for contact recreation such as swimming when *E. coli* levels exceed the health safe level of *550 E. coli/100ml* specified in *the Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas (MfE, 2003).* However, the long-term monitoring data from the Land, Air, Water Aotearoa (LAWA) website shows that the Hōteo River has a five years' median of 116 *E. coli*/100ml during a 2014 to 2018 monitoring period (Gubbs site). This indicates a very good microbiological water quality with a Suitability for Recreation Grade of 'A' in accordance with the MfE recreational guidelines (2003).

8.6 Landfills are identified as possible sources of microbiological contamination (MoH 2017 pg 90). However, the HHRA has not undertaken an assessment of the impact of microbiological hazards presented in municipal wastes on the environment. It is considered that ongoing monitoring of microbiological indicators (such as *E. coli*) should be undertaken.

8.7 The HHRA has not included an assessment of microplastic impact on waterways nor implemented monitoring/control measures in the draft landfill management plan. Microplastic pollution including drinking water is a newly emerging issue around the world. The World Health Organization (WHO) stated in 2019 that '*based on the limited information we have, microplastics in drinking water don't appear to pose a health risk at current levels*.' However, uncertainties remain due to the potential cumulative effect from other sources such as food, air, and plastic toys (*https://www.who.int/news-room/detail/22-08-2019-who-calls-for-more-research-into-microplastics-and-a-crackdown-on-plastic-pollution*). The WHO has called for further assessment of microplastics in the environment and their potential health impact. Efforts are being made both nationally and internationally for the reduction of plastic use. It is considered that the applicant should evaluate measures to further reduce the potential impact of plastics on the environment and human health and at least include microplastic in the monitoring programme for leachate and stormwater discharge.

8.8 I share Watercare's concern with the potential impact of the Application on the Regional Aquifer due to the lack of a good understanding of the likely frequency of unplanned releases and the extent of effects arising from a stormwater system failure or a lining system failure due to differential settlement, earthquake, other mechanism or landfill fire damage. Although these events have a low probability of occurrence, the potential high health consequences should trigger further evaluations. Such information from existing landfill facilities with similar systems is considered essential to ensure any proposed contingency/emergency plan is appropriately prepared so that any potential effects from unplanned releases can be avoided or mitigated to an acceptable level should they occur.

9. Summary of additional risk assessment information

9.1 Following s92 request and meeting discussions, an additional risk assessment was provided in the following documents and with reference to *Hydrogeological Assessment- Addendum Report (Volume 1) (T+T, August 2020)*:

- *Further Sediment, Stormwater, Waste Acceptance Criteria and Health Risk Assessment Additional s92 Responses (T+T, 14 August 2020)* (1st Further Response)

- *Further Stormwater and Health Risk Assessment s92 Responses (T+T, 25 August 2020) (2nd* Further Response).

The two response letters have addressed the following s92 matters:

- Re-assessment of cumulative risks to contact recreation, residential receptor, food collectors by considering additional contaminants sourced from surface water runoff/stormwater from the proposed ARL
- Suitability of surface water (stream) for irrigation of vegetable garden
- Evaluation of rainfall effect by using a higher rainfall (95% upper confidence level (UCL)) in modelling in addition to using annual average rainfall
- Discussion on approaches to unplanned events and ongoing water quality monitoring locations

Recreation and irrigation risk

9.2 The cumulative risk of using the Hōteo River (POE#2) for recreation has been assessed for modelled arsenic, chromium, lead, copper, and zinc concentrations, which were selected through a screening assessment, in consideration of the following additional contribution sources:

- ARL stormwater discharges – based on measured stormwater quality at Redvale Landfill and considering dilution factor
- background concentrations in the Hōteo River – based on Watercare data

The cumulative concentrations of metals in the Hōteo River were assessed as all below drinking water MAV and ANZECC recreational guideline values (mg/L). The concentrations as a percentage of drinking water MAV (generally more stringent than recreational guideline values) are low in a range of 0.06% - 3.2%. Background concentrations of the metals in the Hōteo River account for more than 97% of the total metal concentrations in the River.

9.3 The cumulative concentrations for arsenic, chromium, lead, copper (dissolved) and zinc (dissolved) as well as mercury were modelled at Valley 1 and 2 stream confluence (POE#1) by adding the contribution from ARL stormwater discharge (data from Redvale Landfill with dilution factor considered). The re-modelled concentrations for arsenic and mercury at POE#1 were used for assessing the health risk of wild food collectors eating watercress and eels respectively.

The cumulative concentrations of metals in the stream confluence were assessed as all below drinking water MAV, ecological criteria and ANZECC recreational guideline values (mg/L). The concentrations as a percentage of drinking water MAV are in a range of 0.03% - 9%.

9.4 The second response letter has evaluated predicted concentrations in surface water with respect to the suitability of the water for irrigation. It found modelled concentrations of PFAS are higher in the farm bore while metals are higher in surface water. The modelled cumulative concentrations for arsenic, chromium, lead, copper (dissolved) and zinc (dissolved) in the stream confluence and the Hōteo River are all less than 0.2% of the ANZECC & ARMCANZ (2000) short-term trigger values (STV) for agricultural irrigation (up to 20 years).

9.5 Since stormwater discharge has been taken into account in the cumulative effect assessment, the cumulative effect from dust depositing outside the landfill footprint on waterways is not considered a separate pathway since it is a potential contributor to contaminants in stormwater.

Residential receptor

9.6 The cumulative effect of the ARL on residential receptors was re-evaluated by using surface water from stream confluence instead of groundwater for irrigation of the vegetable garden since metal concentrations in the stream are much higher than in bore water, and surface water for irrigation is popular in the area.

The cumulative lifetime incremental cancer risk (genotoxic carcinogens) is 5.99E-07 (0.599 per million) for irrigation using stream water as compared to 2.34E-07 (0.234 per million) for irrigation using farm bore water in the HHRA report. Both figures are below the acceptable risk of 1.00E-05 (10 per million).

9.7 Residential PFAS exposure using bore water for potable supply and to irrigate the vegetable garden was re-evaluated by assuming an equivalent toxicity for additional PFAS compounds (PFNA and PFDA). Based on the updated data from T+T's *Hydrogeological Assessment - Addendum Report*

(Volume 1) (August 2020), the contaminants of potential concern (COPC) Hazard Index is 5.77E-05 as compared to 1.07E-05 in the HHRA report. Both figures are well below the Hazard threshold of 1.

Food collector and consumption

9.8 The re-modelled concentrations for arsenic and mercury at POE#1 were used for assessing the health risk of wild food collectors eating watercress and eels respectively.

- Arsenic - Cumulative incremental lifetime cancer risk for wild food collector eating watercress and indirect ingestion of surface water is re-calculated to be 1.28E-06 (1.28 per million), as compared to 2.27E-9 estimated in the HHRA. However, the risk is still less than the acceptable risk level of 1.00E-05 (10 per million).

- Mercury: The Hazard Index for wild food collector eating eels and incidental ingestion of surface water is 7.12E-03, which is below the Hazard threshold of 1.

- PFAS compounds –Hazard Index for contaminants of potential concern (COPC) for wild food collector eating eels and incidental ingestion of surface water is 4.93E-04 as compared to 1.07E-05 in the original HHRA, which however are all well below the Hazard threshold of 1.

- Estimated concentrations of PFAS compounds in Finfish, Mammalian animal meat (beef), milk and poultry eggs are all below the calculated cumulative residential exposure trigger points with a significant margin (generally 5 orders of magnitude lower except for Finfish with 2 orders of magnitude lower).

Rainfall

9.9 The response letter demonstrates that during a higher rainfall event, such as a 95% percentile rainfall event, the contaminant concentrations are 16% of the concentrations at the stream confluence (POE#1) calculated using the annual average rainfall, reflecting additional dilution expected during a high rainfall event. This indicates that the contribution from ARL stormwater discharges to concentrations in the Hōteo River would be lower during a peak rain event than based on the annual average of rainfall due to the expected significant further dilution to occur. The letter states that the worst-case assumption would be the mass flux of contaminants increased proportional to the rainfall so that the concentrations of contaminants in stormwater remained the same as the annual average regardless of the size of the rainfall event.

9.10 It is noted from the Hydrogeological Assessment Addendum Report that there is limited potential for contaminant transport to the regional groundwater since only a small fraction of the 1% of the rainfall recharge is predicted as travelling vertically from the shallow groundwater to the deeper regional aquifer.

Unplanned discharge and ongoing monitoring location

9.11 The response letters have not provided further information on the frequency or extent of the potential unplanned discharges, which have been assessed as part of the Risk Management Assessment. The key components of the ‘unplanned discharge’ assessed in the Risk Management Assessment are included in point 6.9 of this memo and it includes potential lining system failing, discharge of contaminated stormwater, landfill fire and waste acceptance criteria not being met. The second response letter states that the ‘moderate residual risk’ unplanned events are low probability/high potential impact events, which are more appropriate to be addressed in the Risk Management Assessment report. It justifies that the potential leachate breakout (5 litres/day) has been considered in the HHRA. However, the leachate breakout appears to be irrelevant to the ‘unplanned discharge’ assessed in the Risk Management Assessment report. Nevertheless, it is noted from the Hydrogeological Assessment Addendum Report that contaminant concentrations at the nearest Farm Bore (POE#4) are modelled at least three orders of magnitude below drinking water standards should leachate leakage occur through the liner at three orders of magnitude higher than the HELP model output rates. However, this does not address the wider cumulative effects from an event, which may cause a lining system failure.

9.12 The letter considers that there would be no additional value in undertaking monitoring within the Hōteo River mainly because monitoring close to the potential source is more reliable to ensure early detection of contaminant releases, and potential discharges from the ARL would represent a small volume as compared to the large volume of water in the River.

10. Final specialist review comments and conclusions

10.1 It is understood that mean concentrations of stormwater quality in Redvale landfill were used in the modelling. Since the maximum modelled concentrations are less than 9% and 3.2% of the drinking water standards in stream confluence (POE#1) and the Hōteo River (POE#2) respectively, using more conservative concentrations such as the 95% UCL in the modelling will not change the health effect conclusion. However, it is noted that the outcome may differ for ecological effects since the modelled concentrations for zinc and copper are already close to the ecological default guideline values (DGV) for 95% species protection (70% and 88% respectively). It is understood from the meeting discussion with the consultants on behalf of Waste Management that the discharge criteria for stormwater are likely to be more stringent than those used in the modelling due to the receiving environment being of very good baseline water quality. In combination with the consideration that the contaminant concentrations are assumed to be present consistently over the landfill lifespan, I consider that the predicted long-term health risks are conservative.

10.2 Increased rainfall appears to result in a decrease in the modelled contaminant concentrations at the Point of Exposure (POE) evaluated in the HHRA due to a larger dilution factor expected. It is noted that an assumption is made that the mass flux of contaminant will not change during rainfall events. The response letter states that the absolute worst-case scenario is that the contaminant mass increases proportional to the rainfall, thus, the contaminant concentrations remain the same regardless of the size of the rainfall. Although I, in general, concur with the assessment, the potential impact of extreme weather conditions such as a storm with high wind and heavy rain on the landfill systems is still not well understood due to lack of supportive evidence from existing landfill data. It appears to be likely that a sudden large increase in stormwater runoff during a storm event would result in decreased retention times that leads to discharges without sufficient treatment expected by a normal operational stormwater treatment system. It is also noted from the assessment by the Council's Specialist, Ms Arsini Hanna, that stormwater runoff from 5% AEP events will bypass all proposed treatment devices and discharge directly into the environment. Although Ms Hanna considers that the adverse contamination effects on the receiving environment from the bypassing of these devices will be negligible, I retain my view of uncertainty on this matter. Should assessment of existing data suggest a potential risk of increase in contamination discharge during a heavy rainfall event, a contingency plan is paramount to include sufficient details on predicted trigger values for these events, procedures for monitoring, inspections, and response actions to mitigate any potential effect of extreme weather events. If existing data is insufficient to reach a conclusion, further monitoring to assess the rainfall effect should be undertaken.

10.3 Based on the predicted low recharge rate (1%) from shallow groundwater to the deeper regional aquifer and modelled low contaminant concentrations in groundwater when increasing leachate concentrations by three orders in modelling input, it appears that the proposed ARL is unlikely to cause a long-term adverse effect on the Regional Aquifer. However, it is noted that the Council's Consultant Hydrogeology Specialist, Mr Aslan Perwick, suggests that the groundwater travel times between the upper aquifer zone and the deeper regional aquifer zone may be significantly more rapid than accounted for. Mr Perwick also suggests that the flow direction in the regional aquifer from the area beneath the proposed landfill footprint is likely to be in a more south-westerly direction and towards the Waiteraire Stream. This raises some uncertainties on the modelling outcomes and whether the receptors assessed in the HHRA are representative. Mr Perwick has recommended additional monitoring to confirm flow directions and permeability of the regional aquifer. In addition to the aforementioned uncertainties raised by Mr Perwick, there is a lack of a full understanding of any short-term effects on the Regional Aquifer from unplanned releases arising from stormwater system failure or lining system failure due to differential settlement, earthquake, other mechanism or landfill fire. In consideration of the significant health risk arising from contamination of the Regional Aquifer, I share Watercare's concerns with the potential risk of the Application on the Regional Aquifer and to the lack of a contingency plan with sufficient details on preparedness for the events, alert and action triggers for responses, response procedures including Watercare/Council notifications, public risk communication and management.

10.4 The cumulative concentrations of metals in the Hōteo River were assessed as safe for irrigation of vegetable gardens. However, it should be noted that the current microbiological River water quality is unsafe for drinking without treatment and intermittently unsafe for recreation.

10.5 Based on the aforementioned assessment, the s92 response has largely addressed the issues raised with regard to cumulative health effects of the proposed ARL on the receiving environment. The additional modelling data shows that stormwater discharge is the most significant source contribution for metals and other genotoxic carcinogen contaminants to the receiving environment as compared to

other contaminant sources from the ARL. Although the final cumulative health and environmental risks to the receptors increase significantly as compared to those assessed in the original HHRA, the risks are still within the acceptable risk levels and generally with a wide margin, thus does not alter the original HHRA conclusions. I in general concur with the HHRA conclusion that the long-term cumulative health risks of the proposed ARL on the residents, food collectors, and contact recreation are acceptable with a wider margin. However, I acknowledge the concerns raised by Mr Perwick and support his recommendation for further monitoring to confirm the modelling assumptions and the appropriateness of the locations of the receptors selected for the HHRA.

10.6 I remain concerned with the 'moderate residual risk' 'unplanned discharges' arising from lining system failing, discharge of contaminated stormwater, landfill fire and/or waste acceptance criteria not met. These issues are also identified as the key concerns from the submissions. Human health risk assessment should not only address long-term health effects but also short-term effects of potentially exposure to high contaminant concentrations such as during an unplanned discharge. Although these events have a low probability of occurrence, the potential high health consequences should trigger further evaluations. Such information from existing landfill facilities with similar systems is considered essential to ensure any proposed contingency/emergency plan is appropriately prepared so that any potential effects from unplanned releases can be avoided, mitigated and managed to an acceptable level. The transparent assessment will ensure any decision is made based on sufficient evidence.

10.7 Landfills are identified as possible sources of microbiological contamination (MoH 2017 pg 90). The greatest contents of microorganisms include municipal wastes, and in particular − the wet fraction, i.e.: food scraps, remains from raw material for meals composition, empty packages after food products, used cleaning agents and personal hygiene materials, and faeces of domestic animals (Burkowska, A. et al, 2011 pg 72). The HHRA does not address microbiological risk of the ARL on the environment. Since sensitive human use of both groundwater and surface water is present in the receiving environment. It is, therefore, considered necessary to include microbiological indicators into the baseline and ongoing monitoring programme. Should any information indicate a risk is present, the relevant monitoring and management plan should be updated with appropriate trigger levels.

10.8 Microplastics, plastic pieces less than 5 millimeters in size, are used in manufacturing, industry, and 3D printing and are in consumer products such as synthetic clothing fabric, toothpaste, and skincare products (https://toxtown.nlm.nih.gov/sources-of-exposure/microplastics). Due to the wide use of plastic, municipal landfills are expected to be a source of microplastic contamination. Since the effect of microplastics on human health is not well understood, the assessment of the health effect of the proposed ARL land use is difficult. However, efforts are being made both nationally and internationally for the reduction of plastic use as well as further research on this issue. I consider that microplastic should be included in the ongoing monitoring programme for leachate and stormwater discharge.

10.9 The Hōteo River has major cultural, spiritual and historic significance to local iwi as well as significant values to the local community for food and contact recreation. It is understood that the proposed ongoing monitoring locations do not include any of the POEs assessed in the HHRA although one is located close to POE#1. I consider that the baseline monitoring and ongoing monitoring locations should at least include the Hōteo River (POE#2) since it is the receiving environment of concern by the community. Although modelling data indicates that the discharge from the ARL will contribute a small percentage of the contaminant mass, the ongoing monitoring data at location POE#2 and the additional monitoring locations recommended by Mr Perwick will enable evaluations to be undertaken on the accuracy of the modelling outcomes and will determine whether additional controls and/or adjustment of trigger levels for discharges are required.

10.10 In summary, the submitted human health risk assessment and associated documentation generally identifies and assesses the risks to human health that may result from the discharge of contaminants from the proposed landfill, with the assessment gaps able to be addressed by the imposition of suitably worded conditions. Overall, I consider the long-term risks posed to human health are low and any short-term effects can be avoided, mitigated and managed by consent conditions. I recommend that the application is granted by considering the following additions or amendments to the draft conditions set in the Draft Key Conditions of Consent - 25 August 2020.

11. Recommendation on additions or amendments to the draft conditions

11.1 To include the Hōteo River and microbiological indicator: *E. coli* into the baseline monitoring programme as specified in the draft condition 44 and 45 respectively and ongoing monitoring programme in draft condition 233;

11.2 To include microbiological indicator: *E. coli* and faecal coliform in the groundwater monitoring programme as specified in draft condition 236;

11.3 To include microplastic into the baseline monitoring and ongoing monitoring programme in draft condition 45, 233, 236 and 241;

11.4 Additional monitoring to be inserted in draft condition 233: Should further evaluation of data from existing landfill facilities show that the data is insufficient to determine rainfall effects on stormwater discharge quality, additional monitoring of contaminants of concern shall be undertaken to determine the relationship between rainfall and stormwater discharge quality;

11.5 Additional recommended condition: The consent holder shall carry out further evaluation of the frequencies and extent of unplanned discharges because of lining system failing, stormwater system failure, sub-surface landfill fire and/or breach of waste acceptance criteria based on the data from existing landfill facilities, and use the data to support the preparation of a relevant contingency plan or an emergency management plan. The evaluation data and correspondent contingency plan shall be provided to the Council at least 20 working days prior to the landfill facility becoming operational;

11.6 Additional recommended condition: The consent holder shall review monitoring data and provide the Council an updated human health risk assessment (HHRA) report every 10 years after the landfill facility becomes operational. The HHRA shall take into account cumulative effects from new contaminant sources in the vicinity of the landfill facility.

Regards

Sharon Tang

References

Buckthought, L. E. 2019. State of the environment monitoring: river water quality annual report 2017. Auckland Council technical report, TR2019/010.

Environmental Health Australia. (2012). Environmental health Risk Assessment-Guidelines for assessing human health risks from environmental hazards (Environmental Health Australia 2012 guidelines) (enHEALTH guideline)

European Food Safety Authority (EFSA) Scientific Committee (2019); Guidance on harmonised methodologies for human health, animal health and ecological risk assessment of combined exposure to multiple chemicals.

Ministry for the Environment. (2011). Methodology for deriving standards for contaminants in soil to protect human health. Wellington: Ministry for the Environment.

Ministry of Health. 2018. Drinking-water Standards for New Zealand 2005 (revised 2018). Wellington: Ministry of Health.

National Environmental Standards for Freshwater 2020 (NES-Freshwater) and National Policy Statement for Freshwater Management 2020 (NPS-FM 2020)

U.S. EPA. (2014). Framework for Human Health Risk Assessment to Inform Decision Making

U.S. EPA. (2019). Guidelines for Human Exposure Assessment. (EPA/100/B-19/001). Washington, D.C.: Risk Assessment Forum, U.S. Environmental Protection Agency (EPA)

U.S. EPA. (2003). Framework for cumulative Risk Assessment, U.S. Environmental Protection Agency (EPA)

WHO. (2009). Assessment of combined exposures to multiple chemicals: report of a WHO/IPCS international workshop on aggregate/cumulative risk assessment. World Health Organization.

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18 September 2020

Warwick Pascoe
Principal Project Lead - Premium Consents
Auckland Council

Dear Warwick

S42A REPORT - BUNBUN60339589 - HYDROGEOLOGY

1.0 Application Description

Applicant's Name:	Waste Management NZ Ltd
Purpose description:	Construction and Operation of a new regional municipal landfill
Service centre application number:	BUN60339589, WAT60339673
Site address:	1232 SH1, Wayby Valley, Auckland

1.1 Application Documents

Key documents I have review and/or are referenced in preparation of this report are as follows:

1. Auckland Regional Landfill, Assessment of Environmental Effects, Prepared for Waste Management NZ Ltd, Prepared by Tonkin & Taylor Ltd, May 2019.
2. Technical Report E – Hydrogeology Assessment Auckland Regional Landfill, Prepared for Waste Management NZ Ltd, Prepared by Tonkin & Taylor Ltd, May 2019.
3. Technical Report A – Geotechnical Interpretive Report Auckland Regional Landfill, Prepared for Waste Management NZ Ltd, Prepared by Tonkin & Taylor Ltd, May 2019.
4. Technical Report B – Geotechnical Factual Report Auckland Regional Landfill, Prepared for Waste Management NZ Ltd, Prepared by Tonkin & Taylor Ltd, May 2019.
5. Technical Report N – Engineering Report Auckland Regional Landfill, Prepared for Waste Management NZ Ltd, Prepared by Tonkin & Taylor Ltd, May 2019.

6. Technical Report G – Assessment of Aquatic and Terrestrial Ecological Values and Effects Engineering Report Auckland Regional Landfill, Prepared for Waste Management NZ Ltd, Prepared by Tonkin & Taylor Ltd, May 2019.
7. Section 92 Questions, Attachment 1 (dated 28 June 2019, "Dome Valley Landfill – s92 Questions") of Sentinel Planning Letter to Andrea Brabant (Tonkin & Taylor Ltd) dated 18 September 2019.
8. 9 October 2019 Meeting Minutes, Auckland Regional Landfill – Hydrogeology s92 questions, Tonkin & Taylor Ltd version of minutes.
9. 9 October 2019 Meeting Minutes, Auckland Regional Landfill – Hydrogeology s92 questions, Pattle Delamore Partners Ltd version of minutes.
10. Section 92 Response Tranche 1, Letter report, Tonkin & Taylor Ltd, 8 November 2019.
11. Section 92 Response Tranche 3, Letter report, Tonkin & Taylor Ltd, 20 December 2019.
12. Section 92 Response Tranche 5, Letter report, Tonkin & Taylor Ltd, 20 February 2020.
13. Submissions – Online Submission Report – summary of BUN 60339589 submissions, prepared by Auckland Council.
14. Geotechnical Addendum Report Version 1, Auckland Regional Landfill, Prepared for Waste Management NZ Ltd, Prepared by Tonkin & Taylor dated 6 August 2020.
15. Response to outstanding Freshwater Ecology section 92 question, Auckland Regional Landfill, Prepared for Waste Management NZ Ltd, Prepared by Tonkin & Taylor dated 6 August 2020.
16. Hydrogeological Assessment - Addendum Report Version 1, Auckland Regional Landfill, Prepared for Waste Management NZ Ltd, Prepared by Tonkin & Taylor dated August 2020.
17. Hydrogeological Assessment - Addendum Report Version 2, Auckland Regional Landfill, Prepared for Waste Management NZ Ltd, Prepared by Tonkin & Taylor dated August 2020.
18. Hydrogeological Assessment - Addendum Report Version 3, Auckland Regional Landfill, Prepared for Waste Management NZ Ltd, Prepared by Tonkin & Taylor dated August 2020.
19. 28 August 2020, Memo to Aslan Perwick (PDP), "Follow up to Hydrogeology Addendum Report V3, Fate & Transport Modelling, prepared by Tonkin & Taylor Ltd.

Other documents provided by the applicant within the application package have also been reviewed, but the above were generally the key documents for this discipline.

2.0 Proposal Background and Description

Waste Management NZ Ltd (WMNZ) is seeking to obtain resource consents for the construction and operation of a new regional landfill facility within the Wayby Valley area, between Warkworth and Wellsford. Site address is 1232 SH1, Wayby Valley, Auckland, comprising several land parcels with an approximate total area of 1020 ha. Figure 1 displays the site location and proposed landfill footprint.

WMNZ is proposing to develop a municipal solid waste landfill on part of the WMNZ landholdings, which will be known as the Auckland Regional Landfill (ARL). The landfill is proposed to be a Class 1 landfill, as defined by the draft 'Technical Guidelines for Disposal to Land' (Wasteminz, August 2018), which would accept municipal solid waste, which includes residential and commercial waste. The landfill will also accept construction and demolition waste, some industrial wastes (that meet strict acceptance criteria), and contaminated soils.

The landfill footprint itself is proposed to occupy approximately 60 ha of the WMNZ landholdings, within an area referred to as 'Valley 1' – which comprises an existing WNW orientated valley which is incised ~50 m to >100 m below the adjacent ridgelines.

The landfill is proposed to be fully lined, with either a Type I or Type II liner system, and will include a leachate collection and removal system (above liner); which is to remain functional throughout the entire landfill life and after-care period. A sub-liner drainage system is also proposed (e.g. groundwater drainage beneath the liner).

WMNZ also propose a groundwater supply take for up to 50 m^3/day and 18,250 m^3/yr, from borehole TB01 (located on the Valley 1 southern ridge line); to provide a potable water supply for the landfill operations. Potable water is required to provide a supply for staff facilities, with some potable water required for odour suppression sprays. It is anticipated that up to 20 m^3/day of potable water will be required on site. Non-potable water is also required for dust suppression, vehicle washing, road washing, and a firefighting reserve. The borehole is proposed to feed both potable and non-potable supply uses.

WMNZ seeks a 35-year term for its regional consents and permanent land-use consents to reflect the long term nature of a landfill development. The proposed works require consent as a non-complying activity overall under the Auckland Unitary Plan.

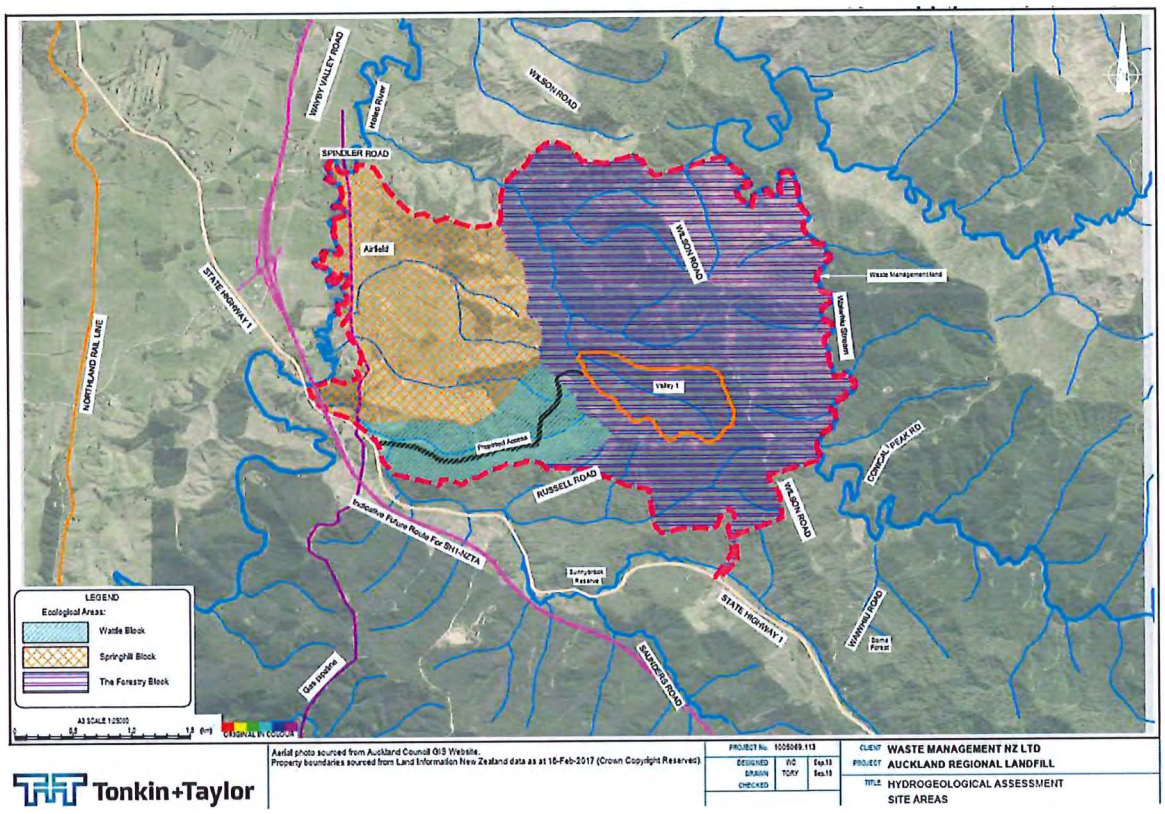

Figure 1: Property and Proposed Landfill Location

3.0 Consents Requested – Groundwater Related

Groundwater related consents sought by the applicant are listed below for reference:

WAT60339673:

Taking, Using, Damming and Diversion of Water (E7)

E7.4.1(A20 and A28) – the diversion and dewatering or groundwater associated with the proposed landfill excavations, as a restricted discretionary activity.

E7.4.1(A26) – the take and use of 50 m^3 of groundwater per day for potable water supply, as a discretionary activity.

E7.4.1 (A41) - New bores for purposes not otherwise specified

Yet to be assigned a service centre number:

Cleanfills, Managed Fills and Landfills (E13)

E13.4.1(A9) - discharges from a new landfill, is a non-complying activity.

C1.7. – discharges associated with the placement and compaction of material associated with a landfill, being an activity that is not specifically classed in a rule as a permitted, controlled, restricted discretionary, discretionary, non-complying or prohibited activity, as a discretionary activity.

DIS60339670:

Discharge of Contaminants (E4)

E4.4.1(A15) – the discharge of contaminants to land, being leachate irrigation back into the proposed landfill, is a discretionary activity.

4.0 Submissions – Groundwater Related

Nearly 800 submissions have been received in response to the application. I have reviewed specific applications with 'substantive' submissions relating to groundwater issues, as well as reviewing the submission summaries compiled by AC.

There are numerous submissions which raise groundwater related issues. The submissions have covered a series of general themes, which are outlined below:

1. Water Quality (WQ) Related Themes
    a. WQ risks from leachate (or other contaminant(s)) migration/release impacting the regional water supply aquifer (and most note the Watercare supply boreholes, Hoteo River takes, plus other private takes, etc.)
    b. WQ risks from leachate (or other contaminant) migration/release to surface water / Hoteo R. / Kaipara Harbour - and associated ecological effects.
2. Physical Hydrogeology Related Themes
    a. Fractured nature of the area's geology, and perceived high propensity for subsurface (groundwater) flow and migration of leachate (or other) contaminants.
    b. High rainfall and high rainfall intensities of the area - and inference of the location being 'unsuitable' due to risks of surface flooding and/or underground migration of leachate (or other) contaminants.
    c. The noted presence of numerous 'springs', 'tomos', 'underground streams', (e.g. Springhill Farm') ... and the inference that the location is 'unsuitable' due to the prevalence of these features, e.g. impacts this could have on the liner integrity, and propensity for contaminant migration.
    d. Impacts on recharge reduction/loss to the underlying/surrounding aquifers and streams.
3. Landfill Liner / Containment Related Failure & Degradation Themes (with consequent leachate release to groundwater)
    a. Liner failure and/or large 'event' e.g. landslide, fire, etc... that could cause a substantial leachate release (or other release) of contaminants - with consequent damaging environmental and/or other effects.
    b. Degradation/failure of the 'millimetres thick' HDPE liner over long-term time periods, and concurrent release(s) of leachate (or other) contaminants - given that the contaminants could last for 100s of years.
4. Regulatory Themes
    a. The proposal conflicts with the purpose and principals of the RMA.
    b. The proposal conflicts with the Auckland Unitary Plan
    c. Use of management plans to not sufficient to provide positive outcomes

Overall, it is my view that all groundwater related topics raised within the submissions have been covered (to varying degrees) by the applicant within the application and supporting documentation.

5.0 Hydrogeological Setting

I make the following summary comments from the applicants interpreted hydrogeology assessment, and my own assessment:

- The geological sequence from residual surface soils through to deeper weathered and then unweathered (and often fractured rock) is typical of the Pakiri Formation, and is the dominant geological profile within the area of interest. Alluvial sediments associated with the Hoteo River, Waiteraire Stream, and other surface water drainage, drape the surface at lower elevations.
- The Pakiri Formation in this region hosts an aquifer which is officially referred to by Auckland Council as the 'Hoteo Waitemata Aquifer' – for aquifer management purposes. Colloquially, the applicant has referred to the aquifer via two zones; "Upper Aquifer" and "Regional Aquifer". The applicant's definition of these two zones is somewhat loose, however I would describe them as per the below, which I understand to be in general agreement with the applicants' distinction:
  - a) 'Upper Aquifer / Upper Aquifer Zone/System' – describes the shallower portions of the aquifer which primarily discharge to local scale sinks e.g. local streams and tributaries, such as the Valley 1 stream.
  - b) 'Regional Aquifer / Regional Aquifer Zone/System ' – describes the deeper portions of the aquifer which primarily discharge to regional scale sinks e.g. the Hoteo River, the Waiteraire Stream. In the Valley 1 and relevant downgradient areas, I consider the regional aquifer to generally refer to aquifer elevations less than ~50 m RL.

  Having the 'Upper' and 'Regional' zones/systems assists with descriptions within the effects assessment, although I would add that further distinctions could also be made e.g. 'Intermediate Zones'. However, it should be noted that the two aquifer zones discussed within the application are overall part of the same Pakiri Formation aquifer, and same Auckland Council aquifer management area – which is the Hoteo Waitemata Aquifer.
- Recharge from rainfall within the Valley 1 catchment is the primary 'source' of groundwater within the Valley 1 area.
- Groundwater inflow from the regional scale catchment (e.g. regional aquifer zone) is also occurring and is a separate source of groundwater to the Valley 1 area and wider region.
- Within the wider region, groundwater discharge is primarily to surface water e.g. the Hoteo River, Waiteraire Stream, and associated stream tributaries, springs. An overall small proportion of groundwater is presently abstracted in the region from boreholes.
- From the data available, under the elevated areas of the landfill footprint / Valley 1 area, the groundwater pressure profile with depth displays large variation e.g. strong downwards head gradients.
- Permeability / transmissivity within the rock portion of the relevant geological profile is controlled primarily by the presence or absence of water transmitting fractures/joints/discontinuities (collectively 'defects') within the rock mass.
- Fracture assessment data provided from BH15 indicates a range of defect dip angles (sub horizontal to sub-vertical) and defect orientations.
- There is a potable groundwater resource beneath the proposed landfill footprint and within the wider region, and groundwater is used for potable purposes. However, there is significant available allocation within the region e.g. the region is not under groundwater abstraction stress at present, but there are plans for municipal groundwater supply for Wellsford Township

(reference: Watercare Submission). The most up to date allocation information for the Hoteo Waitemata Aquifer was provided by Mr. Andrew Benson (Auckland Council) on 7 September 2020, and is summarised below:

- Total Water Available for Allocation: 5,558,000 m^3/year
- S14(3)9b) Take assignment: 1,116,339 m^3/year (e.g. domestic or stock purposes)
- Permitted Activity Take assignment: 45,000 m^3/year
- Consented Takes: 447,880 m^3/year
- Remaining Allocation: 3,948,781 m^3/year

This equates to the Hoteo Waitemata Aquifer having over 70% allocation availability (at time of writing).

- The regional aquifer zone has significantly flatter head gradients than observed within the upper aquifer zones.
- The upper aquifer zone groundwater quality is circum-neutral pH, sodium carbonate dominant water, however some water samples are higher in calcium and/or magnesium. Water quality is generally potable.
- The regional aquifer zone groundwater quality is typically alkaline (pH>8.5), and sodium carbonate dominant. Water quality is potable.
- With respect to the proposed landfill structure:
  - the basegrade is expected to be excavated below the groundwater table (by over 30 m in places) and consequently the landfill will require construction period, operational, and potentially closure period drainage and ongoing diversion of groundwater.
  - A low-permeability liner of near 60 ha area is proposed.
  - A sub-liner drainage system (to operate permanently) is proposed.

6.0 Assessment of Groundwater Effects

The potential environmental effects from the proposal relating to groundwater are summarised below:

1. *Changes to the groundwater regime due to the placement of the landfill structure.*

   There will be impacts to the groundwater system within and beneath Valley 1 and the broader area, namely:

   a. *Groundwater diversion and drainage* – due to the proposed installation of sub-liner drainage systems and the extensive landform changes (cut depths 10's of m beneath the existing water table), significant volumes of groundwater will be drained and/or diverted. The works will involve permanent lowering the water table/pressure beneath and proximal to the proposed landfill structure.

   b. *Reduction in recharge to the regional (deeper) aquifer resource* – this effect is primarily due to the presence of the low-permeability liner (circa 60 ha area), and diversion of incident rainfall away from the surface soils that presently occupy the proposed landfill footprint. A reduction in groundwater recharge infiltrating to the regional aquifer is expected to occur. The applicant has assessed this reduction in recharge to be on the order of 13% when viewed across the entire Valley 1 surface water catchment, e.g. all the way downstream to where the Valley 1 catchment meets the Hoteo River. The applicant has also provided an absolute estimate of recharge/infiltration loss to the regional aquifer at approximately 1.2 L/s (or ~104 m^3/day, or ~38,000 m^3/yr). There is some uncertainty around this figure, and further it would vary from year-to-year, however I am in general agreement with the scale of this estimate.

   c. *Reduction in recharge to the upper (shallow) aquifer zone*– emanating from the same reasons as for (b) above. Under the present hydrogeological system, shallow groundwater that does not infiltrate to the regional (deeper) aquifer (discussed in (b) above), discharges locally to the Valley 1 stream e.g. provides baseflow to the Valley 1 Stream, proximal to where the recharge occurs. For the portion of Valley 1 catchment located upstream of the proposed landfill toe, recharge reduction to the shallow groundwater system will be considerable. In simple terms; total area upstream of proposed landfill toe ~100 ha, the proposed Landfill area ~60 ha = ~60% reduction to recharge to the upper portion of the Valley 1.

For point (b) – recharge reduction to the regional aquifer – I agree with the applicant's assessment that this is an overall small reduction to the groundwater resource on a regional scale, and furthermore I do not consider that the regional aquifer would suffer any sustainability stress from this reduction in recharge. I do however make an important note that this recharge reduction is actually a greater *'net'* water take than the ~0.6 L/s (~18,250 m^3/yr) that the applicant proposes to abstract from borehole TB01 for water supply purposes (see Item 2 below).

For points (a) and (c) – effects of the upper (shallower) groundwater system – when combining the drainage/diversion effects + the recharge reduction effects, I consider there to be a potentially greater than minor effect on baseflows to stream reaches in the catchments immediately adjacent to the proposed landfill location. I provide more commentary on this in the 'Key Residual Issues' section.

2. Drawdown within the regional aquifer due to the proposed groundwater supply take (from borehole TB01) – the taking of groundwater will induce drawdown within the regional aquifer, and this will have a localised effect (reduction) on aquifer pressure. The applicant has assessed this drawdown effect/influence to be ~0.6 m at 500 m distance from TB01, and 0.03 m at 2,200 m distance from TB01.

As there are no existing registered boreholes or other groundwater abstraction takes within ~2 km of TB01 (other than the applicant's own boreholes), there is no affected party. I consider the volume of the take to be sustainable for the aquifer, however noting my point made for Item 1 above, that there is a water balance argument that the *'net'* take from this proposal is actually 1.8 L/s, or 156 m^3/day, or 56,765 m^3/yr (from: 1.2 L/s (recharge reduction) + 0.6 L/s (from TB01)). Either way, I consider that the magnitude of effects on the aquifer is of an acceptable level, and there is significant presently available allocation (>3,900,000 m^3/yr) within the Hoteo Waitemata aquifer management zone.

For completeness, a summary other potentially relevant E2 'Water Quantity Allocation and Landuse' rules are provided below with regards to this application :

3. Water quality degradation effects – these are potential effects that could emanate from leachate leakage through the liner, and/or other type of spill/loss of containment which releases a contaminant(s) to ground. For the former, the applicant has provided a range of water quality (groundwater and surface water) impact estimates for variously sized leachate leakages. The applicant has considered a base-case 3 m^3/yr leachate leakage, as well as a 3000 m^3/yr '1000-times' scenario. The 'base-case' and '1000-times' scenarios are both assessed to be clear of adverse water quality effects when applying the ANZECC 2000 criteria at the No.6 identified receptor locations. I overall agree with the applicants concluding findings that water quality effects at these identified locations/receptors are unlikely to be above the adopted water quality criteria for (where applicable) ecological, livestock, and/or human health (for the specific contaminants and leakage rates assessed). I do however have some residual concerns with the omission of key receptors, and the approach of utilising regional scale, computer generated dilution stream flow estimates rather than measured streamflow data. More commentary on these issues is provided in the 'Key Residual Issues' section.

7.0 Key Residual Issues

An extensive set of s92 queries was requested of the applicant. The majority of these have been responded to adequately; however there remain some information gaps and/or differences of professional opinion in my own assessment of potential effects.

The key residual issues are:

1. *The absence of baseflow gauging in the Valley 1 stream, and surrounding catchment streams* – these streams are key receptors / discharge zones from groundwater within the proposed landfill area. It is my opinion that actual field gauging should have been completed, rather than attempting to rely on regional scale computer models (e.g. NIWA NZ River Maps) to obtain baseflow estimates. Baseflow gauging is considered standard industry practice to ascertain reliable stream baseflow data.

2. *The conceptual understanding of the existing groundwater flow regime* – in my opinion, the applicant's presented understanding contains some shortfalls and contradictions. Displaying a comprehensive understanding of the conceptual flow regime is pertinent to an effects assessment and any relevant consent conditions for a proposal of this nature and scale. Whilst the applicant has provided assessment and commentary on all key elements required/requested, my own assessment differs on the below key matters:

    a. *Groundwater flow directions from the upper (shallower) aquifer zone in the area of the proposed Landfill Footprint* – my assessment indicates that the downwards flow direction, i.e. from the upper (shallower) aquifer to the underlying regional (deeper) aquifer, is more significant and pervasive than the applicant has accounted for. I note the applicants interpreted groundwater head/flow gradients within the regional aquifer which is considerably flatter than for the upper aquifer – a concept which I am in general agreement with. This does however indicate that the regional aquifer is of higher permeability and with significantly lower head pressure than the upper aquifer, and consequently the regional aquifer is 'under-draining' the upper aquifer. The regional aquifer therefore is an important discharge zone for the upper aquifer. I do not consider this concept has come through sufficiently within the applicant's conceptual model.

    b. *Groundwater flow directions within the underlying regional (deeper) aquifer zone*– my assessment indicates that a more south-westerly flow direction is likely within the regional (deeper) aquifer underlying the proposed landfill e.g. flow direction (at depth) from the proposed Landfill location is more south-westerly and towards the Waiteraire Stream (as this is the closest regional aquifer sink).

    c. *Connection between the upper aquifer zones and the underlying regional aquifer zone* – Whilst I agree that typical 'bulk-average' calculations/estimates for flow paths from the upper aquifer zones to the regional aquifer zone indicate slow/long (e.g. multiple decades) transit of groundwater – there is also evidence to suggest that vertical hydraulic connection may be locally good and that groundwater travel times may be significantly more rapid than accounted for. BH15 displays a clear example of good vertical connection when assessing the shallowest piezometer (BH15_4) which measures head pressure at the proposed base-grade elevation (~98 mRL) and the deeper piezometer BH15_2 at 42 m RL. The head gradient between these two piezometers is only ~0.08 – which indicates a fairly good vertical connection over the ~56 m vertical interval directly beneath the proposed landfill. Furthermore, the mid-depth piezometer BH15_3 (at ~62 mRL) displays a near identical head pressure and hydrograph to BH15_2 – which indicates very good connection over this 20 m vertical interval. The BH15 borehole logs display

open aperture (unfilled) sub-vertical fracturing, of various orientations, which provides further field evidence that physical connections are likely to exist – albeit it is not known/discernable from the available data how deep these sub-vertical fractures/fracture networks may preferentially transmit groundwater (vertically or horizontally). In my opinion, evidence from the applicant's observations and monitoring data from BH15 indicate good vertical connection at this location, and hence likelihood of similar or potentially more transmissive conditions existing for groundwater flow elsewhere within the proposed landfill area.

d. Notwithstanding the above, I do note that the applicant has undertaken what I consider a limited amount of ground/groundwater investigation within the proposed landfill footprint. BH15 is the only machine borehole and the only borehole which extends below the proposed landfill basegrade (within the proposed footprint). Whilst BH15 has provided some useful insights to the ground conditions beneath the proposed landfill, it is only one ~110 mm diameter borehole, and hence in my opinion there remains considerable uncertainty on ground conditions and conceptual understanding. This uncertainty needs to be dealt with via conservatism with respect to effects assessment, and rigorous proposed consent conditions.

3. *Potential hydraulic impacts from sub-liner drainage and recharge reduction due to the landfill structure, ~60 ha liner, and ancillary works* – the applicant's assessment concludes that *"... the landfill is not expected to change stream flows in surrounding catchments by a measurable amount."*. My own assessment of the potential baseflow reduction in reaches of streams immediately adjacent to Valley 1 differs from the applicant's. I estimate that some stream reaches could see up to a 20% reduction in baseflow (flow rate). This could have follow-on effects to the stream reach e.g. reduction in the permanent and/or intermittent stream lengths – and associated potential ecological effects (which are outside the area of my expertise, but may not have been assessed). The yellow dotted line + yellow shaded polygons in the Diagram 2 display the particular reaches/streams which I have residual concerns about with respect to baseflow reduction potential:

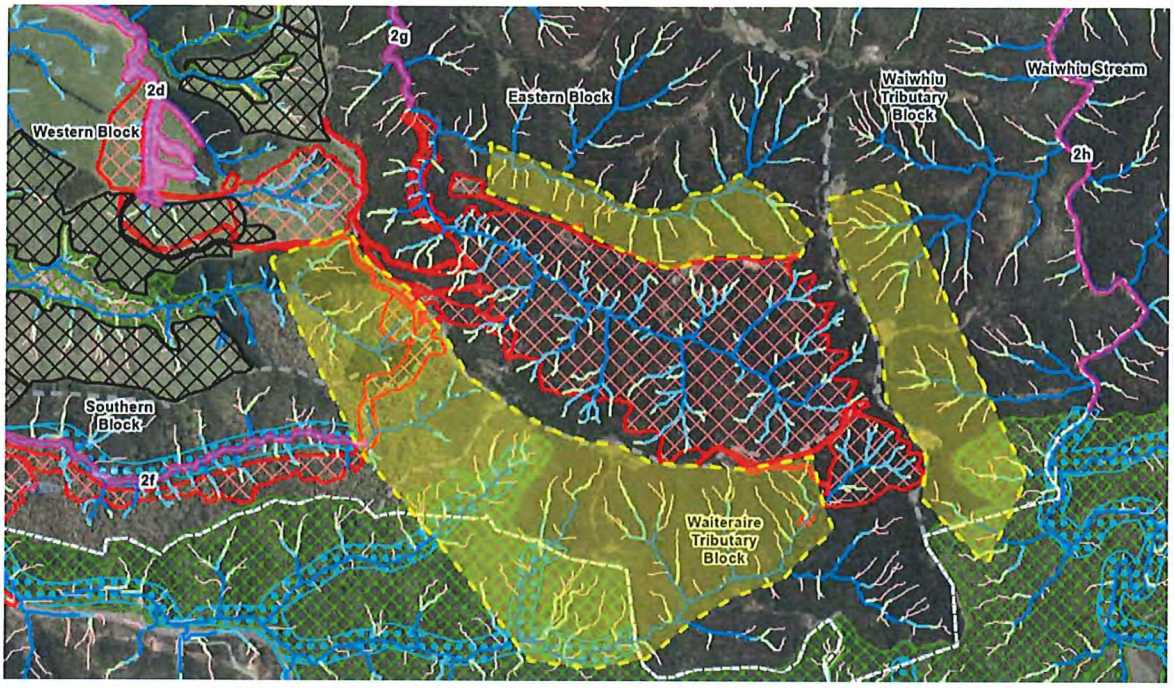

Figure 2: Reaches of Stream with Residual Baseflow Reduction Concern (base image extracted from Applicant Ecological Addendum Report, August 2020)

5. *Capture of potential leachate leakage within the sub-liner drainage system* – The applicant's assessment of flow paths within the upper aquifer zone, specifically at/near the water table directly below the proposed landfill structure states that: *"...shallow groundwater flow from the landfill footprint post-construction/post-completion will be completely captured by drains to be installed beneath the liner. On this basis, transport to receptors would only occur if there was a failure in the drainage system."* My own assessment disagrees with the conclusion that the proposed sub-liner drains are likely to capture all shallow groundwater flow paths beneath the liner. I estimate that at least ~10% of groundwater flow paths beneath the liner could evade the proposed drainage system described by the applicant, and that these would most likely migrate generally downwards and ultimately into the regional aquifer. Furthermore – within the application documents and various s92 responses, there is mention of various proposals to progressively remove/decommission all or parts of the sub-liner drainage system as the phases of landfilling progress. I note that the most recent assessment of effects provided by the applicant incorporates the sub-liner drainage system to remain operational throughout the entire landfill operational and after-care periods. Should this approach alter, and the sub-liner drainage system (or parts of it) be decommissioned, this would further promote the downwards flow path for any leachate/contaminant leakage beneath the liner, and may also increase risks to the upper aquifer (and relevant stream receptors).

6. *Identification of potential receptors with respect to contaminant fate and transport* – the applicant has identified No.6 potential receptors, see below extract from the Hydrogeology Addendum Report V3:

- **POE#1 Freshwater ecology of Valley 1 and 2 stream confluence located 360 m from the landfill footprint.**
- **POE#2 Freshwater ecology of Hoteo River located 2,100 m from the landfill footprint.**
- **POE#3 Recreational users accessing Hoteo River located 2,100 m from the landfill footprint.**
- **POE#4 Stock accessing water from the Farm Bore, located 1,900m from the landfill footprint.**
- **POE#5 Use of the Farm Bore located 1,900 m from the landfill footprint for drinking water.**
- **POE#6 Freshwater ecology of Waiteraire Stream located 1,000 m from the landfill footprint.**

Whilst some of these receptors appear - from the applicant's assessment as well as my own – unlikely to be on flow paths migrating from the proposed landfill, there are at least two other key receptors that I consider to be pertinent to water quality risks emanating from potential leachate/contaminant release to groundwater which the applicant has omitted. These are:

a. TB01 – the applicant's proposed potable groundwater supply take, located ~230 m from the proposed landfill footprint. This borehole accesses the regional (deeper) aquifer, but from my assessment a plausible flow paths exists from beneath the landfill liner to the TB01 intake zone. The proposed groundwater take from TB01 is ~50 m^3/day (18,250 m^3/yr) and the drawdown influence from this pumping, plus the recharge reduction from the landfill structure, further exacerbates the risk to water quality abstracted from a borehole this proximal to the proposed landfill.

b. The regional aquifer within the area south through west-south-west of the proposed landfill footprint, all the way to the Waiteraire Stream – whilst there are no presently consented groundwater takes or registered groundwater boreholes in this area, there could be in the future as it is outside the property boundary, and hence this portion of the regional aquifer should be considered a receptor. There is also discharge from the regional aquifer to the Waiteraire Stream (so the aforementioned portion of regional aquifer is also a migration path to another receptor).

In my opinion, both of these receptors should be assessed against the relevant drinking water quality standards / regulations, and a rigorous monitoring regime and contingency plan measures should form part of any proposed consent conditions.

7. Consent Conditions relating to groundwater risks require significantly more rigor. This is due to the uncertainties and risks associated with:

   a. The limited ground investigation within the proposed footprint.

   b. Conceptual uncertainty with particular respect to preferential flow paths beneath and potentially away from the proposed landfill.

   c. The regional significance of and community reliance on the aquifer as a municipal and economic water supply source.

   d. The sensitivity of nearby and downstream receptors (both human health and ecological).

I provide recommendations on proposed consent conditions in the below section.

8.0 Summary of Statutory Matters

For completeness, a summary of other potentially relevant rules within the AUP (operative in part) is provided below:

E2 – Water quantity, allocation and use

E2.3:

(7)(a)(i) – as discussed in Section 6 of this memo, the take is well within the aquifer availability, hence recharge to other adjoining aquifers is considered maintained.

(7)(a)(ii) – ground consolidation / aquifer consolidation has been addressed by the applicant, and there may be limited ground consolidation from the proposal. However, the assessment demonstrated that this is limited to the applicant's property boundary, and if occurred would only affect the implicant land, buildings, structures, etc.

(7)(b)(i), (ii) and (c)- as I have outlined in Section 7 of this memo, there is some residual uncertainty regarding potential effects on base-flows. I have recommended specific consent conditions to address these issue (covered in Section 9).

(7)(d) – saline intrusion potential from the proposed take has been assessed by the applicant, and no saline intrusion effects are expected. I support this conclusion.

(7)(e) – effects on water levels and take ability within neighbouring boreholes has been assessed. Any drawdown/interference effects are expected to be very small, and are not expected to impact the take ability of these neighbouring boreholes.

(7)(g) – the borehole proposed for the take has been pump tested and has displayed the ability to supply groundwater at the maximum request rate.

(7)(h) – as per (7)(a)(ii) above, there is no ground settlement expected on any structures outside of the applicant's property boundary.

E2.3(8) – relevant mitigation options have been outlined in Section 9 of this memo.

E2.3(9) – relevant monitoring options have been outlined in Section 9 of this memo, and within the proposed consent condition set.

E2.3(13((a)&(b) - as I have outlined in Section 7, there is some residual uncertainty regarding potential effects on base-flows. I have recommended specific consent conditions to address this issue (covered in Section 9).

E2.3(23)(a)(i)&(ii) – this is outside my area of expertise, hence I am not able to comment further, but will rely on others for this assessment.

E2.3(23)(b) – the proposed groundwater diversion proposal is not expected to exacerbate flooding.

E2.3(23)(c)(i) – measurement/monitoring of water levels is proposed within the consent conditions.

E2.3(23)(c)(ii) – no monitoring of ground, buildings, or other structures is proposed, and I agree is not required in this instance.

E2.3(23)(d) - as I have outlined in Section 7 of this memo, there is some residual uncertainty regarding potential effects on base-flows. I have recommended specific consent conditions to address this issue (covered in Section 9), which includes suggested mitigation options.

9.0 Recommendations

Key recommendations for proposed consent conditions

1. Significant additional monitoring infrastructure to provide placement of upgradient and down-gradient boreholes (spatial capture), and screen zones (vertical capture). The present selection of investigation boreholes plus proposed No.2 additional boreholes do not provide sufficient coverage of potential contaminant migration pathways. As the baseline monitoring needs to be carried through to operational phase monitoring, sufficient monitoring infrastructure needs to be installed for the baseline monitoring phase.
2. Specific monitoring and contingency plan provisions for the TB01 potable water supply re: human health and aquifer resource protection risks.
3. Specific monitoring and contingency plan provisions for the regional aquifer south through south-west of the proposed landfill down to the Waiteraire Stream (regional potable water supply) re: human health, aquifer resource protection, and ecological risks.
4. Stream baseflow monitoring and contingency planning – both baseline and during operation baseflow monitoring is required. Provision for development of a contingency plan, to address baseflow effects (if there are found to be adverse effects to receptors).
5. Sub-liner Drainage Monitoring – this should be continuous monitoring (e.g. online loggers) as Best Practice for leachate screening parameters, particularly given the 'leak detection' role that a sub-liner drainage system such as this would provide e.g. leakage near to the lowest floor of the landfill would likely be captured by these drains – so the sub-liner drainage system is expected to receive some leachate influence, and early warning measures are required.
6. Consent condition(s) to tie the installation and permanent operation of a sub-liner drainage system(for operational and aftercare periods) - whilst the applicant has not as yet provided a detailed sub-liner drainage system design, a sub-liner drainage network has been described and incorporated into the applicant's effects assessment. I propose that specific consent conditions are developed to formally tie this design component to any consent. In my opinion, the sub-liner drainage system forms a key component of the overall leachate management system, and much like the specifications for the liner type, it is reasonable to incorporate into consent conditions.
7. In relation to items 3 and 4 above: the applicant's proposed Groundwater Monitoring and Management Plan (GMCP) should also outline the management and remediation measures that may be implemented in the event that contamination of the aquifer occurs. Such measures may include, but not be limited to, active remediation measures such as the installation of groundwater interception structures, removal of groundwater via pumping for treatment or disposal, or the in-situ treatment of groundwater via the introduction of air, reagents, or encouraging biological activity, etc. Reactive measures may also include the introduction of controls on, or the prohibition of water takes and / or the collection of food from potentially affected receptors.

There are other consent conditions alterations, however these a wording alterations, additional monitoring parameters, etc., and it is assumed that these will be further refined ahead of the hearing.

10.0 Limitations

This report has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Auckland Council and others (not directly contracted by PDP for the work). PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the report. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

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Yours faithfully

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memorandum

TO	Warwick Pascoe	FROM	Alan Pattle
	Auckland Council	DATE	7 September 2020
RE	Auckland Regional Landfill, S42A Technical Report; Landfill Engineering		

1.0 Introduction

Waste Management NZ Ltd (WMNZ) is seeking to obtain resource consents for the construction and operation of a new regional landfill facility within the Wayby Valley area, between Warkworth and Wellsford. Site address is 1232 SH1, Wayby Valley, Auckland, comprising several land parcels with an approximate total area of 1020 ha.

WMNZ is proposing to develop the landfill on part of the WMNZ landholdings, which will be known as the Auckland Regional Landfill (ARL). The landfill is proposed to be a Class 1 landfill, as defined by the 'Technical Guidelines for Disposal to Land' (Wasteminz, August 2018) (referred to hereafter as 'the Landfill Guidelines'), which would accept municipal solid waste, which includes residential and commercial waste. The landfill will also accept construction and demolition waste, some industrial wastes (that meet strict acceptance criteria), and contaminated soils.

The landfill footprint itself is proposed to occupy approximately 60 ha of the WMNZ landholdings, within an area referred to as 'Valley 1' – which comprises an existing WNW orientated valley which is incised ~50 m to >100 m below the adjacent ridgelines.

The overall landfill project is proposed to include:

- All works associated with the development of an operating landfill on the identified footprint area including:
  - Earthworks to construct the required shape of the basegrade;
  - Construction of a multi-barrier, low permeability lining system to prevent leachate seepage into the surrounding environment;
  - Construction of a leachate collection system above the low permeability lining system;
  - Stormwater control around the constructed landfill and ultimate treatment of stormwater before it leaves the site;
  - A landfill gas (LFG) collection system to collect LFG from the placed waste;
- A leachate management system, including leachate storage, tanker loading facilities and leachate treatment facilities;
- LFG treatment by a LFG to energy plant, with any excess being flared;
- Provision of water supplies for operational (non-potable) and staff (potable) requirements;

- A bin exchange area near the site entrance, adjacent to SH1, where road vehicles will deposit bins for site vehicles to transport them to the landfill tip face;
- An access road from the site entrance to the main site, and all other roads required to access the various parts of the site;
- Operational infrastructure such as weighbridges and vehicle wheel wash;
- Facilities for site staff, including on-site wastewater disposal;
- Maintenance facilities for site plant and equipment.

WMNZ seeks a 35 year term for its regional consents and permanent land-use consents to reflect the long term nature of a landfill development. The proposed works require consent as a noncomplying activity overall under the Auckland Unitary Plan.

I have undertaken a review of the resource consent application, on behalf of Auckland Council in relation to landfill engineering effects. My qualifications and experience are as follows:

- BE(civil) and ME(civil)) from the University of Canterbury;
- Chartered Professional Engineer;
- Chartered Member Engineering New Zealand;
- Member Association of Groundwater Scientists and Engineers, USA.

I have 45 years of experience in environmental engineering and hydrogeology including consenting for many regional municipal landfills around New Zealand. I have been Chairman of the Redvale Landfill Peer Review Panel since 2000 and a member of the Greenmount Landfill Engineering Review Panel since 2015.

In writing this memo, I have reviewed the following documents:

1. Auckland Regional Landfill, Assessment of Environmental Effects, Prepared for Waste Management NZ Ltd, Prepared by Tonkin & Taylor Ltd, May 2019;
2. Technical Report A – Geotechnical Interpretive Report Auckland Regional Landfill, Prepared for Waste Management NZ Ltd, Prepared by Tonkin & Taylor Ltd, May 2019;
3. Technical Report B – Geotechnical Factual Report Auckland Regional Landfill, Prepared for Waste Management NZ Ltd, Prepared by Tonkin & Taylor Ltd, May 2019;
4. Technical Report E – Hydrogeology Assessment Auckland Regional Landfill, Prepared for Waste Management NZ Ltd, Prepared by Tonkin & Taylor Ltd, May 2019;
5. Technical Report N – Engineering Report Auckland Regional Landfill, Prepared for Waste Management NZ Ltd, Prepared by Tonkin & Taylor Ltd, May 2019;
6. Section 92 Questions, Attachment 1 (dated 28 June 2019, "Dome Valley Landfill – s92 Questions") of Sentinel Planning Letter to Andrea Brabant (Tonkin & Taylor Ltd) dated 18 September 2019;
7. 9 October 2019 Meeting Minutes, Auckland Regional Landfill – Hydrogeology s92 questions, Tonkin & Taylor Ltd version of minutes;
8. 9 October 2019 Meeting Minutes, Auckland Regional Landfill – Hydrogeology s92 questions, Pattle Delamore Partners Ltd version of minutes;
9. Section 92 Response Tranche 1, Letter report, Tonkin & Taylor Ltd, 8 November 2019;
10. Section 92 Response Tranche 2, Letter report, Tonkin & Taylor Ltd, 6 December 2019;
11. Section 92 Response Tranche 3, Letter report, Tonkin & Taylor Ltd, 20 December 2019;
12. Section 92 Response Tranche 5, Letter report, Tonkin & Taylor Ltd, 20 February 2020;
13. Submissions – Online Submission Report – summary of BUN 60339589 submissions, prepared by Auckland Council.

2.0 Consents Requested; Landfill Engineering Related

E33.4.1 (A8) - Use of land for a new industrial or trade activity listed as high risk in Table E33.4.3.	Controlled
E33.4.2(A12) - Discharge of contaminants from an existing or new industrial or trade activity area not listed in Table E33.4.3 where the permitted discharge standards are not met.	Controlled
E7.4.1 (A28) - Diversion of groundwater caused by any excavation (including trench) or tunnel that does not meet the permitted activity standards or is not otherwise listed.	Restricted discretionary
E8.4.1 (A5) Diversion and discharge of stormwater runoff from additional impervious areas greater than 5,000m^2 of road (which include road ancillary areas that are part of a road, motorway or state highway operated by a road controlling authority) or rail corridor that complies with Standard E8.6.1 and Standard E8.6.4.1.	Restricted discretionary
E11.4.1 (A5) Greater than 50,000m^2 where land has a slope less than 10 degrees outside the Sediment Control Protection Area.	Restricted discretionary
E11.4.1 (A8) Land disturbance greater than 2,500m^2 where the land has a slope equal to or greater than 10 degrees.	Restricted discretionary
E12.4.1 (A6) Greater than 2,500m^2 of land disturbance.	Restricted discretionary
E12.4.1 (A10) Greater than 2,500m^3 of land disturbance.	Restricted discretionary
E36.4.1(A37) All other new structures and buildings within the 1% AEP floodplain.	Restricted discretionary
E36.4.1 (A41) Diverting the entry or exit point, piping or reducing the capacity of any part of an overland flow path.	Restricted discretionary
E36.4.1 (A42) Any buildings or other structures, including retaining walls (but excluding permitted fences and walls) located within or over an overland flow path.	Restricted discretionary
E36.4.1 (A56) Infrastructure in overland flow paths not otherwise provided for.	Restricted discretionary
E3.4.1 (A19) Diversion of a river or stream to a new course and associated disturbance and sediment discharge.	Discretionary
E3.4.1 (A33) Culverts or fords more than 30m in length when measured parallel to the direction of water flow outside of an overlay.	Discretionary
E4.4.1(A15) Discharge of water or contaminants (including washwater) onto or into land and/or into water not complying with the relevant standards or not otherwise provided for by a rule in the Plan	Discretionary
E8.4.1 (A10) All other diversion and discharge of stormwater runoff from impervious areas not otherwise provided for.	Discretionary
E14.4.1 (A54) Combustion activity not meeting the permitted, controlled or restricted discretionary standards.	Discretionary
E26.2.3.1 (A63) Other electricity generating facilities.	Discretionary
E3.4.1 (A33) Culverts or fords more than 30 m in length when measured parallel to the direction of water flow within an overlay.	Non-complying
E3.4.1 (A49) New reclamation or drainage, including filling over a piped stream.	Non-complying

3.0 Key Landfill Engineering Issues

After working through all the various aspects of the landfill engineering, ancillary works and closure/aftercare the key issues substantially reduce to matters of competent detailed development and construction of the presented design concepts and undertaking the operations according to best practice. Many design and operational elements that have been used successfully at other regional landfill sites, notably Redvale Landfill, Whitford Landfill and Kate Valley Landfill have been proposed for this site. The list of key issues given below therefore identifies those aspects of the proposed landfill engineering proposals that pose the highest risk for adverse environmental effects.

Landfill Liner

This critical element of the landfill must be designed and constructed carefully as it will be required to be in service as a leachate and gas containment barrier for potentially several hundred years until the leachate strength becomes benign. This issue was identified in the submissions in relation to HDPE liners which are yet to have a proven in-use lifetime beyond the current experience of several decades. The applicant has referenced a technical paper[1] that simulates a life of 500 years plus in a composite liner arrangement (Type 2) where it still retains its containment characteristics. The applicant's assessment of HDPE use for a Flexible Membrane Liner (FML) is that it is current international best practice and is expected to have a life of 400 to 750 years.

The applicant has recognised potential difficulties with liner installation on steep slopes by limiting maximum grades to 1V:2.5H and more generally 1V:3H which allow for conventional construction equipment to be used for basegrade preparation and clay liner installation. Historic landslide features have been identified within and at the edge of the landfill footprint which may need pre-treatment (drainage, undercutting, etc) to stabilise them prior to liner emplacement. This conservative basegrade design/construction approach is critical to achieving the long term performance standards (low leakage rate, liner longevity) that are needed.

Wrinkles in the HDPE that are not smoothed out when the liner is covered are a major potential source of leakage that require careful construction control. Wrinkles are noted in literature to result in leakage rates many times over those from other defects. The applicant has estimated the leakage rate from poor construction with wrinkles would result in leakage up 108 m^3/yr, compared to their base case of 3 m^3/yr, and has modelled the equivalent to 3,000 m^3/d as an uncertainty scenario in the Hydrogeological Assessment. However, I and the hydrogeological reviewer, hold reservations about the validity of the modelling to cover all the potential water quality and flow effects (covered by Aslan Perwick).

However overall, this reviewer considers that the liner system chosen is robust and contains significant redundancy, being a multi-barrier approach. Even if the HDPE has defects and/or degrades during the period it is required to contain contaminants (potentially several hundred years), the underlying GCL (if that design is chosen) and /or the underlying clay liner have an indefinite life being natural mineral materials, and a significant capacity to absorb movement without rupture. There are documented cases of landfills in the US performing very well through earthquakes[2]. Therefore, the risk of escape of significant quantities of leachate through the liner, ie sufficient to cause environmental damage, is very low. The small residual risk can be adequately covered by monitoring of the surrounding groundwater and clean-up contingency plans (included in draft condition covering the LMCP, Condition 240 (last bullet)).

[1] Ewais, A. M. R., Rowe, R. K., Rimal, S. and Sangam, H. P. (2018). 17-year elevated temperature study of HDPE geomembrane longevity in air, water and leachate. Geosynthetics International, 25, No. 5, 525–544. [https://doi.org/10.1680/jgein.18.00016]

[2] Golder Associates, 2016. Potential Effects Of Earthquake Shaking On The Proposed CRRRC Landfill, Memo for Ministry of Environment and Climate Change, Canada

Many springs/seeps have been identified in the landfill valley which the applicant proposes to drain prior to liner emplacement. Following waste emplacement on the liner the applicant will consider whether to block off the drains and let groundwater pressures build up on the outside of the liner (which it is claimed will not be to the extent that there is a risk to liner integrity) or keep them flowing as a leachate detection opportunity. This reviewer prefers the latter option and recommends that it be included in a consent condition.

Leachate Head on Liner

The liner design and leachate leakage assessment are based on a maximum leachate head of 300 mm. The basegrade geometry and the leachate collection system design has been, in the main, set to meet this limit. However, the proposed minimum "target" grade on the floor and benches of the landfill of 2% and 1.5% for any leachate pipe, provides a risk for significant leachate ponding behind any blockages that develop. This matter was raised in a s92 question to the applicant who responded that there are several mitigating factors available such as: flushing out any blocked drains for up to 200m from the ends of the pipes, provision of redundancy by design with oversized and additional leachate collection pipes on the floor, the ability to divert leachate flows from the side walls along benches to the outside edge of the fill for collection, etc.

However, it is clear that not all risk of blockage can be removed with the current design. The most vulnerable area is the eastern floor area where the floor is up to 150m wide and 500m long at a grade of 2% to the west under the thickest part of the fill (up to 90m) at completion. Further mitigation could be provided at the final design stage by steepening the grade in this area and/or providing further leachate conveyance piping depending on the outcome of hydraulic modelling of potential blockages. This matter is provided for in Condition 111 that requires design for a maximum leachate head to 300 mm.

Leachate that collects in the outlet sump at the western toe of the landfill is proposed to be pumped to storage tanks at higher elevation. While this setup provides flexibility for locating leachate storage at easy to manage locations near the access road (as opposed limited options with a gravity collection sump), it allows for leachate levels to build up in the fill should that be deemed desirable from an operational perspective. Restrictions need to be placed on the use of this practice so as to avoid excess head on the liner for long periods. I recommend that a **consent condition** should be applied to address this issue such that this practice is limited to unforeseen operational situations for a maximum period and duration.

Capacity of the Leachate Collection, Treatment and Disposal System

The application Engineering Report discuss 7 onsite and off-site options for the treatment and disposal of leachate generated in the landfill. It recognises that leachate production is variable due to rainfall but omits to mention that there are also operational factors that can contribute. These include management of stormwater during new cell commissioning and management of cover during the transition between stages. There are also contingency situations that may develop with large rainfall events, off-site disposal and construction/operation upsets. Given the risks to the local environment if the leachate system is overwhelmed, this reviewer considers it appropriate that minimum standards are set for onsite buffer capacity and backup disposal options (along the lines of those provided for the lining system in Conditions 108 – 114).

Stormwater Management During Staging

During the early refuse placement stages the management of stormwater upstream of the refuse is proposed to occur by two stormwater pipes; one passing beneath the liner to carry the full up-valley stormwater flows and one above the liner to carry runoff from new liner construction areas. This solution presents a risk of washout of the completed downstream landfill stages, other ancillary facilities and downstream natural assets should the pipes have insufficient capacity, become blocked or are unable to access and freely discharge the stormwater flows.

In a s92 response the applicant has indicated the pipes will be operational for only a short period (6 years) and will be designed to manage 1% AEP flows. The main risk identified is blockage by logs at the inlet to the pipes which will require regular clearance. Several contingency measures are proposed to manage blockages and overtopping of the pond upstream of the pipe inlets but ultimately if all this fails stormwater will enter the waste at the upstream end. The applicant considers such an outcome would not present a risk of washout of the waste as the route through the waste will have a 600m long path length to the downstream side, sufficient to attenuate any flow that enters the waste. The assessment is accepted by this reviewer and notes that similar arrangements are used for other landfills where a "bottom up" fill staging regime is used, such as at Happy Valley Landfill in Wellington and currently at Redvale Landfill. Overall, this reviewer is satisfied that the risk can be managed appropriately.

Landfill Gas and Odour

Odour is generally a key environmental risk for municipal refuse landfills even where they are sited in remote settings as odour effects from waste can have impacts on neighbours for several km from the landfill. With the proposed waste load handling regime of reception at the site in the bin transfer area followed by transfer to the landfill tip face by separate vehicles, increased opportunity for generation and release of odour to the atmosphere arises as opposed to a site where waste is transported directly to the tip face. This is due to the increased time the waste takes to transit through the site before being deposited at the tip face. This is an operational matter that needs to be carefully managed so as to provide capacity redundancy in the bin transfer area and in the transport of the bins to the tip face, especially at peak times of waste acceptance. Such matters are covered in the draft Landfill Management Plan (LMP, Vol3, s3,4).

From an engineering point of view, management of landfill gas and odour at the landfill is proposed to be achieved by the use of standard elements including a gas collection well network in the waste, pin wells (or targeted well points in problem areas), collection mains, blowers and flares and an energy plant at a later stage. In addition, the base liner, intermediate and final cover are designed to contain the gas within the waste so that it can be collected. Provided the detailed design of all the elements meets best practice, the risk of gas/odour release reduce to the rigor of execution of operational processes as managed through the LMP.

Overall, this reviewer is satisfied that the proposed engineering provisions for the management of landfill gas are appropriate to minimise the risks to the environment from gas and odour escape.

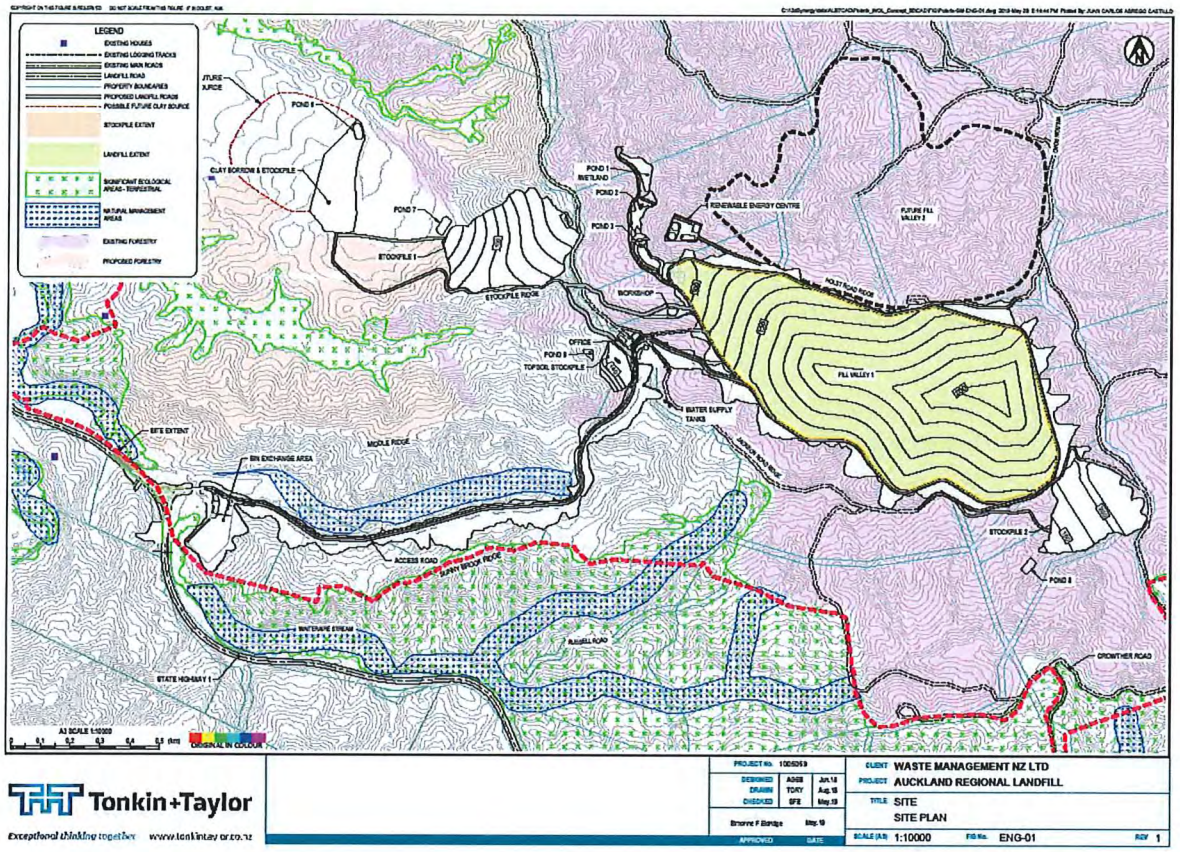
4.0 Applicant's Assessment

Landfill Location

Within the 1020 ha of land owned by WMZ, there are two valleys capable of providing the target airspace volume: Valley 1, the southernmost valley of the Eastern Block and Valley 2, the northernmost valley (Figure Eng01). Valley 1 was selected for landfill development predominantly because it is more accessible by likely access routes to the site. The **footprint** was selected to maximise the fill potential of Valley 1 with an estimated airspace volume of approximately 25.8 Mm^3. The key considerations in determining the footprint were:

- The downstream extent was determined to allow sufficient area downstream of the landfill for long term stormwater treatment facilities, leachate handling and other operational requirements within Valley 1 prior to the confluence with the watercourse from Valley 2;
- The perimeter of the landfill was determined to allow for a perimeter road with drainage at approximately a minimum 2 % grade to the mouth of the valley;

- The north and south perimeters were determined to fit closely to the existing contours, with practical "straightening" of the perimeter to facilitate access along the perimeter road and facilitate liner construction;
- The eastern extent of the landfill determined to practically fit within the existing landform, while considering a practical final fill profile for the landfill.



Geology

The proposed landfill footprint and access road alignment are underlain by Pakiri Formation bedrock consisting of interbedded sedimentary sandstone and siltstone with some conglomeritic layers. The bedrock is overlain by a variable thickness of residual, colluvial and landslide soil. The site soils generally consist of silts and clays with fine sand of variable strength and plasticity.

Basegrade Geometry

The **basegrade geometry** was developed to account for construction limitations and materials balance for the relatively narrow, steep sides of Valley 1. Natural slopes along the northern side are typically 1V:2.5H while slopes along the southern side are shallower, typically 1V:3H to 1V:4H, with some locally steeper areas on both sides. Soil required landfill construction and operation over its lifetime was estimated to be approximately 5 Mm^3 with the basegrade geometry selected to provide an excess cut over fill.

In addition, the geometry was developed to:

- Achieve a minimum slope of 2 % anywhere within the footprint to facilitate leachate flow to the leachate collection pipe system;
- Limit slopes to 1V:3H to facilitate construction and installation of both clay and the geosynthetic liner components.

Excavation for the basegrade is expected to be mainly in weathered soils but some blasting at depths below 10m may be needed. The extent of geotechnical investigations within the proposed footprint area is limited due to access limitations associated with the relatively steep terrain and the site being heavily forested.

The actual form of the basegrades may be modified during detailed design based on more detailed geotechnical information available at that time. A toe bund will be constructed at the base of the landfill in the order of 10 m height. This allows for containment of leachate at the toe, stability of the landfill and provides a practical starting point for filling from the toe of the landfill.

The perimeter road, in combination with other access roads, will provide access for landfilling operations at some locations. Therefore, these portions of road need to be at a grade suitable for refuse vehicle traffic, typically not steeper than 1V:10H.

Fill Profile

The final **fill profile** has been designed to maximise filling within Valley 1 and in accordance with the following parameters:

- The maximum overall slope after settlement will be 1V:5H, selected for overall stability of the landfill and to minimise potential erosion of the cap surface by overland flow;
- The minimum slope at any point of the landfill will be 1V:20H (5 %), selected to provide for stormwater runoff without ponding, even if some differential settlement has occurred;
- Contour drains will be installed on the finished cap surface to divert stormwater to the landfill perimeter drains;
- The final lifts of waste will be placed above the proposed final contour levels to allow the surface to settle to approximately the levels shown.

Fill Staging

Staging of the landfill phases may occur either starting operations from the bottom of the valley and working up or starting at the top of the valley and progressively forming cells down the valley. With a top down approach the loss of stream habitat could potentially be managed to be progressive over time, rather than immediate.

Both approaches have operational challenges for **managing stormwater and leachate**, respectively. The overall footprint of the landfill and therefore the footprint of stream reclamation within Valley 1 would not change under either approach. Under both scenarios the main stormwater treatment ponds would be constructed in the early stages of the initial construction and site establishment, sized for treatment of the entire Valley and will form part of the permanent infrastructure for the site. The ponds will be online, due to the limited area available at the base of the Valley.

Once constructed, the ponds would form a barrier to fish passage and the upstream migration of fish would be disrupted. Fish passage would not be provided through the stormwater ponds as the upstream environment will be covered by landfill development. As such, removal of fish would need to occur prior to construction of the stormwater ponds under both scenarios.

The applicant favours a combination of the two approaches for Auckland Regional Landfill. The phasing has been designed to provide significant capacity in the stormwater treatment system in the early stages of the landfill operation, with the proposed stormwater pond design providing in excess of the volumes typically required by good practice. This additional capacity will be provided on the lower landfill footprint, requiring that the first phase of development be upstream from the final landfill toe, working "bottom up" from that point with the final phase of development following a "top down" approach.

Groundwater Drainage

It is expected that there will be a number of **springs and groundwater seepages** exposed within the valley when excavation to basegrade levels has been completed. Springs/seepages remaining beneath a lining system can result in uplift pressures and cause a local failure of the lining system, and therefore they must be controlled and drained away.

To control groundwater beneath the landfill a network of subsoil drains will be constructed beneath the lining system to be available to drain groundwater seepage under all stages of the landfill development. However, 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, i.e. when sufficient waste fill has been placed within each filling Phase such that uplift pressures are no longer of concern.

Landfill Liner

The proposed **liner system** used will be in accordance with the WasteMINZ "Technical Guidelines for Disposal to Land" using either a Type 1 or Type 2 lining system which are considered to be equivalent to each other in terms of leachate containment ability. The systems are based on a multibarrier approach incorporating a 1.5mm HDPE geomembrane underlain by either a geosynthetic clay liner or the equivalent thickness (in terms of seepage resistance) of low permeability compacted clay. In addition, where fractured rock is encountered in the subgrade, it will be sub-excavated by 2m and backfilled with compacted soil to provide an additional attenuation layer.

Where there are insufficient liner soils available within the footprint of a phase, suitable soils will be excavated from borrow areas on other parts of the site:

- The base of Stockpile 1;
- The area of Northland Allochthon on the neighbouring Western Block;
- The hillsides of the Western block around where excavation is required for road construction;
- Elsewhere on site where earthworks are required.

Leachate Collection

The **leachate collection** system will comprise:

- All landfill/lining system surfaces having a grade of not less than 2 %;
- A high permeability aggregate layer on the floor areas of the landfill;
- A leachate drainage layer/liner protection layer on the side slopes;
- A primary leachate collection drain at the centre of the floor;
- Leachate collection drains at the toe of all slopes, on the benches and on the floor;
- Secondary leachate pipes on floor areas (if required) to minimise hydraulic head over the liner;
- A design leachate head on the liner less than 300 mm.

Landfill Cap

WMNZ has a preference for the **final capping** layer to be approximately 2 m thick, to provide an effective barrier and to provide adequate thickness for a range of plantings on the final cap surface.

From top to bottom the cap will comprise:

- 100 to 150 mm topsoil;
- 450 to 900 mm subsoil/growth layer;

- 800 mm low permeability compacted soil 'barrier' layer ($k < 1 \times 10^{-7}$ m/s);
- 150 to 600 mm intermediate and/or daily cover soil.

The soils for construction of the final capping system will generally be soils obtained from excavation within the landfill footprint, stockpiled for later use.

Landfill Gas

The proposed **landfill gas** (LFG) management system will generally incorporate the following:

- A LFG collection system comprising a network of collection wells and pipework;
- A destruction system using flaring or electricity generation;
- Monitoring to confirm the effectiveness of the system, including LFG monitoring boreholes/wells outside the waste boundary (footprint) and regular surface methane emission monitoring on capped areas.

Leachate Management

The following approach to **leachate management** is proposed at the Auckland Regional Landfill:

- Leachate collected from the landfill will be pumped directly to a balancing tank at higher elevations around the landfill;
- During the early stages of operation the balancing/holding tanks will transfer to off-site disposal (either the Auckland Sewerage system, the existing Redvale leachate evaporator or other suitable option);
- Some leachate will be recirculated to the landfill to minimise off-site disposal;
- Once sufficient LFG is available a new evaporator or new technology will be installed on site;
- The flare and LFG to energy plant and evaporator will be located at the western end of the ridge to the north of the site.

Ancillary Works

Support activities to the landfill include a bin exchange area, an access road to the landfill, other roads, water supply, onsite wastewater treatment and disposal, site offices, workshop, and renewable energy centre.

The **main access** to the site will be from SH1 through the valley of the Southern Block, then crossing the ridge into the landfill located in the Eastern Block. The length of the access road is just under 2 km. The road has been located along the more gently sloping southern side of the valley, avoiding the identified Significant Ecological Area (SEA) at the western end and the identified Natural Stream Management Area (NSMA) through the base of the valley. Towards the eastern end of the valley the road crosses the stream over a 1200 mm culvert to rise to the ridge on the southern side of the valley to enter the landfill valley at approximately RL 140 m. The road bridges over the Waiteraire Stream near the entrance to the site.

The road will be a two-way road, with 3.6 m width lanes and with a sealed surface. This provides for safety and efficiency of access for all vehicles on this primary access route onto the landfill site. The design objective is for the grade not to exceed 8 % to be suitable for hauling full waste vehicles uphill.

Landfill Construction and Operation

Initial construction activities will include:

- Construction of permanent site stormwater controls downstream of the landfill and any other stormwater controls required for initial earthworks (e.g. at stockpile areas);
- Establishment of the site entrance and any works on SH1;

- Construction of the bin exchange area;
- Construction of the main site access road through the Southern Block;
- Site access roading to the first stage for landfilling and to all stockpile areas;
- Construction of the main site office area and workshop facilities;
- Formation of basegrades for Phase 1 of the landfill, construction of the toe bund, low permeability liner system and leachate collection system.

Operational activities include:

- Waste filling;
- Winning and placement of daily cover and intermediate cover as required. This may also;
- Include stockpiling soils close to where they may be required;
- Stormwater management and maintenance works;
- Construction of the next landfill phase and other required construction work.

Closure activities include placing the final capping layer on completion, establishing any final landscaping and removing any facilities and infrastructure that is not required during the aftercare period, or modifying such infrastructure for the aftercare period.

Aftercare activities include maintenance of the cap and stormwater systems, management and maintenance of the leachate and LFG systems and ongoing site and environmental monitoring.

5.0 Submissions

Nearly 800 submissions have been received in response to the application. I have reviewed specific applications with 'substantive' submissions relating to groundwater issues, as well as reviewing the submission summaries compiled by AC.

There are numerous submissions which raise groundwater related issues. The submissions have covered a series of general themes, which are outlined below:

- Climate change, high rainfall, more floods - concerns generally relate to capacity and resilience of engineering features for large storms and floods;
- Design and construction - engineering standards, earthworks, excavation - concerns relate to resilience and longevity of engineered features including liner;
- Landfill Operation - leachate, gas (fire), dust management, sediment, daily cover (especially given the nature of the local sticky clays) - concerns relate to containment leachate, gas, sediment and associated risks. Fire concerns are related to methane rather than fire within the landfill which is controlled through design of gas collection components;
- Landfill liner - longevity, robustness – concerns that the proposed HDPE liner will degrade and become ineffective before the leachate strength has decayed to a level where it is not a risk to the environment;
- Engineering site suitability - land stability, wetlands – concerns about the ability to design and construct the landfill to overcome risks of land stability and soft ground materials within low lying wetlands areas;
- Conformance with the AUP, RMA and other Acts, NPSFM or industry standards.

The submitters comments are fairly general about engineering components and relate to the effects that may ensue should the engineering elements be inadequate to deal with the local site conditions and of insufficient resilience to extend through the life of the landfill and aftercare period.

I wish to comment on submission 9544 that covers concerns about the longevity of the landfill liner and references a peer reviewed scientific paper[3] that examines the risk of landfill liner failure. The submitter quotes from the paper *"However, many researches have found that the lining system (of landfills) has limited (10 - 30 years) duration "*. Unfortunately, the paper author does not provide any references to support the statement, which makes it difficult to evaluate its context and applicability, if any, to the ARL situation. The paper goes on the discuss an assessment of liner failure probability for 30 sites in Northern Italy based on assumed failure of one or more of the liner components eg leachate collection system, mineral liner and synthetic liner. Other than summary information of the liner makeup for the respective landfills, no field evidence is provided to show that the liners in the landfills have actually failed, and the paper appears to discuss a theoretical assessment of the liner longevity should that happen. For this reason, I don't consider the paper adds anything new to the applicant's evaluation of the potential longevity of the liner proposed for the ARL.

Overall, it is my opinion that the issues raised by the submitters are dealt with by the applicant in the application and/or the post application requests for further information.

6.0 Assessment of Landfill Engineering Effects

The potential environmental effects that relate to landfill engineering and operation revolve around the management of potential discharges from the landfill. As I noted in Section 3 this mainly comes down to competent detailed development and construction of the presented design concepts and undertaking the operations according to best practice. The Peer Review Panel should play a key role in providing independent oversight and certification of the design, construction, operation and monitoring activities and challenging the operator to maintain the standards necessary to achieve the objectives of consents.

Comments on each of the discharge types follow.

Leachate: With a competent, well run operation I expect that the effects of leachate on the environment will be minimal. The containment systems used in modern landfills have evolved considerably over the last 25 years, based around a multi-barrier approach to provide several points in the escape pathway for detection and then mitigation/remediation of any release from the landfill. Releases, if they occur are usually small (eg leachate breakouts from the cap) and are readily captured within the barrier chain well before entering the environment outside the site. From my reading of the application documents, it is clear the multi-barrier approach is incorporated in the containment/detection systems proposed for the ARL.

The main points of potential leachate escape are discussed below with recommendations for regulatory control as appropriate.

[3] Alberto Pivato, 2011. Landfill Liner Failure: An Open Question for Landfill Risk Analysis *Journal of Environmental Protection*, 2011, 2, 287-297 doi:10.4236/jep.2011.23032 Published Online May 2011 (http://www.scirp.org/journal/jep) Copyright © 2011 SciRes. *JEP* 287

Location	Risk Event	Preventative Response	Regulatory Control
Base Liner/sumps/leachate collection drains	Leakage	Minimum design, maximum head in sumps, groundwater monitoring	Condition, GWMCP, LMCP, PRP
		Construction standard	Condition, Specification, CEMP, PRP
Landfill cap, Intermediate cover, Daily cover	Breakout	Cap/Cover design, regular inspection, remedial works, surface water monitoring	Condition, Specification, CMP, LMCP, SEMP, PRP
Leachate handling facilities	Spill	Facilities design, containment bunds	Condition, Specification, ITAEMP, SEMP, LMCP, PRP

GWMCP: Groundwater Monitoring and Contingency Plan

CMP: Cover Management Plan

ITAEMP: Industrial and Trade Activities Environmental Management Plan

LMCP: Leachate Monitoring and Contingency Plan

CEMP: Construction Environmental Management Plan

SEMP: Site Emergency Management Plan

Landfill Stormwater/Sediment: The key to managing stormwater quality within the landfill catchment during operation of the landfill is to maintain separation between leachate and fresh stormwater. There is also an imperative to minimise leachate volumes and hence disposal needs by keeping as much stormwater in an uncontaminated state as possible.

The "bottom-up" staging approach adopted by the applicant requires routing of clean stormwater flows underneath and around refuse during the first 3 stages of the operation, ie for the first 8 years. Thereafter, conventional lower risk, gravity routing of stormwater above the refuse is possible. While the risk of washout can be managed, there is increased risk during these early stages of generating large volumes of contaminated stormwater due to overflow into the leachate collection systems. This could place pressure on the leachate collection and disposal operations which are indicated by the applicant to have limited storage, depending on the storage scenario selected for final design. However, as indicated in Section 3, I consider mitigation of this risk can be readily incorporated into design of the leachate management system. To this end I agree with the Risk Management Assessment in the application documents that rates this event as a major risk unmitigated but reduced to a moderate risk (ie potential harm to a receptor is possible but severe harm is very unlikely) with suitable mitigation processes in place.

In the event that uncontrolled leachate escape occurs from the leachate collection sump below Stage 1 it will enter the permanent stormwater ponds by gravity. The applicant has indicated that should this happen the ponds would be closed for discharge and the contaminated water pumped out for disposal back into the landfill or for disposal via the leachate management system. Steps required to manage this risk will need to be detailed in the Site Emergency Management Plan and the Leachate Monitoring and Contingency Plan.

Sediment control relies on minimising the area of bare earthworks by mulching and grassing, reducing runoff velocities or using water course armouring where not possible and using interim and permanent sediment ponds prior to entry to the main stormwater ponds. With all the measures in place and operating properly the applicant estimates the sediment yield from the site will be less than the current land use.

Location	Risk Event	Preventative Response	Regulatory Control
Phase 3 clean stormwater pond, temporary sediment ponds	Overflow	Design standard, Maintenance	Specification, SWMCP, SEMP, PRP
		Construction standard	Specification, PRP
SWMCP: Stormwater Monitoring and Contingency Plan CEMP: Construction Environmental Management Plan SEMP: Site Emergency Management Plan			

Landfill Gas/Odour: The landfill gas management system proposed for the waste includes a network of full depth gas collection wells, connecting pipework, a gas destruction/energy generation system and a monitoring plan to detect points/areas of gas escape from the landfill. Generally, gas/odour discharge is likely to occur through operational issues as design and construction of gas collection/disposal systems have well proven methodologies/standards to achieve reliable control of landfill gas. The main sources of gas/odour release include:

- Odourous loads transiting through the bin exchange area and then tipped at the working face;
- Releases of gas through the landfill cover in areas where cracks have developed or the cover is thin;
- Releases of gas from areas at the edge of cells where the waste is too thin to install full wells;
- Inadequate management of the working face to ensure refuse is not left exposed for long periods of time;
- Inadequate operation of downwind odour control equipment such as sprays and blowers.

These activities need to be controlled through the operational plans that set out procedures and standards expected for these activities.

Location	Risk Event	Preventative Response	Regulatory Control
Working Face	Odourous waste,	Waste acceptance, working face management, landfill cover, odour mitigation	Condition, WAP, WFDP, OMP, LGMP, PRP
Landfill cover	Gas leakage	Cap/Cover design, regular inspection, remedial works, gas monitoring	Condition, CMP, LGMP, PRP, SEMP, PRP
Bin exchange area	Odour Leakage	Waste acceptance, regular inspection	WAP, BEMP, OMP, PRP
WAP: Waste Acceptance Procedures			

BEMP: Bin Exchange Management Plan

WFDP: Working Face Disposal Plan

CMP: Cover Management Plan

OMP: Odour Management Plan

LGMP: Landfill Gas Management Plan

SEMP: Site Emergency Management Plan

7.0 Conclusions and Recommendations

The concepts and draft plans contained within the Landfill Engineering supporting information for the ARL are, in the opinion of this reviewer, in general accordance with current industry best practice. On the basis of the information supplied the landfill can be expected to perform and manage environmental risks to the high standards of modern landfills. The high-risk elements such as the liner, leachate control and management, stormwater control and landfill gas control all have redundant/backup components that are there to contain and/or control releases of contaminants to the environment outside the site.

While the landfill is required to have components in place that need to be protective of the environment for the period of operation and aftercare, which may be several hundred years, the current industry expectation is that this is achievable. The base liner, in particular will need to perform well over this duration since there will be little opportunity for any future remedial action once it is covered by up to 90m of refuse. The design selected (either Type 1 or Type 2), meets current international best practice which acknowledges this expectation.

Associated with the containment systems is management of the waste pile to undergo the biochemical processes of waste stabilisation as quickly as possible so as to limit the long-term risks to the environment to as short a period as possible. The cap design selected allows for maintenance of conditions (moisture, temperature, etc) within the fill to facilitate this outcome.

Recommendations from this review are to include conditions to cover the following:

1. Broaden the proposed brief for the Peer Review Panel to be consistent with other landfills in NZ (eg Redvale, Kate Valley) so as to provide an independent oversight of the landfill development and operation. The interaction of the various elements of a landfill are complex and inter-related which requires that oversight to be across all of the various parts of the operation to be effective. The draft conditions currently limit the role of the PRP oversight of the liner only.
2. Set a limit to control the maximum depth of leachate accumulation in the landfill. The Phase 1 and Phase 7 leachate sumps should have a maximum allowable level of leachate in them no more than 0.3m above the level of the adjacent liner as that is the basis for the liner leakage assessment. Provision could be made for emergency situations where leachate heads of up to say, 2m could be tolerated over a short term while remedial actions are carried out. The specifics of what would be reasonable for this would need to be worked through with the applicant, taking account of the scenarios that need to be covered.
3. Provide minimum requirements for back-up, buffer capacity and alternative disposal of leachate to ensure that the maximum leachate head on the liner is not exceeded and that elements in the train of leachate collection and disposal have sufficient capacity and back-up to manage variability in leachate generation and contingency situations.

4. Require continuous monitoring of the subsoil drainage system discharge to check for changes in water quality. This system is ideally suited to pick up any leakage through the liner and would provide confidence that the liner is performing as expected to contain leachate. This requirement would be added to draft Condition 240 (n)

8.0 Limitation

This memorandum has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by the applicant Waste Mangement NZ Ltd, and others (not directly contracted by PDP for the work), including Auckland Council. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the memorandum. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

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

Prepared by

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memo

Date: 17 September 2020

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From: Peter Kensington, Consultant Specialist – Landscape Architect (KPLC Limited)
For: Auckland Design Office, Design Review Unit

Re: BUN60339589 (DIS60339670 / LUC60339671 / LUS60339672 / WAT60339673)

An application by Waste Management New Zealand Limited for resource consents (various) for the construction and operation of a new regional landfill facility at 1232 State Highway 1, Wayby Valley, as a non-complying activity overall, under the Auckland Unitary Plan (Operative in part) ('**AUP(OP)**').

Technical review - assessment of landscape and visual effects

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Dear Mark

Introduction, background and terms of reference

1. Following my review of the information within the above application and in response to the relevant submissions that have been made on the publicly notified application, this memo provides my technical review comments, in response to your original request for specialist input brief dated 10 June 2019.

2. I am generally familiar with the Wayby Valley area and, for the purpose of reviewing this application, I visited the site, alongside other Auckland Council ('**council**') and applicant representatives, on 7 March 2019 as part of pre-application discussions. As part of that site visit, I also visited representative public viewpoints that would be utilised by the applicant to inform their assessment of landscape and visual effects. On 8 July 2020, I visited the applicant's current operations at Redvale Landfill at Dairy Flat, in order to better understand the current operations and the proposal's likely landscape and visual effects. I also visited the Redvale Landfill operations on 31 July 2020 between 6.00-7.00am during the hours of darkness. More recently, on 11 September 2020, I visited the site and surrounding area again, alongside applicant representatives – including viewing during the hours of darkness that evening.

3. I am also preparing a separate assessment of landscape and visual effects technical review memo in relation to the request by the applicant for a private plan change to the AUP(OP), which is seeking a new precinct to provide for the Auckland Regional Landfill at Wayby Valley ('**Proposed PPC 42**').

4. I have reviewed the following relevant application material (as publicly notified):

- *'Auckland Regional Landfill, Assessment of Environmental Effects'*, prepared by Tonkin & Taylor, version 1.0, dated 30 May 2019 ('**Application AEE**') with associated: 'Volume 1' Appendices A-G; 'Volume 3' Drawings; and 'Volume 2' Technical Reports A-T, including in particular:
  - Appendix F – Assessment of AUP(OP) objectives and policies, dated May 2019;
  - Technical Report H – *'Auckland Regional Landfill, Landscape and Visual Assessment'*, prepared by Boffa Miskell, dated 24 May 2019, Revision/Version 8 ('**Application ALVE**'); and
  - Technical Report Q – *'Auckland Regional Landfill, Landfill Management Plan – draft table of contents'*, no author acknowledged and undated.
- *'Auckland Regional Landfill, Compiled further information response'*, prepared by Tonkin & Taylor, version 1, dated 6 March 2020, with associated appendices, including in particular:
  - Appendix T – *'Draft Auckland Regional Landfill Management Plan'* ('**Draft LMP**'), including in particular: Volume 2, dated February 2020, Section 8 *'Landscape and visual amenity'*; noting reference to *'Landscape Mitigation and Restoration Plan'* and Section *'Post-Closure Management Plan'*, at Volume 3, dated 30 January 2020, Sections 3.71-3.73; and
  - Appendix U – *'Draft Ecological Management Plan, Auckland Regional Landfill'*, prepared by Tonkin & Taylor, version 2, dated 21 January 2020, including in particular:
    - Figure 13 – Freshwater Offset and Compensation Package (Rev 4); and
    - Figure 14 – Forest and Wetland Compensation Package (Rev 4).

5. I have also reviewed draft versions of various additional application information, including suggested consent conditions and additional analysis drawings, final versions of which I understand will be included as part of the applicant's expert evidence which is to be pre-circulated prior to the application hearing.

6. I am aware of the relevant statutory provisions which apply for the proposed activity, which is located within the Rural – Rural Production zone under the AUP(OP), with various designations, controls and overlays applying to the site. Of relevance, the site contains part of a wider natural heritage Outstanding Natural Landscapes Overlay ('**ONL**'), being Area 32 (Dome Forest); however, no part of the proposal is located within this part of the site, effectively avoiding the ONL. Also of relevance, but located outside the site, the AUP(OP) identifies part of the Hōteo River as an Outstanding Natural Feature ('**ONF**'). The Application ALVE (at Appendix 5) outlines relevant extracts from the AUP(OP) for these ONL and ONF.

7. I have relied on reviewing Appendix F of the Application AEE, which lists the relevant AUP(OP) statutory provisions, to ascertain all relevant objectives and policies which relate to an assessment of landscape and visual effects of the proposal when considered under the Resource Management Act 1991 ('**RMA**'). While I am aware of the objectives and policies proposed under Proposed PPC 42, I have not considered these in my assessment, because it is my understanding that these currently have no legal effect.

8. For the record, following my preliminary review of the application as originally lodged, for the purposes of the council's procedural steps under sections 88 and 91 of the RMA, my email to you dated 28 June 2019 confirmed that, in my opinion, the application at that time contained sufficient information. My preliminary advice confirmed that the Application ALVE was comprehensive and contained an adequate amount of information to allow for an understanding of the proposal's likely landscape and visual effects.

9. Having said this, my preliminary advice also noted:

> *"One important item of information which I was expecting to be included within the application material is in relation to the proposed Landscape Mitigation and Management Plan (LMMP). This will be a critical document that contains key information and direction*

over ongoing landscape management (implementation / maintenance / establishment), the mitigation of adverse landscape and visual effects and realising any positive landscape effects. The LMMP will work alongside a suite of other related management plans, including in relation to ecological management and compensation (off-set mitigation).

In this regard, I note that a draft table of contents for the wider Landfill Management Plan has been provided within Technical Report Q of the application AEE. In addition, the applicant's proposed conditions of consent, within Appendix G of the application AEE, also provide an indication of the suite of related management plans and their anticipated objectives.

From my experience with other applications that involve a reliance on management plans to assist with the mitigation of more than minor adverse effects, further detail is required on the content of these documents prior to consent being granted. I can appreciate that for this application, there are a number of unknowns in terms of design detail and construction, however I would have thought that at least a draft framework for each management plan could be prepared now.

Having said the above, I don't suggest that the lack of this detail on the LMMP should hold up notification of the application, but that the council should flag this issue with the applicant early, so that it can be addressed prior to the matter proceeding to a hearing."

10. It is my understanding that the applicant has prepared further application information, including a draft Ecological and Landscape Enhancement and Restoration Plan ('**ELERP**') to form a component part of the applicant's wider proposed draft Landfill Management Plan. I have reviewed a draft version of the ELERP and understand that this document will be included as part of the applicant's expert evidence.

Application review comments

General

11. The Application ALVE is a comprehensive document, which includes helpful GIS mapping (Appendix 3: Graphic Supplement – Part A) to understand the proposal and to inform the assessment.

12. I agree with Application ALVE assessment methodology (Section 2.0 and Appendix 1) and I adopt the seven-point scale of effects (paragraph 2.26 and Appendix 1, Table 4) for my technical review.

13. I also agree with identification of the *"main elements of the project that could give rise to landscape and visual effects"* [1] and the Application ALVE description of the relevant aspects of the proposed operations (Section 6.0); including in relation to: site establishment and initial construction works; ongoing operational and phase development activities; and post-closure and aftercare activities.

14. Finally, I confirm that I concur with the description of the site location, context and character (Section 3.0) and of the site's landscape resources and character (Section 4.0) within the Application ALVE.

Visibility

15. I concur with the identification of the proposal's *'Visual Catchment and Viewing Audiences'* within the Application ALVE (Section 7.0 and Appendix 3: Graphic Supplement – Part A), including through the use of Zone of Theoretical Visibility Geographic Information Mapping analysis. This mapping clearly illustrates the likely extent of visibility for the proposed: fill valley (Figure 9); stockpile areas (Figure 10)[2]; access road (Figure 11); office, workshop and energy centre buildings (Figure 12); and bin exchange area (Figure 13).

[1] Application ALVE paragraph 2.32.

[2] Noting that Stockpile 2 no longer forms part of the application and that Stockpile 1 has now changed in extent (same location).

16. The representative viewpoints within the Application ALVE (Table 3, page 22 and Appendix 3; Graphic Supplement – Part A, Figure 16 – location plan) with associated *'site context'* viewpoint photographs are clear and capture a range of existing views towards the site from publicly accessible locations.

17. The visual simulations of the proposal, from seven of these representative viewpoints, are then very useful in gaining an understanding of the likely extent of visible change in the landscape over time (refer Application ALVE Appendix 4, Graphic Supplement – Part B – visual simulations). In particular, the careful analysis and presentation of proposed planting on site and within the wider landscape, associated with production forestry management (harvesting and replanting activity), is particularly relevant.

18. In my review, I found that Figures V25-V28 were particularly helpful to understand the likely extent and form of visible landscape change associated with the proposal and ongoing forestry activity.

Landscape effects

19. Section 8.0 of the Application ALVE provides a thorough assessment of the proposal's landscape effects, considered in relation to each stage of the project lifecycle for defined portions of the site. The findings of this assessment are summarised in Table 4 (page 31) of the Application ALVE.

Table 4: Summary of Landscape Effects

Landscape (Resource / Character / Value)	Level of Effects (Adverse, unless stated otherwise)		Post Closure
	Site Establishment	Ongoing Operation	
LANDSCAPE RESOURCE			
TOPOGRAPHY			
Eastern Block	Low	Moderate-Low	Moderate-Low
Southern Block –Main Access Road	Moderate	Moderate	Moderate
Southern Block – SH1 & Bin exchange. Area	Low	Low	Low
Western Block	Low	Very Low	Very Low
Waiteraire Tributary Block	No Effects	Low	Low
VEGETATION			
Eastern Block	Low	Low*	Low*
Southern Block	Low	Low	Low
Western Block	Low	Low	Low
Waiteraire Tributary Block	No Effects	Very Low	Very Low
STREAMS AND WETLANDS			
Eastern Block	Moderate	Moderate	Moderate
Southern Block	Moderate-Low	Moderate-Low	Moderate-Low
Western Block	Low	Low	Low
Waiteraire Tributary Block	No Effects	Low	Low
LANDSCAPE CHARACTER			
Eastern Block	Very Low	Moderate-Low	Moderate-Low
Southern Block	Moderate	Low	Low
Western Block	Low	Low	Low
Waiteraire Tributary Block	No Effects	Very Low	Very Low

* Beneficial effect

20. I concur with the above findings, noting that there will be a range of adverse landscape effects, up to a moderate degree, during each phase of the proposed operations throughout the site. These include:

During site establishment and initial construction works

Moderate (more than minor) adverse effects on:

- the topography associated with the main access road in the Southern Block;
- the streams within the Eastern Block (Valley 1); and
- the landscape character of the Southern Block.

During ongoing operation, and post closure

Moderate adverse effects remaining on the topography of the Southern Block and streams in the Eastern Block, with these adverse effects reduced over time through revegetation mitigation.

21. I agree with the findings of the Application ALVE that all other effects on the landscape resources and landscape character will be either moderate-low (minor), low or very low (less than minor).

22. I also agree that there will be beneficial landscape effects for vegetation within some areas of the site as a direct result of the proposed mitigation planting, which involves establishing native revegetation that will replace some areas of existing pasture and exotic production forestry.

Visual effects

23. Section 9.0 of the Application ALVE provides a thorough assessment of the proposal's visual amenity effects for the identified representative viewpoints; assessing the nature of current views and then the anticipated changes in these views in relation to each stage of the project lifecycle. The findings of this assessment are summarised in Table 5 (page 48) of the Application ALVE.

Table 5: Summary of Visual Effects

Viewing Audience	Level of Effects (Adverse)			Post Closure
	Site Establishment	Operation - Up to Year 5	Operation – Year 5 to 35	
WELLSFORD TOWNSHIP AND ENVIRONS				
All viewing audiences (road users, recreationalists, workers, and residents)	Moderate-Low	Low	Low to Moderate*	Low
WAYBY STATION ROAD AND ENVIRONS				
All viewing audiences (road users, recreationalists, workers, and residents)	Moderate-Low	Low	Moderate-Low	Low
WAYBY VALLEY ROAD AND ENVIRONS				
All viewing audiences (road users, recreationalists, workers, and residents)	Moderate-Low	Low	Low	Very Low
VIEWS ON OR NEARBY SH1				
Wellsford Golf and Squash Club and nearby road users	Very Low	Very Low	Low	Low
Road users south of Wellsford Golf and Squash Club up to Wayby Valley Road	Low	Very Low	Low	Low
Residents adjacent to the Wellsford Golf and Squash Club	Moderate-Low	Low	Moderate-Low	Low
Residents at 1207 SH1	Low	Low	Low	Low
Residents opposite Forestry Road	No Effects	Moderate-Low	Low	Low
Road users opposite landholding entrance	Moderate-Low	Low	Very Low	Very Low
RESIDENTS ADJACENT TO SPRINGHILL FARM				
Residents adjacent to Springhill Farm	Moderate-High	Moderate	Moderate	Moderate-Low
DOME FOREST AND ENVIRONS				
Waiwhiu	No Effects	Low	Moderate-Low	Low
Te Araroa Trail	No Effects	Low	Moderate-Low	Low

* Note: **Moderate** rating only applicable to a limited area within Wellsford township

24. I concur with the above findings, noting that there will be a range of adverse visual effects during each phase of the proposed operations (until closure), up to a moderate-high degree. These include:

During site establishment and initial construction works

Moderate-high (more than minor) adverse visual effects on residents adjacent to Springhill Farm, noting that, of the three identified properties: one is owned by the applicant; one is in the motorway designation corridor; and views from the third will be mitigated by (existing) planting.

During operation up to the thirty-fifth year of operation

Moderate (more than minor) adverse visual effects on residents adjacent to Springhill Farm – noting the above further refined analysis – including from established proposed mitigation planting .

Moderate-low (minor) adverse effects for some Wellsford viewing audiences located within a limited area, viewing at a distance generally greater than 4.0km from the site[3] as a mitigating factor.

25. I agree with the Application ALVE that post-closure, the residents adjacent to Springhill Farm will experience moderate-low (minor) adverse visual effects. I also agree that, for the remaining viewing audiences, the adverse visual effects of the proposal during operation will be moderate-low (minor) or less. This includes residents opposite Forestry Road and the majority of viewing audiences within the Wellsford township and environs, Wayby Station Road and environs, Wayby Valley Road and environs, residents adjacent to the Wellsford Golf and Squash Club and road users opposite the site entrance.

26. In summary, I agree with the Application ALVE that adverse effects on visual amenity from the proposal will vary throughout the life of the proposed operation. The potential moderate-high adverse visual effects on people within dwellings adjacent to Springhill Farm will be successfully mitigated by planting. For some viewers in Wellsford township and surrounding areas, views of the proposed operation might be attainable, however, given the viewing distance (generally greater than 4.0km), adverse visual effects are likely to be minor, with some experiencing no effects, as the landfill operations will not be visible.

Night time lighting effects

27. Section 9.0 of the Application ALVE (paragraphs 9.116-9.120) assess the potential effects that might arise from night time lighting on site as part of the proposal. Key aspects of this assessment include:

The proposal is to operate during hours of darkness (from 5.00am and up to 10.00pm); noting my understanding that these hours relate to the working face of the landfill (with Sunday works to cease at 5.00pm; while the bin exchange area will be operational 24-hours/day and 7-days/week.

To ensure the safe operation of the facility, lighting is required at the:

- Site entrance
- Bin exchange area
- Office and staff car park (to allow for the safety of staff)
- Landfill working face (using a portable lighting rig)

The main access road will not be lit.

Proposed mitigation measures, to assist with the reduction of glare (observing the light source) and sky glow (ambient light spill) include:

- Low level lighting
- Downlights
- Light shields
- Directional lighting orientated away from Wellsford.

The project will adhere to the relevant permitted lighting standards of the AUP(OP).

28. I note that the site is part of a landscape which is experienced at night as a predominantly unlit environment, particularly when viewed from the south (for example, from within dwellings on elevated

[3] I have viewed updated draft ZTV mapping (to be included with the applicant's evidence) which provides further visibility analysis detail.

properties in Kraack Road) with only limited exposure to direct light sources (glare from distant vehicle headlights, for example) or sky glow. Conversely, when viewed from the north the lights of Wellsford and from traffic on SH1 (and in the future the new motorway) are particularly noticeable elements in the existing outlook. As a result of my site observations, given the lighting mitigation measures proposed and the generally limited visibility of those parts of the site that will be lit, I concur with the Application ALVE that the adverse night time lighting effects of the proposal will be very low.

29. I have relied on the advice of the council's expert lighting technical reviewer, John Mckensey, when making my own judgements and defer to his expertise in relation to detailed analysis of lighting effects.

Proposed mitigation measures

30. Alongside the ecological mitigation planting that is proposed, the Application ALVE highlights various measures which are engrained in the proposal to avoid, remedy and mitigate adverse landscape and visual effects associated with the proposal, both during operation and post-closure when the landfill operations are complete. As set out in the Application ALVE (at paragraph 6.12), these measures include:

- Avoidance of native vegetation clearance within SEA areas and Wetland Management Areas as far as practicable.
- Avoidance of effects and encroachment into NSMA, which are limited to an area of approximately 80m² at the eastern extent of the overlay, along the proposed main access road.
- Avoidance of project footprint on the identified ONL.
- Re-establishment of Poplar trees along SH1 adjacent to the Bin Exchange Area.
- Native revegetation planting along the cut and fill slopes particularly along the main access road.
- Where practicable, fill stockpiles from the proposed final toe of the stockpile, with the front face formed and shaped as filling progresses. As soon as sufficient area is available, remote from current filling works, the surface of the front face will be vegetated. This will comprise covering with a layer of topsoil or other suitable growth layer and sowing grass seed, or hydroseeding the face.
- On completion of filling at the end of each summer earthmoving season, all bare earth surfaces of the construction-related earth fills will be stabilised with grass, erosion mats or tarps.
- Establishment of native and exotic (pine) planting on the sides of the valley in which the landfill is to be located, above the landfill footprint.
- Establishment of grass and/or native planting on the landfill's final cap, noting that the extent and type of planting will need to be determined by engineering considerations. One consideration is ensuring that plants that are established on the landfill would need to be shallow rooting species, so they do not pierce the landfill cap. As a minimum the entire cap would be planted with grass (i.e. it will not be left as bare earth).
- Screen planting on ridges around the perimeter of Valley 1 and west of Stockpile 1. The nature of this planting would be fast growing evergreen trees such as pine or eucalyptus, to assist in screening works and the project.
- Provision for adding recreation value through the establishment of a walking track along the Waiwhiu stream.

- Sensitive design of buildings, particularly the proposed office near Valley 1, and office near the landholding entrance. This would include neutral colours which relate to the vegetative setting.

- Signage for the entrance of the landholding should be as discrete as practicable (adhering to NZTA sign requirements), and not visually dominate the entrance. It is recommended that any signage should be well set back (i.e. at least 10m) from SH1.

- Lighting throughout the project will be minimised as far as practicable so it meets the permitted standards of the zone. Placement and direction of lights should avoid high points which are visible outside of the landholding. Light shields should be used where necessary, and all lightings shall be down facing to minimise effects on the night sky.

31. I note that the Application ALVE contains (at Appendix 3: Graphic Supplement – Part A) two specific mitigation planting drawings (Figures 14 and 15), which capture the location and intent of proposed planting for the purposes of remedying and mitigating adverse landscape and visual effects. These two drawings (alongside any other associated drawings to be presented in evidence by the applicant) will be important to record as key documents in consent conditions and management plan requirements.

Relevant Management Plans

32. In my opinion, a key component of the application which will ensure a successful integration of the proposal into the landscape and assist with avoiding, remedying and mitigating adverse landscape and visual effects, will be the requirement to comply with the ELERP, under the Landfill Management Plan.

33. While the ELERP has not yet formally been included as part of the application documents, from the content of the draft documentation that I have reviewed to date, I am confident that the landscape management requirements within this Landfill Management Plan will ensure an appropriate outcome.

Consistency with relevant statutory provisions

34. From my review of the relevant statutory provisions, which relate to an assessment of landscape and visual effects of the proposal, the key directives seek to:

- Encourage innovative design to address environmental effects (RPS objective B2.3.1(2)).

- Protecting the quality of the natural environment (RPS objective B3.2.1(2)(e)).

- Enable infrastructure while managing adverse effects on the quality of the environment and amenity values (RPS objective B3.2.1(3)(a)-(b)).

- Provide for infrastructure, recognising a functional/operational need to locate in areas that have natural and physical resources, while ensuring that adverse effects are avoided, remedied or mitigated (RPS objective B3.2.1(8) and policies B3.2.2(3), B3.2.2(6) and B3.2.2(8)).

- Ensure an appropriate assessment of adverse effects on Mana Whenua values (RPS policy B6.3.2(3)).

- Enable a diverse range of activities while avoiding significant adverse effects on rural areas and avoiding, remedying or mitigating other adverse effects on rural character, amenity, landscape and biodiversity values (RPS policy B9.2.2(1)).

- Cleanfills, managed fills and landfills are sited, designed and operated so that adverse effects on the environment are avoided, remedied or mitigated (RP objective E13.2(1) and policy E13.3(4)).

- Enable and provide for outdoor activities with appropriate levels of artificial lighting and control the intensity, location and direction to avoid significant glare and light spill in order to limit adverse effects, including the loss of night sky viewing (DP objectives E24.2(1)-(2) and policies E24.3(1)-(2).

- Enable infrastructure, including electricity generation and avoid, remedy or mitigate adverse effects, including nuisance from light spill and on the amenity values of adjoining properties (RP/DP objective E26.2.1(8)-(9)) and policy E26.2.2(4)).

- Maintain or enhance the character, amenity values and biodiversity values of rural areas, while accommodating the localised character of these areas and the dynamic nature of rural production activities (DP objective H19.2.3(1) and H19.2.5(3)).

- Manage the effects of rural activities to achieve a character, scale, intensity and location that is in keeping with rural character, amenity and biodiversity values, including characteristics of: a predominantly rural environment; fewer buildings of an urban scale, nature and design; and a general absence of infrastructure which is of an urban type and scale (DP policy H19.2.4(1)).

35. In addition to the above, in relation to the identified ONL and ONF, in my opinion the following policy under the AUP(OP) is also relevant.

- Enable use and development that maintains or enhances the values or appreciation of an outstanding natural landscape or outstanding natural feature (DP policy D10.3(5)).

36. In my opinion, the application will be consistent with the intent of the relevant statutory provisions.

Submission review comments

37. I understand that over 1,000 submissions have been made in response to the publicly notified application, noting some submissions in support (or neutral), with the vast majority of submissions in opposition.

38. In reviewing all of the submissions, acknowledging that further details regarding each submission may likely emerge during the submitters' evidence for the hearing, I make the following comments in relation to relevant issues that have been raised (refer **Attachment 1** for summary of relevant submissions).

Submissions in support *– good location for proposal (well screened)*

39. I agree that the site is located in a remote location, which assists with the avoidance of adverse visual effects. While viewers passing by the main site entrance will be aware that a landfill activity is located in the vicinity, the main workings of the proposal will be located in a part of the site that is visually discrete, with landform and existing vegetation being mitigating factors to ensure that the activity is not visible.

40. Having said this, I acknowledge that there will be some activity on the northern slopes of the site, associated with the movement and stockpile of topsoil and clay capping material, which will be visible from beyond the site boundaries. This visibility is mitigated by viewing distance, alongside the consideration that similar earthworks activities are generally expected in a rural environment.

Submissions in opposition

ISSUE 1: ADVERSE EFFECTS ON THE CULTURAL LANDSCAPE

41. The submissions from mana whenua have raised an important issue that requires consideration when determining landscape effects. I note that the Application ALVE does not address cultural landscape effects; however, I understand that the applicant has engaged with mana whenua submitters to better

understand the specific cultural landscape effects that have arisen and potentially realise appropriate mitigation measures (in the form of acknowledgement, interpretation, access and plant selection).

42. It is therefore difficult for me to respond to this issue at present because I do not currently have enough understanding of the issues raised in the submissions and I have not been involved with any relevant engagement, in order to make an informed assessment of the proposal's cultural landscape effects.

43. I understand that the applicant will be responding to this issue through submissions and evidence.

ISSUE 2: DISTASTEFUL VIEWS / VISUAL NUISANCE / LIGHT POLLUTION

44. I acknowledge that the application proposes to introduce an activity into this landscape that may be perceived by people as being out of character with the existing landscape and that there is the potential for adverse visual effects to arise through rubbish distribution through the wider landscape (wind-blown from trucks, for example). In my opinion however, consistent with the Application ALVE findings, the external visual effects from the proposal will be very limited (confined to views of activity within the Stockpile 1 area) and that adverse effects on amenity values through light pollution will be avoided.

45. Following my visit to the Redvale Landfill operations as part of understanding this application, I noted that the applicant has a good track record in managing that property so that rubbish is well contained within the site. I note the proposed Landfill Management Plan, in combination with other proposed consent conditions, contains requirements to ensure the management of issues that arise in relation to the issue of visual nuisance that might occur from rubbish inadvertently being strewn throughout the local landscape. In my opinion, the proposed conditions of consent could be strengthened in order to further require the regular collection and disposal of rubbish that might accumulate within the vicinity of the site entrance in the state highway corridor. In addition, the proposed conditions which require the establishment and ongoing involvement of a Community Liaison Group and management of complaints, will be appropriate avenues for these types of issues to be raised and addressed by the consent holder.

ISSUE 3: ADVERSE EFFECTS ON RURAL CHARACTER AND AMENITY / PROXIMITY TO OUTSTANDING NATURAL LANDSCAPE / CLAIM THAT SITE IS WITHIN THE COASTAL ENVIRONMENT

46. I do not agree with the claims made within the submission by Richard Garner, on behalf of the Federated Farmers of New Zealand (Auckland Province) Incorporated, that the application will lead to adverse effects on the rural landscape and character of the site and surrounding environment. In my opinion, as assessed in the Application ALVE, the proposal is well located within a visually discrete part of the landscape, with those visible aspects of the proposal being similar in character to other rural activities. Additionally, the magnitude of visual change in the landscape will be relatively slow, with a gradual manipulation of landform, that will eventually result in a final appearance that is consistent with the underlying land base.

47. The rural context of the site, with a predominance of production forestry activity, will assist in ensuring that the potential adverse landscape effects from the proposal can be visually absorbed. The applicant's proposal to rehabilitate parts of the site and to undertake and establish appropriate planting on the wider property (including additional areas of production forestry) will also assist with the remediation and mitigation of adverse landscape effects overall. In addition, the proposal will avoid adverse effects on the identified area of Outstanding Natural Landscape and ensure that an appropriate integration and buffer is established between the landfill activity and this sensitive component part of the wider landscape.

48. Finally, I agree with Application ALVE[4] that the site is not within the coastal environment.

[4] Refer Application ALVE, page 7 – Summary of Existing Landscape Assessments.

ISSUE 4: GENERAL REFERENCE TO DESTRUCTION OF BUSH THAT IS USED FOR RECREATIONAL PURPOSES AND HAS NATURAL BEAUTY – RUINING OUR NATURAL LANDSCAPE – BLOT ON THIS BEAUTIFUL LANDSCAPE – ISSUES WITH WEED CONTROL

49. Again, I acknowledge the intent and concern raised through submissions that raise general issues around the potential for adverse landscape and visual effects to arise from the proposal, by introducing a landfill activity into an environment that is perceived as having high landscape and scenic value. Having said this, it is my opinion that the analysis undertaken to inform the Application ALVE has proven that the proposal will effectively avoid significant adverse effects on these sensitive receivers.

50. For those limited number of people that will experience an outlook towards the operational aspects of the proposal (being the Stockpile 1 area), these effects will be similar to those experienced through rural activities, such as those that currently exist in the localised landscape – through production forestry, for example. In my opinion, the proposal will not result in a 'blot' on the landscape and has been designed to include appropriate landscape management components that will remedy and mitigate adverse effects over time, so that the site maintains and enhances rural character, while providing for the activity.

ISSUE 5: ADDITIONAL RECREATIONAL OPPORTUNITIES AND OFFSET/COMPENSATION SUGGESTIONS

51. I will defer to the council's expert terrestrial ecology technical reviewer, Simon Chapman, in relation the assessment and review of the applicant's proposed detailed ecological offset and compensation; however, from a landscape perspective, it is my opinion that the proposed ecological improvement measures that have been proposed by the applicant (as offset/compensation) will also result in the remediation of the landscape. The requirements set out in the proposed ELERP component part of the wider proposed Landfill Management Plan, which is to be required and enforced through conditions of consent, will ensure the consent holder achieves these anticipated outcomes over time. In my opinion therefore, the proposal does include opportunities for appropriate improved landscape management outcomes.

52. In addition, it is my understanding that the applicant is also willing to include new opportunities for public access through the wider landholding of the site, to connect with existing tracks so that those parts of the site that have a high landscape value can be better experienced by the public. While I have not yet viewed these proposals, I understand that the applicant will produce drawings in evidence for the hearing.

Submitters proximate to the site

53. Finally, in relation to my review of the relevant submissions, I had anticipated that some submitters within private properties would raise adverse visual effects issues. For example*: '. . .the view from our house will be changed by the proposal so that our outlook is compromised . . .'*. However, I have not viewed any submissions raising this issue. The following submitters are however located in close proximity to the site:

    Craig Purvis (#9426), 761A State Highway One

    Meryl Bacon (#9711), 147 Waiwhiu Conical Peak Road

    Bridgit Bretherton-Jones (#9620), 149 Waiwhiu Conical Peak Road (Waterfall Farm)

    Matt Lomas (#9602), 95 Wilson Road

    Deborah Sarney (#EP13), 72 Spindler Road

    Richard Brown (#9427), 76 Spindler Road

    Susan Tomlinson (#10000), 78 Spindler Road

    Michael Carmichael (#9684) and Lee Laughton (#9857), 80 Spindler Road

    John and Mary Appleby (#9420), undefined but "opposite entrance".

54. I understand that the applicant will include, as part of their evidence, refined ZTV mapping which will clearly identify the location of existing dwellings within the wider landscape, including highlighting the location of the above submitters. This will further assist with an assessment of this potential issue and the extent of visibility from these locations. From my preliminary review and site assessment, it is my understanding that the proposal will not be readily visible from dwellings on these submitter properties.

Recommended conditions of consent

55. I have had the opportunity to suggest amendments to the applicant's originally proposed consent conditions, in order to strengthen these requirements as they relate to avoiding, remedying and/or mitigating adverse landscape and visual effects. I confirm that the latest version of these proposed conditions that I have reviewed (version dated 25 August 2020), does not include all of my suggestions and I recommend the following changes (with additions - bold underlined; and deletions - strikethrough italic):

Condition 103 (site access)

103 Signage on SH1 for the entrance of the site shall adhere to NZTA sign requirements for State Highways **and be located at least 10.0m from the SH1 road reserve boundary**.

***Reason**: in response to a mitigation recommendation within the Application ALVE.*

Condition 106 (litter)

106 Effective procedures shall be implemented to control litter. In particular the following measures shall be taken:

a Best practicable options shall be used in the vicinity of the working face in order to control windblown litter;

b Regular patrols (approximately weekly) shall be conducted to identify and pick up wind-blown litter within the landholding **and within the SH1 road reserve 1.0km either side of the entrance to the landfill entrance gates**;

c Any trucks delivering waste to the landfill shall be covered if there is any potential for litter leaving the trailer.

***Reason**: in response to issues raised through submissions.*

Conditions 169-173 (landscape and visual mitigation)[5]

Landscape and visual **effects** mitigation

169 All earthworks areas, including soil stockpiles, not intended to be disturbed for more than 4 months shall be grassed, hydroseeded or otherwise planted.

170 Any areas of the landfill which are no longer required for filling activity, and have reached the final contour and have final cover placed, shall be reseeded or planted with suitable groundcover species as outlined in the report titled 'Landscape and Visual Assessment'~~,~~ Dated May 2019 by Boffa Miskell Ltd and as specified in the **Ecological and** Landscape **Enhancement** and **Restoration** ~~*Visual Management*~~ Plan **(ELERP)** required by Condition XX except if there is a difference then the current certified **ELERP** ~~*LVMP*~~ shall prevail. The timeframe of this planting **implementation** will be determined by the requirements and restraints of gas extraction infrastructure, schedule of progressive final capping, waste settlement and optimum planting seasons but shall be within 12 months of completion of the part of the final cover.

[5] Under Part C - 'Landfill Operations'.

171 The final landform and restoration of the landfill cap and associated works shall be in accordance with the ~~*Landscape and Visual Management Plan*~~ **ELERP** required by Condition XX.

172 Final contouring of earthworks, including stockpiles and landfill cap shall reflect natural or existing adjacent ground contours as far as practicable within engineering constraints.

173 The primary (main) colour or colours of all external buildings, roofs and structures shall be in the range of greys, charcoal, dark greens and browns with a reflective value no more than 40%, subject to any variation recommended by the Kaitiaki Forum and certified by Auckland Council. Non-reflective glass shall be used in glazing.

***Reason**: to be consistent with the revised ELERP section of the proposed Landfill Management Plan.*

Condition 214 (landfill management plan)

214 The LMP shall address how the following matters will meet any requirements, limits or restrictions set out by the consent conditions:

- . . .
- List of items to be completed prior to each stage including prior to landfill commencement date.
- **Maintenance, including defects replacement, for areas of mitigation planting.**
- After-care.

***Reason**: to ensure an appropriate ongoing landscape management approach to planting on site.*

Conditions 244-250 (Ecological and Landscape Enhancement and Restoration Plan)[6]

244 An Ecological and Landscape Enhancement and Restoration Plan (ELERP) shall be prepared and provided to Council for certification**, measured against the objectives and details within conditions 244A- 246,** at least three months prior to the construction commencement date.

244A The **ecological** objectives of the ELERP is to meet the conditions of this consent, to describe forest, wetland, and riparian and wetland margin revegetation. The focus of the ELERP is the replacement/replanting of plant species that have been affected by the project and the optimisation of ecological benefits through improving ecological connectivity between habitat types and protecting significant habitat types through buffer/margin plantings. The ELERP shall be consistent with and complementary to the Ecological Enhancement Pest Management Plan required by condition 187.

The planting areas shall be in general accordance with those shown in the Ecological Values and Effects Report by Tonkin + Taylor, date May 2019:

a Enhancement and/or protection of 14 km of stream within or as close as practicable to the WMNZ landholdings.

b Planting of [9.9] ha of native terrestrial vegetation within WMNZ landholdings.

c Long term pest control on WMNZ landholdings and Sunnybrook Reserve.

d Protection of [111.9] ha native forest areas within WMNZ landholdings by covenant.

e Planting and protection of [4.63] ha of degraded wetlands within the Western Block that are not affected by the project.

[6] Under Part D - 'Landfill Management Plan'.

f Planting of wetland buffers of 10 m or 5 m around SEA and non-SEA wetlands within the Western Block, approximately [15.18] ha.

g Protection of all native wetland habitats by covenant, approximately [25.59] ha.

In addition to the above, the planting shall be based on the conceptual layouts of the Mitigation Plans depicted in Appendix 3 of the Boffa Miskell Ltd document entitled "Landscape and Visual Assessment, May 2019".

245 The **landscape objectives of the** ELERP shall **ensure that ongoing landscape management is undertaken in order to continue to** avoid, remedy ~~*or*~~ **and** mitigate the **actual and potential** adverse landscape and visual effects of the ~~*project*~~ **consented landfill operations** through the following measures:

~~*h*~~**a** Establish and maintain tree shelterbelts to provide effective visual screening of the landfill during its development and during the aftercare period;

~~*i*~~**b** Native revegetation along the cut and fill slopes around the bin exchange area and along the main access road

~~*j*~~**c** Planting of fast growing trees and native plants adjacent to the roundabout and SH1 to re-establish this roadside character and provide further screening of the project activities

~~*k*~~**d** Management of the off-site visually exposed face of the stockpiles wherever possible, with the front face formed, shaped and vegetated, as filling progresses

~~*l*~~**e** Stabilisation with grass, erosion mats or tarps, of bare earth surfaces of the stockpiles and clay borrow pit areas on completion of filling/earthworks at the end of each summer earthmoving season.

~~*m*~~**f** Planting on the side slopes and ridges around the perimeter of Valley 1 and around the stockpiles and clay borrow pit to assist in integrating and screening project works.

~~*n*~~**g** Screen planting along access roads within the site to the extent practicable

~~*o*~~**h** Ensure planting is of appropriate scale and mix of species to reflect the existing vegetation structure of the rural and forested area;

~~*p*~~**i** Outline an ongoing and adaptive planting and management process for the landfill both during its development and during the aftercare period.

246 The details of ~~*this plan*~~ **the ELERP** shall include:

a Confirmation of the areal extent and spatial configuration of plantings proposed.

b Description of the objectives of the mitigation planting / landscape treatment, including the mitigation intent of each of the planting areas and how this will be fulfilled over time as the plants develop and age;

c Identification of areas of existing vegetation to remain or be removed and the methodology for managing, and supplementing this vegetation where necessary in a timely manner to maintain the mitigation objectives;

d Site preparation (if required), e.g. fencing, weed or animal pest management and habitat enhancement (e.g. deployment of felled logs in revegetation sites).

e Timing of plantings.

f Schedules of planting, including plant species composition, plant sizes, plant densities, measures of stock condition (e.g. health of plant stock) the use of growth enhancement measures where required (e.g. fertiliser tablets or stock guards). Where available, plants will

be eco-sourced native species from the same ecological district. Planting plans for stream riparian margins and wetland areas shall be in accordance with the Auckland Regional Council Riparian Zone Management Strategy for the Auckland Region, Technical Publication 148, June 2001 (TP148) and Appendix 16 of the Auckland Unitary Plan 'Guideline for native revegetation plantings'.

g Plant maintenance methods for ensuring successful establishment and long-term persistence of plantings, including the duration of maintenance, methods for ongoing control of weed or animal pests and infill planting.

h Monitoring and reporting requirements.

i Covenanting/encumbrance details.

. . .

249 All restoration **and mitigation** planting described in the ELERP shall be **implemented and** completed within three years of the initial construction and enabling works being completed. Written confirmation shall be provided to the Auckland Council within 30 days of the works being completed confirming that all works have been completed in accordance with the ELERP.

. . .

***Reason**: to ensure clear objectives for each specialist component of this plan; acknowledging overlap.*

Conclusion

56. Following my technical review of proposal within the application and the relevant submissions, taking into account the recommended changes to the applicant's proposed conditions of consent discussed above and subject to my review of further information that is presented in evidence at the hearing; it is my assessment that the proposal will result in adverse landscape and visual effects that can be effectively avoided, remedied and/or mitigated through appropriate landscape management techniques to achieve an outcome that will progressively integrate successfully over time within this rural environment; and therefore be consistent with the relevant landscape and visual amenity focussed statutory provisions.

Please let me know if you require any further clarification.

Regards

Peter Kensington

Consultant Specialist – Landscape Architect[7]
Registered NZILA and MNZPI

On behalf of Auckland Council, Auckland Design Office, Design Review Unit

Email: peter@kplc.co.nz Phone: 027 227 8700

[7] Refer **Attachment 2** for my qualifications and relevant experience.

Attachment 1

Summary of relevant submissions (landscape / visual effects)

Submissions in support

- Lionel Don (#7925)

"I am absolutely in support of this landfill going ahead, it is in a remote location that very few people will have visual access too . . ."

Noting also the related submission in opposition from Elizabeth Dowling (#EP17) at point 1(f) which states:

"The proposed landfill site is out of sight of the passing public, it will in effect promote the idea that someone, somewhere will manage our waste with no obvious impact on the average Auckland citizen – landfills if used, should be in the full sight of the public as how else can we understand the destruction of land, trees, water and species. An out of sight landfill does not promote minimisation of waste, composting of waste and recycling of waste, nor does it promote the conversion of waste to something useful."

Submissions in opposition

ISSUE 1: ADVERSE EFFECTS ON THE CULTURAL LANDSCAPE

- Maria Henare – aka Mina Henare-Toka, Kaitiaki, Tinopai Resource Management Unit (9914)

- Te Uri o Hau / Ngati Whatua – Mikaera Miru, Kaitiaki - Waiaotea Marae (#9410)

- Ngā Māunga Whakahii o Kaipara Development Trust – Jane Sherard (#EP27)

- Te Rūnanga o Ngāti Whātua - Dame R. Naida Glavish (Chair) / Alan Riwaka (Chief Executive) (#EP16)

- Ngāti Whātua Ōrākei, Andrew Brown, Strategic RMA Advisor (#9956)

"The proposal / application results in more than minor / including significant, actual and potential adverse effects to the environment, which should be avoided, as follows [amongst others]:

- *Adverse cultural effects to mana whenua / Māori / Ngā Maunga Whakahii o Kaipara Development Trust / Te Rūnanga o Ngāti Whātua and the related cultural landscape where the proposal is located.*
- *Intrinsic values, amenity, and quality of environment*
- *Landscape and natural character."*

Noting additional submissions in opposition from mana whenua, including:

- Te Uri o Hau, Environs Holdings Limited (Fiona Kemp) (#EP25)

- Haranui Marae Trust Board (Lynne Te Aniwa Tutara) (#9891)

- Ngāti Manuhiri Settlement Trust (Piet Tuinder / Mook Hohneck) (#EP15)

- Professor Merata Kawharu, Ngati Whatua (#9977) (individual submission – Dunedin)

- Lisa Knight (#9980), Otamatea marae, Ngāti Whatua (individual submission – Auckland)

- Professor Paul Tapsell (#10041) Ngāti Whakaue (individual submission – Melbourne)

- Piere Tapsell (#10056) Ngāti Whatua (individual submission – Dunedin)

- Dr Paratene Tane (#10068) Ngāti Kawa / Ngāti Rāhiri (individual submission – Oromahoe, Bay of Islands)

Noting submission in support from mana whenua

- Te Uri o Ngati Rango Kaitiaki - William Kapea (#9794)

ISSUE 2: DISTASTEFUL VIEWS / VISUAL NUISANCE / LIGHT POLLUTION

- David Sawyer (#9657) and Kirsty Sawyer (#9660)

- Valerie Hay (#9672)

- Michelle Carmichael - Fight the Tip Tiaki Te Whenua (#9684) and Lee Laughton (#9857), 80 Spindler Road

- Herby Skipper - Fight the tip. Save the Dome (#9884)

- Deborah Sarney (#EP13), 72 Spindler Road, Wellsford (resident that lives within 1.5km of the site)

- Richard Brown (#9427), 76 Spindler Road

- Breda and Ron Matthews (#EPL15) – point 24

- Valeria Maw (#EPL167) – point 28

- Leihia Wilson (#9415)

- Joan Brown (#9416)

- Anna Ingham (#9425)

- John Appleby and Mary Appleby (#9420)

- Kathryn Hunter (#9913) and Christopher Hunter (9918)

- Meryl Bacon (#9711), 147 Waiwhiu Conical Peak Road

- Bridgit Bretherton-Jones (#9620), 149 Waiwhiu Conical Peak Road (Waterfall Farm)

- Craig Purvis (#9426) 761A State Highway One, Dome Valley, Warkworth 0941

- Matt Lomas (#9602) 95 Wilson Road, RD 2, Wellsford [within 2km of site]

- Lynne Marie, Te Aniwa Tutara, Interim Secretary, Otakanini Haranui Marae Trust Board (#9891)

"Nuisances" refers to "visual nuisance" including [amongst others]:

- *extensive lighting / light pollution, influencing the environment and reducing our dark sky which are culturally important, a scenic and scientific resource, and are critical for nocturnal species.*
- *distasteful views of multiple rubbish trucks (300-500 a day) travelling on our small country roads."*

"Rubbish distribution is likely throughout the surrounding environment by wind and rainfall with adverse impacts on biodiversity. This will cause [amongst others]:

- *distasteful views for the community when seen."*

"Back to tourism . The bed and breakfast businesses in the Wellsford to the Brynderwyns area, enjoy dark skies over the Dome. Giving perfect star gazing opportunities. Or alternatively, spectacular lightning displays, for those romantic over-night get aways. This will be spoilt, by the 24 hr operations, carting and processing rubbish under lights. Within direct view lines from Wellsford, and surrounds."

ISSUE 3: ADVERSE EFFECTS ON RURAL CHARACTER AND AMENITY / PROXIMITY TO OUTSTANDING NATURAL LANDSCAPE / CLAIM THAT SITE IS WITHIN THE COASTAL ENVIRONMENT

- Federated Farmers of New Zealand (Auckland Province) Incorporated – Richard Gardner (#9987)

"…the proposed landfill is incompatible with the purpose of the Auckland Rural Production Zone, as described in both the Auckland Plan 2050 [1 - The Auckland Spatial Plan, prescribed under the Local Government (Auckland Council) Act 2009] and the Auckland Unitary Plan. The Auckland Plan 2050 records that support of rural production is important to how Auckland is to grow and change:[2 – Auckland Plan page 208]

Auckland's rural areas are valued for their:

- *current and future productive uses*
- *rural landscape and character*
- *ecological areas*
- *recreational opportunities.*

No provision is made in the Auckland Plan 2050 of the use of Auckland's rural areas for waste disposal purposes. The productive and other values referred to in the Auckland Plan go on to be reflected in the relevant provisions in the Auckland Unitary Plan:

The purpose of the Rural – Rural Production Zone is to provide for the use and development of land for rural production activities and rural industries and services, while maintaining rural character and amenity values."

. . .

"… the proposal will have adverse effects on the rural amenity of the immediate area and indeed, given the population density of Auckland as a whole, unacceptable effects on the rural amenity of the wider rural area, and indeed of Auckland as a whole.

Turning from amenity to the broader issue of landscape, the landscape assessment that accompanies the application does not take proper account of the proximity of special areas area in the vicinity of the application site, an in particular an ONL that is associated with the Dome Forest and, seemingly, the Hoteo River, including its tributaries."

…

"Further, recent litigation reveals that the site may be in the coastal environment,[5 - See Cabra Rural Developments Limited & Ors v Auckland Council [2018] NZEnvC 90 at [129]. But see also Auckland Council v Cabra Rural Developments Limited [2019] NZHC 1892 at [172] – [200]] and there is no assessment that has been made of the site on that basis, nor of the relevance to the proposal of the site should it in fact be in the coastal environment.[6 - In contrast to claims in the landscape assessment – See Auckland Regional Landfill, Landscape and Visual Assessment prepared for Waste Management (NZ) Limited, 24 May 2019, Boffa Miskell, at 2.12]"

ISSUE 4: GENERAL REFERENCE TO DESTRUCTION OF BUSH THAT IS USED FOR RECREATIONAL PURPOSES AND HAS NATURAL BEAUTY – RUINING OUR NATURAL LANDSCAPE – BLOT ON THIS BEAUTIFUL LANDSCAPE – ISSUES WITH WEED CONTROL

- Zoe Duffy (#EPL176)

- Kerry Gore (#)

- Henrietta Young (#EP30)

- John Tiernan (#EP19)

"Destruction of a block of heritage native bush that many people use for recreational pursuits."

- Graham Gough (#EPL56)

"the Dome valley Wayby area is a beautiful stretch of bush and land and surely there are other properties available to council with less potential damage to the environment."

- Laine Hill (#8466)

"Destruction of the natural beauty and landscape of the site and surrounding area."

- Sarah Hill (#8469)

"Destruction of the landscape of the site and the surrounding region, including endangering our native flora and fauna . . . select a more environmentally sympathetic site which is already deforested and has supporting infrastructure."

- Sue Phillips (#9392)

"Ruining our natural landscape."

- Nicholas Mulder (#9992)

*"…let's get **clever** and not blot this beautiful landscape for our children with a throwback to today's lazy society…"*

- Susan Speedy, Frog Pool Farm (#9398 / #9399)

"As a 30 year resident and land owner of the Dome Valley I am concerned about the detrimental effects to the natural environment and residential environment . . .

I would like council to purchase this land and turn it into a native forest reserve given the significant areas of native Bush and intact eco systems already here in the area. Including many endangered species and habitats, flora fauna and Significant natural landscapes and waterways.

- *Impacts of deforestation of over 80 hectares of pine forest with native understory.*
- *Impacts of deforestation of old growth native forest.*
- *Impacts of deforestation of native forest around stream edges.*
- *Impacts of unsightly bin exchange area on SH1 inside entrance in a scenic area of natural significance.*
- *Impacts on the scenic nature and feel of the area."*

- Susan Speedy admin for No Mega Landfill in the Dome Valley petition (#9423)

- Alton Crisp (#EPL200)

"Allowing this landfill to proceed would be a gross failing of your duty as Mayor to protect scenic areas of high natural values performing important tasks such as habitat for native species, both flora and fauna, a lot of which is currently critically endangered, clean water charging aquifer, springs , streams, Hoteo river and Kaipara Harbour.

"86.88 hectares of pine and native understory will be destroyed.

17.3 ha of pasture will be destroyed.

9.11 ha of wattle.

4.62 ha of regenerating forest 0.86ha of mature forest

15.4 km of streams all destroyed."

- Ian and Denise Civil, 109 Kaipara Flats Road, Warkworth (#EP23)

"The proposal will have significant adverse effects on the amenity of the immediate area and beyond."

- Anita Walker (#9297)

"Dome valley conservation area is classified as an outstanding nature landscape and heritage site, by Auckland council with mature native vegetation including kauri and Rimu and kihikatea. It seems like a ludicrous place to put a landfill. Putting this outstanding conservation and heritage site in peril with all the environmental hazards it may have."

- Dedrie Trnjanin (#9893)

"This is a pristine part of New Zealand. Natural fauna, fishing and hiking. We oppose mining in the South Island, so why are we putting a landfill here? It is just the same - destroying the landscape for unnecessary waste . . . Yes, we need a landfill but why destroy such a beautiful part of the New Zealand?"

- Fiona Moselen (#10057)

"The Waiwhiu and Hoteo rivers and the native bush around them run through the land on which I spent my childhood. This land has been carefully to protected and we were taught appreciation of the native bush and waterways. We have celebrated finding a hochstetters frog, along with koura, kokopu and eel. On the other side are the Dome Hills - Auckland Councils 'Outstanding Natural Landscape' for the same reasons - precious native forest, endangered creatures. To target this area for a landfill is unfathomable."

ISSUE 5: ADDITIONAL RECREATIONAL OPPORTUNITIES AND OFFSET/COMPENSATION SUGGESTIONS

- Royal Forest and Bird Protection Society of New Zealand Incorporated (#9920) Nick Beveridge , Regional Manager, Auckland & Northland

"The preservation of the natural character of the wetlands, and lakes and rivers and their margins, and the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna are Matters of National Importance and must be provided for in achieving the purpose of the Act. . . . The project will result does not protect these values, nor does the application set out an adequate assessment of effects upon which measures to avoid, remedy and mitigate can be applied and any residual effects determined for further consideration of offsetting or compensation measures."

- *Concerns with proposed offsetting / compensation package and consent conditions.*

- Forest and Bird Warkworth Area (#9926) Roger Williams – complementary to submission 9920

"The reports do not satisfy us that weeds are adequately addressed. The cap of the landfill, both temporary and final is topsoil and grass. There is a huge potential for weeds such as pampas to develop. Pampas seeds are blown for many tens of kilometres."

- *Concerns with transparency of conditions (need for independent monitoring).*

- Department of Conservation, Director-General of Conservation, Lou Sanson - via Andrew Baucke, Director Operations and Chris Rendall (#9975)

Suggests further ecological enhancements could be implemented in order to offset significant adverse effects, including in relation to natural character – for example "… ecological enhancement could include planting of permanent native forest in places that are identified as sites of future forestry, providing connections between remnant areas with indigenous biodiversity values, further stream enhancement and extensions to the wetland habitats (rather than planting forestry up to their edges)."

- Dot Dalziell – NZ Walking Access Commission Ara Hikoi (#9841) neutral

"Our submission is that there is an opportunity to amend both the Plan Change and Resource Consent to require particular public access to be created in and through the ARL landscape. This public access would connect to the legal road network (including unformed legal roads) adjoining the land, and also to future walking and cycling infrastructure in the surrounding area, specifically:

1. *A walking and cycling linkage connecting Wayby Valley north-western boundary of the ARL to Waiwhiu Valley via Wilson Road; and*
2. *North-South walking and cycling linkage connecting from Wayby Valley through the ARL site to Sunnybrook Scenic Reserve."*

- Marie Alpe (#9927)

"From my experience of 16 years working for the Department of Conservation and many years advocating in planning processes for the protection of the special natural character, landscape and conservation values of the Te Arai/Tomarata area I submit that Council must take a highly precautionary approach. If proposed mitigation, avoidance and offsetting measures cannot determined as being infallible and there remains an element of risk from the landfill then the application is not sustainable, in an unsuitable location and should be declined."

Attachment 2

Peter Kensington – qualifications and relevant experience

1. I have worked as a landscape architect and a planner for twenty-three years. I am currently a director of Kensington Planning and Landscape Consultants Limited (**KPLC**); formed in September 2017. As a KPLC consultant, I provide professional landscape architectural and planning services for applicants, regulatory authorities and submitters.

2. My relevant qualifications include a Bachelor of Landscape Architecture (Honours), 1995, from Lincoln University (Canterbury) and a Bachelor of Regional Planning (Honours), 1993, from Massey University (Palmerston North). I am a Registered member of the Tuia Pito Ora / New Zealand Institute of Landscape Architects (**NZILA**) and a Full member of the New Zealand Planning Institute. I have been an elected member of the national executive committee of the NZILA (during the 2011-2013 term), as Treasurer, then again appointed as a proxy member between 2016-2017. I am a current certificate holder of the Ministry for the Environment's *'Making Good Decisions'* foundation course.

3. I have worked for the Christchurch City Council (1995-1997), the Wellington City Council (1999), the Auckland office of Boffa Miskell Limited (1999-2012) and, prior to establishing KPLC, the Auckland Council (**Council**) (2012-2017). At the Council I was a Principal Planner in the Hearings and Resolutions team of the Resource Consents Department. In that role, I was responsible for the case management of appeals, direct referrals, judicial reviews, objections, hearings and independent duty and hearings commissioner processes – in relation to applications for resource consent associated with the geographic area generally defined by the legacy Auckland Council District Plan (Isthmus Section) and the Operative Auckland Council District Plan (Hauraki Gulf Islands Section). In addition to my core role, I also prepared expert landscape architecture evidence in relation to various matters. I also assisted the Resource Consents Department's Practice and Training team with interpretation and integration of the Auckland Unitary Plan (Operative in part) into the department's practices and procedures.

4. My landscape architectural work is focussed within the landscape planning speciality of landscape architecture, where an assessment of effects on natural character, landscape and/or visual amenity values is required, primarily in relation to applications for resource consent or plan changes. Throughout my professional career, I have provided expert landscape architectural advice in relation to many matters where an assessment of the effects of proposed developments on the landscape character and visual amenity values of urban, rural or coastal environments is required. The majority of my recent KPLC consulting over the past two-years has been undertaken on behalf of the Council's Resource Consents Department, primarily through the Auckland Design Office, Design Review Unit.

5. This includes providing professional expert advice in relation to pre-application meetings and with the formal review of applications for resource consent, such as the following recent projects:

   i. Bulk earthworks, stormwater, roading infrastructure and street tree planting to provide for a staged residential subdivision on steep and elevated land at East Coast Road, Silverdale

   ii. Cleanfill operation (coastal site), Ostend, Waiheke Island

   iii. Four stage, 31-lot rural residential subdivision with associated revegetation, Palliser Downs, Wainui

   iv. Coastal residential subdivision (sixty vacant lots) at Te Arai South (former plantation forestry); establishment of two golf courses and ancillary activities, including: clubhouse and maintenance facilities; earthworks; water storage reservoirs; water takes; and discharges

   v. Dwellings (various) on individual lots at Tara Iti, Te Arai North Precinct

   vi. 30-lot rural residential subdivision, Brownhill Road, Whitford

   vii. Retrospective and ongoing consenting (refusal on appeal) for quarry activity, Lake Road, Te Arai

   viii. Leachate evaporator unit air discharge, Redvale Landfill, Dairy Flat.

PETER KENSINGTON
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NEW ZEALAND INSTITUTE OF LANDSCAPE ARCHITECTS
REGISTERED LANDSCAPE ARCHITECT

LDP Ltd
Independent Electrical & Illumination Engineers

14 September 2020

Auckland Council

Private Bag 92250

Auckland 1142

Attention: Warwick Pascoe

Dear Warwick,

RE: PROPOSED AUCKLAND REGIONAL LANDFILL DEVELOPMENT, WAYBY VALLEY
APPLICATION FOR RESOURCE CONSENT
PROPOSED LIGHTING – PEER REVIEW
[BUN 6033 9589]

As requested, I have reviewed the proposed lighting and associated Assessment of Environmental Effects (AEE) supplied by the applicant.

The applicant has applied for Resource Consent (RC) as well as a Private Plan Change (PC42). This report addresses lighting effects with respect to the Resource Consent application.

1.0 QUALIFICATIONS AND EXPERIENCE

The author of this report is John Mckensey. John holds a Bachelor's Degree in Electrical Engineering from the Queensland Institute of Technology and has the following qualifications and relevant memberships - MIES, CMEngNZ, MIE Aust, CPEng(Aust), NER, APEC Engineer, IntPE(Aust), GSAP, Member RLMA, Member International Dark Sky Association.

He is an Executive Engineer for LDP Ltd with 40 years' experience in illumination engineering including 20 years' experience in environmental lighting effects, up to and including Environment Court hearings.

John was the lighting advisor to Auckland Council with respect to the establishment of environmental requirements for lighting effects for the Auckland Unitary Plan and he advised Christchurch City Council in relation to lighting effects for their Replacement District Plan. He prepared the Auckland Council Sports Field Lighting Guidelines, including environmental lighting effects and he is a lighting advisor to the NZTA and to Auckland Transport.

He has been involved in a number of Resource Consent processes which included assessment of potential lighting effects on Biota other than humans. These include Amberfields, Hamilton (NZ

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long-tailed bat); Kennedy Point Boat Harbour, Waiheke Island (Little Blue Penguin) and Waikato Expressway, Tamahere to Cambridge (NZ long-tailed bat).

2.0 DOCUMENT HISTORY

The following documents are relevant to the review;

- Assessment of Environmental Effects (AEE) – Tonkin & Taylor – version 1 – dated 30/05/2019 (including a statement regarding lighting effects)
- Ecology Report – Tonkin & Taylor – version 1 – dated 30/05/2019
- Draft Ecological Management Plan – version 2 – dated 21/02/2020 (including a Bat Management Plan)
- Submissions – in relation to the Resource Consent application
- Draft Conditions of Consent

3.0 REVIEW

3.1 Auckland Unitary Plan

Within the AEE, the applicant has supplied the following statements in relation to lighting effects;

> *"Minimal low energy, low intensity, directional and controllable lighting. Lighting within the project footprint will be designed to meet the Auckland Unitary Plan permitted activity standards and WMNZ's requirements for safety. Lighting of the roundabout on State Highway 1 will have to meet NZTA requirements."*

I have considered the nature of the site and the proposed lighting as described. I am of the opinion that it will be practical to achieve compliance with Section E24.6.1 Lighting – General Standards, of the Auckland Unitary Plan (AUP).

The proposed draft Conditions of Consent will mandate compliance.

3.2 Effects on Humans

The principal matters to consider in terms of effects on humans for this application are;

- Residential Amenity – Light spill and glare
- Traffic Safety – Glare

3.2.1 Residential Amenity

The applicant hosted a night time site visit to the existing Redvale Landfill to appreciate the nature of lighting effects. The applicant advised that this will be indicative of the nature of lighting expected at the Wayby Valley site. The visit occurred at 6.00am onwards on 31/07/2020.

Our principal observations were that;

- Lighting on the site was not evident until I reached the main gates to the facility
- From the main gates, I could barely see lights at the top of the tip face. The main office and operational buildings were nearby and lighting effects were negligible-low. I note this refers to views from the main gates. Views from residential locations I would consider as nil-negligible.

A visit to the Wayby Valley site and surrounds was also attended on 11/09/2020 from 5:30pm to 7:30pm, to provide familiarisation and context. After dusk, I visited locations on site where I would expect the proposed lighting to have the greatest potential to be seen from beyond the site;

1. The highest road point on the site, (which will be near the eventual top of the tip face),
2. The location where the access road will terminate in operational buildings, and
3. The bin exchange location.

I observed that;

- At location 1: No lights were visible from this location, house or otherwise.
- At location 2: There were a few lights barely visible through foliage, all within approximately 10 degrees either side of north-west – in the general direction of Wellsford.
- At location 3: One house was visible from location 3. I understand that this house will be removed by the NZTA as part of new motorway works.

In locations where I could not see house lights, it follows that it is unlikely that any house would have a view of the proposed lighting in these locations. It is possible that some visibility may exist, more likely of the Operations Buildings than other locations, but given the separation distances and the proposed lighting design conditions as amended, any such effect would be negligible-low, in my opinion.

I have also viewed draft plans, supplied by the applicant on 08/09/2020, identifying areas that will potentially have visibility of the operational areas in the Wayby Valley site.

Based upon the information sighted, my observations on site, the proposed constraints on the lighting design and the exemplar lighting effects sighted at the Redvale site, I am of the opinion that glare effects will be negligible-low.

Boundary separation distances from proposed lighting installations will ensure that light spill effects are effectively nil.

3.2.2 Traffic Safety

The applicant proposes to light the roundabout at State Highway 1 to NZTA requirements. NZTA require compliance with their document M30 (Specification and guidelines for road lighting). M30 places restrictions on glare to motorists which, in my opinion, are sufficient to satisfy road safety requirements in that regard.

The access road will not be lit. This was clarified by Rachel Signal-Ross by email communication dated 21/08/2020.

The only other lighting in the vicinity of a public road will be operational lighting in the bin exchange area near State Highway 1. The applicant has advised that all lighting on site will comply with the AUP, which places restrictions on glare to motorists similar to those in M30.

Hence, in my opinion, glare to motorists will be adequately addressed and any effects will be negligible-low.

3.3 Effects on Biota other than Humans

While a number of species of fauna and flora have been identified as present or likely to be present on site, the only species that Mr Simon Chapman of Ecology New Zealand Ltd (Ecologist advising Auckland Council) considers to be important to assess in relation to artificial light effects is the New Zealand Long-tailed bat (LTB).

The LTB is a nocturnal species that is considered Threatened – Nationally Critical.

The applicant has provided a draft Ecological Management Plan which includes a Bat Management Plan. This in turn contains proposed lighting management measures.

I have reviewed the proposed measures in conjunction with Mr Simon Chapman and we are of the opinion that the measures proposed will generally be suitable to adequately manage lighting effects to the LTB.

I propose this be further reinforced by amendments to the Applicant's proposed draft Conditions of Consent as detailed later in this report.

4.0 SUBMISSIONS

Submissions were received by Auckland Council in relation to the Resource Consent application.

4.1 General Matters

A number of submissions raised concerns in relation to potential lighting effects, some generally referred to as light pollution (e.g. light spill and glare) and others citing potential degradation of star gazing conditions.

4.1.1 Light pollution

The applicant has advised that the lighting will comply with the AUP permitted activity requirements. Given the separation distance from any expected lighting on site to residential boundaries, in conjunction with the proposed nature of any such lighting and the proposed conditions of consent, I am of the opinion that this is readily achievable. For the reasons stated in section 3.2 of this report, in my opinion, lighting pollution will be negligible-low.

4.1.2 Star gazing

In my opinion any potential effects on star gazing will be minimal and quite localised. There could potentially be some effect to astronomical viewing at very low angles across the operational areas of the site and a very modest addition to sky glow effects above the site. The latter would

be most evident when there is a high moisture content in the atmosphere, which would correlate to occasions when atmospheric conditions are not favourable for star gazing regardless. On balance, it is my opinion that any such effects will be negligible-low.

4.2 Specific Matters

I note below various specific matters raised by submitters, with comments, in my opinion (IMO) shown in italics;

- Deborah Sarney – "Pollution – this includes light…"

  IMO – Light pollution effects will be negligible-low. Refer 4.1.1

- Christopher Hunter (#9918) – "Extensive lighting influencing our environment and reducing our dark sky which are culturally important, a scenic and scientific resource, and are critical for nocturnal species"

  IMO – The proposed lighting will be modest in scale and restricted to operational areas. Effects on the dark sky, humans and other biota will be negligible-low. Refer 3.2, 3.3, 4.1.1 & 4.1.2

- Craig Purvis (#9426) – "Extensive lighting influencing the environment and reducing our dark sky"

  IMO – Comments as for the previous submitter

- Matt Lomas (#9602) – "bed and breakfast businesses…enjoy dark skies over the Dome. Giving perfect star gazing opportunities…This will be spoilt, by the 24 hr operations, carting and processing rubbish under lights. Within direct view lines from Wellsford and surrounds."

  IMO – Effects on star gazing will be negligible-low. Refer 4.1.2 and previous comments

- Lynne Marie, Te Aniwa Tutara, Interim Secretary, Otakanini Huranui Marae Trust Board (#9891) – "Nuisances – …light…"

  IMO – Light pollution effects will be negligible-low. Refer 4.1.1

5.0 CONCLUSION

In my opinion, adverse effects of the proposed lighting will be negligible-low.

6.0 PROPOSED CONDITIONS

If Council is of a mind to grant consent, I recommend the following conditions be applied to the consent. Adjustments to the draft conditions proposed by the Applicant are shown with <u>underlining</u> (for my proposed additions) and ~~strikeout~~ (for my proposed deletions);

Lighting

Construction

1. *Within the site, when vehicle headlights are used, they shall be dipped (low beam) at all times*
2. *Exterior lighting on buildings, structures and temporary platforms (i.e. all exterior lighting other than vehicle mounted luminaires) shall be installed with zero upward tilt and produce no more than 1% direct upward light*

Operation

3. *Lighting of the SH1 roundabout shall comply with the relevant NZTA standards for lighting on State Highways. Luminaires shall be installed with zero upward tilt and produce no more than 1% direct upward light*
4. *Prior to any permanent exterior lighting being established within the WMNZ landholding, the consent holder shall provide a finalised lighting design ~~plan~~ to the satisfaction of Auckland Council in sufficient detail that demonstrates that:*
   a. *The proposed lighting meets the relevant permitted standards in Chapter E24 of the Auckland Unitary Plan.*
   b. *All permanent ~~elevated~~ exterior lighting ~~(mounted above ground)~~ is downward facing with zero upward tilt, emits zero direct upward light and is not located on the ridgelines (unless there is no practicable alternative or it is required for safety reasons)~~, and will have lighting shields (where appropriate)~~.*
5. *Within 2 months after installation of lighting, the consent holder shall provide a report from a suitably qualified lighting expert confirming that all lighting has been installed in accordance with the ~~approved~~ finalised lighting design plan prepared in accordance with condition XXX.~~ and complies with the permitted standards in Chapter E24 of the Auckland Unitary Plan.~~*
6. *Lighting within the site shall not be obtrusive and shall meet lighting standards (as outlined in condition XXX) so that glare and light spill is generally confined to the site to minimise sky glow effects on the surrounding environment.*
7. *Within the site, when vehicle headlights are used, they shall be dipped (low beam) at all times.*
8. *In order to minimise potential effects on fauna, particularly the New Zealand long-tailed bat (LTB), the following measures shall be adopted for all permanent lighting within the site;*
   a. *Nominal colour temperature of no more than 2700K*
   b. *Lighting shall be minimised while being sufficient for safe operation, in accordance with the recommendations of AS/NZS 1680.5:2012 (Outdoor workplace lighting) and the AS/NZS 1158 suite of standards (Lighting for roads and public spaces).*

I trust the foregoing is satisfactory. Please contact the writer if further information is required.

Yours faithfully,
LDP Limited

John Mckensey MIES
Executive Engineer

Technical Memo – Specialist Unit

To:	Mark Ross, on behalf of North West Resource Consenting Unit, Auckland Council
From:	Fiona Harte – Senior Specialist (Earth and Stream Works), Specialist Unit, Auckland Council
Date:	01/09/2020

1.0 APPLICATION DESCRIPTION

Application and property details

Applicant's Name:	Waste Management New Zealand Ltd
Application numbers:	LUC60339671 & LUS60339672 (BUN60339589)
Activity types:	Regional earthworks (land disturbance)
Purpose description:	Earthworks to facilitate the construction and operation of a proposed regional landfill
Site addresses:	1232 State Highway 1, Wayby Valley

2.0 INTRODUCTION, PROPOSAL, SITE AND LOCALITY DESCRIPTION

Reviewer Qualifications and Experience

2.1 I am employed as a Senior Specialist within the Earth, Streams and Trees Team of Auckland Council's Specialist Unit. I have been employed in the Specialist role since August 2016. In this role I primarily provide specialist input into resource consent applications, however, I also provide input to compliance teams regarding earth and streamworks matters.

2.2 Prior to this, I was employed as a Monitoring Officer by Auckland Council between the period of January 2013 and August 2016. In this role I was responsible for monitoring resource consents and undertaking compliance.

2.3 I hold a Postgraduate Diploma of Science in Environmental Management from the University of Auckland (2011), and a Bachelor of Science (majoring in Geography with a specialisation in Environmental Science) from the University of Auckland (2010).

2.4 As part of this assessment, I visited the site on two occasions to observe the proposed earthworks areas, and streams and wetlands located within the subject site.

Proposal relevant to this application

2.5 The applicant is seeking resource consent for earthworks in relation to the construction and operation of a landfill. A full description of the proposal is provided in the Assessment of Environmental Effects (**AEE**) for the application prepared by Tonkin & Taylor Limited and dated May 2019.

2.6 The following application documents are particularly relevant to this report and the earthworks consent applied for:

(a) Reports:

- *'Auckland Regional Landfill Assessment of Environmental Effects'*, prepared by Tonkin & Taylor Ltd, dated May 2019. (AEE)
- *'Auckland Regional Landfill Sediment and Erosion Control Report'*, prepared by Tonkin & Taylor Ltd, dated May 2019. (SECR)
- *'Auckland Regional Landfill Engineering Report'*, prepared by Tonkin & Taylor Ltd, dated May 2019. (Engineering Report)
- *'Auckland Regional Landfill Assessment of Aquatic and Terrestrial Ecological Values and Effects'*, prepared by Tonkin & Taylor Ltd, dated May 2019. (Ecology Report)
- *'Auckland Regional Landfill Water Quality Baseline monitoring report'*, prepared by Tonkin & Taylor Ltd, dated May 2019. (Baseline Monitoring Report)
- *'Stormwater and Industrial and Trade Activity'*, report prepared by Tonkin & Taylor Ltd, dated May 2019. (SWITAR)
- *'Draft Landfill Management Plan'*, prepared by Tonkin & Taylor Ltd, dated 30 January 2020.
- *'Auckland Regional Landfill – s92 response'*, letter from Rachel Signal-Ross (Tonkin & Taylor Ltd) to Warwick Pascoe (Auckland Council), dated 06 December 2019.
- *'Auckland Regional Landfill s92 response – Tranche 5'*, letter from Rachel Signal-Ross (Tonkin & Taylor Ltd) to Warwick Pascoe (Auckland Council), dated 20 February 2020.
- *'Removal of Stockpile 2 from the Auckland Regional Landfill resource consent application BUN60339589'*, letter from Simonne Eldridge (Tonkin & Taylor Ltd) to Warwick Pascoe (Auckland Council), dated 14 August 2020.
- *'Site Plan'*, drawing number ENG-01, revision 2, prepared by Tonkin & Taylor Ltd, dated August 2020.
- *'Draft Key Conditions of Consent – 25 August 2020'*, document prepared by Tonkin & Taylor Ltd and dated 25 August 2020.

- *'Hydrogeology addendum report'* email from Rachel Signal-Ross (Tonkin and Taylor Ltd) to Fiona Harte (Auckland Council), dated 28 August 2020; 4.22pm.

2.2 In brief:

(a) Earthworks for establishment and enabling works are proposed over an area of 41.4ha hectares. These works are proposed to be undertaken over four years (four earthworks seasons) and include earthworks to construct access roads and culverts, stockpile area, bin exchange area, clay borrow area, an engineered wetland and treatment ponds for the landfill operation.

(b) Earthworks are also proposed for ongoing operation of the landfill. The total landfill footprint is approximately 60ha (or 72 ha when including cut batters and a perimeter road). The landfill is proposed to be worked in approximately seven phases over a period of 35 years.

(c) Earthworks areas for the topsoil, stockpile 1 and clay borrow areas associated with the proposed landfill operation, total approximately 23ha.

(d) The applicant has proposed erosion and sediment controls that will generally be designed in accordance with best practice (GDO5), however, there are some discrepancies.

(e) An adaptive management regime has also been proposed to manage the earthworks and will include baseline monitoring of the receiving environment and an ongoing freshwater monitoring programme.

Site Description

2.7 The applicant provides a description of the site in section 4 of the AEE. In summary, the site contains a mix of rural farmland to the west and forestry plantation to the east. Many streams and wetlands dissect the site including those within a Significant Ecological Area (SEA), Natural Stream Management Area and Wetland Management Area overlays. The Hoteo River borders the western portion of the site and is classed as SEA. All the streams and wetlands located on site discharge to the Hoteo River located 2-3km away from the proposed earthworks. The Hoteo River ultimately discharges to the Kaipara Harbour and are both deemed sensitive receiving environments. The mouth of the Hoteo River within the Kaipara Harbour is classed as SEA-M2-5b for its mangroves and salt marsh areas and habitat for banded rail. The Kaipara Harbour contains many areas of SEA that recognise its intertidal banks as feeding ground for wading birds. One area in particular is classed as SEA-M1-174, where the Kaipara Harbour seagrass Meadows provide provision of habitat for a wide variety of plant and animal species and is the main source of juvenile Snapper for the west coast of the North Island.

2.8 The site as described by the applicant can be delineated into four areas and these are referred to in the AEE and SECR as:

- *The Western Block, comprising the western part of the WMNZ landholdings including Springhill Farm and including the Hōteo River along a portion of its western boundary;*

- *The Eastern Block, comprising an area of approximately 350 ha of plantation pine forestry. This area is predominantly steep ridges and valleys and includes the proposed landfill valley (Valley 1). A number of forestry access tracks run along the ridges;*
- *The Southern Block, comprising a strip of land between Springhill Farm to the north and the Sunnybrook Reserve to the south-east; and*
- *The Waiteraire Tributary Block, comprising an area of plantation forestry and native vegetation at the south eastern extent of the WMNZ landholdings.*

3.0 REASON FOR CONSENT – EARTHWORKS

3.1 Regional land use consent for earthworks is required under the provisions of Chapter E.11 Land Disturbance – Regional, of the Auckland Unitary Plan (Operative in Part) (**AUP**). Activities (A8) and (A9) in Activity table E.11.4.1 provides that general earthworks in the Rural Production Zones and on roads, greater than 2,500m^2 within the Sediment Control Protection Area and on land with a slope equal to or greater than 10 degrees, are to be assessed as a restricted discretionary activity.

3.2 The regional landfill application proposes earthworks over a total area of approximately 136 hectares (41.4ha for site establishment and 95ha for landfill operation). As such, the application requires regional consent with the proposed earthworks assessed as **restricted discretionary activity.**

3.3 Although the applicant has applied under the provisions of E11, the earthworks could be considered under E26 for infrastructure. However, the activity status would remain restricted discretionary and the objectives, policies and assessment criteria within E11 would still apply.

3.4 No earthworks are proposed within any SEAs.

4.0 TECHNICAL ASSESSMENT OF EFFECTS

4.1 This report provides a review of the earthworks and streamworks construction methodologies proposed for establishment and operation of the proposed regional landfill should it be granted consent. Although this report covers some aspects of the landfill operation, it is noted that the specific contaminated land aspects (including potential discharge of leachate) and operational stormwater/ industrial trade activity (ITA) assessment are addressed in separate reports from Natalie Webster and Arsini Hanna respectively, for the Council.

4.2 The applicant identifies and assesses the effects of the proposed earthworks activities on the environment that are likely to arise and any mitigating factors in section 9.6 of the AEE (section entitled “Erosion and Sedimentation”) and within the SECR and Ecology Report. The potential adverse environmental effects of the proposed earthworks activities are in relation to potential sediment discharges. In general, sediment can increase the turbidity within watercourses, make it difficult for aquatic organisms to locate food, clog fish gills, smother habitat and increase nutrient loading. The applicant’s ecologist has specifically identified the potential for smothering of stream substrates, impacts on banded kokopu and potentially kākahi (freshwater mussel).

Establishment and enabling earthworks

4.3 In order to manage the effects related to the potential sediment discharges associated with the earthworks, the applicant has provided an outline of the erosion and sediment controls proposed for each specific activity in the SECR, and further information was provided in their responses to requests for additional information (section 92 responses). The applicant's reports propose a variety of controls to be established across the site to minimise the potential for erosion to occur and for sediment to be discharged during the earthworks operation. The applicant has also proposed to undertake the earthworks in general accordance with Auckland Council's Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region, June 2016, Guideline Document 2016/005 (**GD05**) and adopt an adaptive management regime.

4.4 The specific earthworks activities proposed for establishment and enabling works are proposed over four years and include the construction of:

- Stockpile 1, topsoil stockpile and the clay borrow area.
- Landfill access road and bridge.
- Landfill ponds and engineered wetland.
- Bin exchange area.

A summary of the proposed earthworks is provided in table 1 below:

		Earthworks (ha)				
Catchment	Project works	Total earthworks	Year 1	Year 2	Year 3	Year 4
Upper Western Block - Wayby Wetland (South)	Landfill access Rd and topsoil stockpile	5	2.5	2.5	-	-
Lower Western Block – Wayby Wetland (South) Catchment	No works Proposed	-	-	-	-	-
Upper Western Block - Wayby Wetland (North)	Stockpile 1 and clay borrow	22	5	5	5	5
Southern Block - Access Road	Landfill access Rd & bin exchange area	11.4	4	4	1.7	1.7
Upper Waitaraire Stream	Stockpile 2 no longer proposed	-	-	-	-	-
Eastern Block Valley 1 (Landfill)	Engineered wetland and landfill ponds	3	-	-	-	3
Total		**41.4**	**11.5**	**11.5**	**6.7**	**9.7**

Table 1: Proposed earthworks activities and total earthworks areas including yearly breakdown.

4.5 These figures are slightly inaccurate as the stockpile 1 area was proposed to be increased by 2ha as a result of the removal of the stockpile 2 area originally proposed within the application. This means the total for the stockpile and clay borrow area increases from 20ha to 22ha and earthworks for the upper western block for each of the four years will be more than 5ha. If continued to be distributed evenly across the four construction years, this would equate to 5.5ha each year and an increase in the above totals for years 1-4 by 0.5ha.

4.6 The applicant has detailed the type of erosion and sediment controls that would be utilised for the proposed earthworks. The primary erosion and sediment controls that are proposed are detailed below:

1. Stabilised access ways which would reducing the risk of construction vehicles tracking sediment out onto the public or private roads.
2. Clean water diversions which would ensure that surface water is directed around the earthworks area so that clean water does not enter the area and contribute to the amount of water that needs to be treated on the site.
3. Progressive stabilisation of the earthworks and stabilisation of earthwork areas where they have not been worked for more than two weeks.
4. Minimisation of open areas by staging which would limit the area of earthworks open to erosion and subsequent sedimentation.
5. Decanting earth bunds (DEBs), silt fence and sediment retention ponds (SRPs) which would impound sediment laden water generated from the earthworks and provide treatment prior to its discharge to the receiving environment.
6. The use of flocculant (chemical treatment) for SRPs and DEBs is proposed to be considered.
7. Initial baseline monitoring of the receiving environment and ongoing construction monitoring of the receiving environment.

4.7 Although the applicant has detailed the type of erosion and sediment controls that would be implemented, site specific erosion and sediment control plans for each earthworks area that detail the exact selection and location of controls, has not been provided. The applicant has proposed to submit site specific erosion and sediment control plans prior to the commencement of works should the proposal be approved. While I am able to understand from the application documents how the earthworks would be managed, I recommended that a final set of erosion and sediment control plans (including site specific drawings) be provided to Council for approval prior to any earthworks or streamworks commencing at any given area of the site. This is to ensure that any plan which is to be implemented, includes the final specifications and exact location of controls which are to be utilised for that area. This will also allow Council to ensure that the final selection of erosion and sediment controls are

appropriate for each earthworks area.

4.8 The applicant stated in the SECR and in the s92 response dated 06 December 2019 (question 47), that chemical treatment will be considered for all SRPs and DEBs during the enabling works and landfill operation, wherever there is a need to maintain downstream water quality. Given the sensitivity of the receiving environment, it is considered imperative that downstream water quality is maintained. Further to that, rainfall activated chemical treatment of SRPs and DEBs is considered industry best practice and accords with GD05. The use of chemical treatment for SRPs and DEBs significantly increases the sediment removal efficiency of these devices and will help ensure that downstream water quality is maintained by providing the highest sediment removal efficiencies possible.

4.9 The use of chemical treatment was further questioned, and additional comment was provided within the s92 response dated 21 February 2020 (question 47). The applicant stated that although chemical treatment is standard practice, they have proposed an adaptive approach using ongoing monitoring to provide a feedback loop to confirm and evaluate the effectiveness of erosion and sediment controls measures. The applicant does not support the use of chemical treatment as a default requirement and have also stated that they do not support the continued discharge of chemicals to the environment if it is not necessary. I disagree with this approach and note that best practice, being the use of rainfall activated chemical treatment (flocculants), should be the starting point as opposed to in response to a monitoring regime. An adaptive management approach should not be used to justify a lower level of control or treatment to what is normally required by best practice.

4.10 It is also my opinion that the benefits of using chemical treatment within SRPs and DEBs, being a significant reduction in sediment yields, far outweighs the potential effects relating to residual chemical that may enter the receiving environment. Technical publications by the legacy Auckland Regional Council, TP 226 *Overview of the Effects of Residual Flocculants on Aquatic Receiving Environments*, and TP227 *The use of flocculants and coagulants to aid the settlement of suspended sediment in earthworks runoff trials methodology and design*, form the basis of Council's approach which in recent years has evolved to a requirement for rainfall activated chemical treatment of both SRPs and DEBs on earthworks sites.

4.11 TP226 concluded that *"…there appears to be a small risk to the natural aquatic environment arising from potential losses of unbound residual flocculants from treatment ponds on construction sites. Impacts are likely to be low level and also likely to not be significant in relation to other factors which govern the health of aquatic communities. The benefit of reduced sediment levels in discharges is considered to outweigh the risk of any low-level impacts attributable to residual flocculants"*.

4.12 In the trials undertaken for TP227, sediment removal efficiencies (reduction of suspended solids) of between 90 - 99% were observed for well-designed ponds. The study concluded that SRPs sized at 2% of their contributing catchment, would achieve a sediment removal efficiency of 69% without treatment and 93% with treatment; and for SRPs sized at 3% of their contributing catchment, a sediment removal efficiency of 81% without treatment, and 97% with treatment would be achieved. This demonstrates the substantial increase in sediment

removal that can be achieved by utilising chemical treatment.

4.13 In consideration of the above, I recommend that chemical treatment be a requirement for all SRPs and DEBs that would be utilised throughout the establishment and enabling works, and that a chemical treatment management plan (CTMP) be provided to Council for approval prior to commencement of any earthworks. The CTMP should include detail that outlines the specifications and design detail of a rainfall activated methodology, monitoring and maintenance, roles and responsibility and spill contingency plans. A bench testing regime should also be included which would detail the type of chemical and proposed dosing rate based on the soils being worked. This will ensure that the chemical is used sparingly and effectively whilst still providing for greater sediment removal efficiency.

4.14 The Dome Valley area receives higher than average rainfall and the proposed earthworks areas are within and adjacent to streams and wetlands which have associated floodplains. As the applicant hasn't provided detailed erosion and sediment control plans that show the exact location of where erosion and sediment controls will be placed, it is unclear whether the controls could be overwhelmed during engagement of adjacent floodplains. If flood waters can overtop and enter a SRP or DEB where located close to a stream, this could result in discharge of unmanaged and untreated sediment laden water. To address this risk, it is recommended that the final site specific ESCPs detail the location of proposed erosion and sediment controls in relation to adjacent floodplains. Where the level of floodplain is higher than the embankments of any bund associated with the controls (i.e. SRP, DEB or dirty water diversion), they should be re-designed or relocated to avoid inundation.

4.15 Some of the earthworks areas border SEA (i.e. the proposed bin exchange area). Where erosion and sediment controls are located adjacent to or abutting vegetation, their construction or placement can adversely affect that vegetation. For example, trenching to construct silt fence can sever tree roots within the rootzone of a tree which can extend outside of the SEA. The applicant stated in the section 92 response (question 50) dated 21 February 2020, that works near SEA will be minimised and works within the dripline of vegetation within a SEA will be avoided where possible. I note that a tree's rootzone can often extend beyond its dripline. As such I recommend that the site specific ESCP for the proposed bin exchange area include detail of how the applicant will manage earthworks, including the selection and placement or erosion and sediment controls within the rootzone of any vegetation located within adjacent SEA. This may also require arboricultural input.

4.16 Proposed staging over four earthworks seasons (being 01 October to 30 April in each year) has been proposed (as detailed in table 1 in section 4.4 above). In the section 92 response dated 06 December 2019 (question 53), the applicant stated that no limit was proposed at present, however, limiting open areas would be a key consideration during the works. However, the applicant has noted a total 'maximum bare earth (ha) during works' of 5.65ha in table 4.4 of the SECR when calculating sediment loads for the bin exchange area, main access road, stockpiles 1 & 2 and the clay borrow area. The maximum bare earth figures stated by the applicant have been used to calculate subsequent sediment yields and level of effect resulting from the proposed earthworks. In addition to this, the receiving environment is sensitive to sediment discharges and in a high rainfall area. The applicant also provided some further

figures regarding maximum exposed areas via email (*'Hydrogeology addendum report'* from Rachel Signal-Ross (Tonkin and Taylor Ltd) to myself, dated 28 August 2020; 4.22pm), however, these are not consistent with the USLE calculations which note a maximum area of 5.65ha. The applicant proposed general figures for maximum open areas for each of the catchments ranging between 2.5 and 5ha. However, during each earthworks season, multiples catchments are proposed to be worked meaning that the maximum exposed area could range between 9 and 14.5ha.

4.17 I believe it is necessary to limit open areas during the earthworks as a condition of consent to avoid ambiguity at the monitoring stage. I propose 6ha as the open area limit based on the applicant's SECR and proposed staging for each year as opposed to limiting the open area for each catchment to be worked. This means that no more than 6ha of earth would be exposed at any one time during the establishment and enabling earthworks. I believe this should be a realistic figure to work to over each of the four earthworks seasons without an evidence to the contrary, where for years one (11.5ha), two (11.5ha), three (10.45 ha) and four (9.7ha), the earthworks can be broken into a minimum of two stages during each earthworks season.

4.18 The applicant does not propose to undertake earthworks during winter, however, would like provision to allow winter earthworks subject to a 'winter works application' to Council (as stated in the section 92 response, question 48c). Council does provide for winter earthworks to occur and standard regional earthworks conditions allow for a winter earthworks application be provided to Council for consideration and approval. However, it is not guaranteed and in general, Council considers the consent holder's compliance performance, the scale and nature of earthworks proposed and their proximity to and the sensitivity of the receiving environment. In this case, the applicant is working within a catchment that is highly sensitive to sediment discharges, particularly cumulative sediment discharges from a range of activities within the catchment. The Dome Valley, as noted above, also receives higher than average rainfall. These factors mean that bulk winter earthworks would be a very high-risk activity within this site. I suggest that winter earthworks should only be undertaken where it is absolutely necessary or where the area of works is very small. For example, to complete an earthworks area that has fallen behind schedule and where left uncompleted could result in a significant hazard or sediment discharge (i.e. due to instability of an uncompleted batter slope), or where the area of earthworks is less than 2,500m^2 (this is below the regional consent threshold for earthworks). As such, I have included a winter earthworks approval condition in section 6 below that varies from the standard winter earthworks condition normally imposed by Council.

Operation of landfill

4.19 The Engineering report and draft Landfill Management Plan (LMP) prepared by the applicant detail the proposed operation of the landfill. Further information can also be found in the Stormwater and Industrial Trade Activity Report (SWITAR). The applicant proposes within the draft LMP to submit a final Erosion and Sediment Control Plan for Landfill Operation (ESCPO) prior to implementation. This will provide final details regarding staging and exact location and specification of controls. I support this approach and have included this requirement as a recommended condition below.

4.20 In summary, the proposed landfill operation involves:

1. Phasing of the landfill over approximately 7 phases, ranging 4.4 – 13.2ha (indicative).

2. Creation of 'cells' for deposition of refuse and restriction of the working area at the working face (typically 60m by 60m, or up to 80m by 80m for short periods).

3. Implementation of daily cover with earth material, intermediate cover with earth material and a final cap to be stabilised and planted on completion. The final cap is proposed to be undertaken progressively as an area is completed to final levels.

4. A series of sediment ponds and an engineered wetland to treat the landfill footprint's catchment. Localised controls are also proposed such as additional SRPs, silt fences, check dams and cut off drains.

5. The use of three additional earthworks areas, being stockpile 1, topsoil stockpile and the clay borrow area, established during the enabling works stage, to support the landfill operation in supplying soil for cell construction and cover material.

6. The use of SRPs designed at 3% of the contributing catchment areas (being $3m^3$ of impoundment volume per every $100m^2$ of contributing catchment) to treat sediment laden water generated from each of the stockpile and clay borrow areas where the SRPs will also be designed to contain extended detention storage to mitigate the potential effects of stream bank erosion (holding and releasing 95^{th} percentile storm depth as per Auckland Council Guideline Document (GD01): *Stormwater Management Devices in the Auckland Region*).

4.21 Operation within the landfill footprint has potential to mobilise sediment through the 'cell' construction including use of soil for daily, intermediate, and final cover. Sediment laden runoff is proposed to be treated by the on-site treatment system for the landfill (a series of sediment retention ponds and an engineered wetland). Although the applicant does not consider cell construction as part of the industrial trade activity assessment, all runoff will be directed to the on-site treatment system and is included in the calculations for this system. The effectiveness of this treatment system is assessed by Arsini Hanna and Andrew Rumsby for the Council and is not discussed further in this report.

4.22 The earthworks activities that would have the greatest potential to generate sediment throughout the operation of the proposed landfill are the stockpiling and clay borrow areas, including movement between these areas and the landfill. The applicant proposes to manage sediment discharges from each of these areas with sediment retention ponds sized at 3% of the contributing catchment. This information was provided in the Stormwater and Industrial Report. A SRP for each of these areas is shown on the site plan within the SWITAR.

4.23 Through email (*'RE: Hydrogeology addendum report'* from Rachel Signal-Ross (Tonkin and Taylor Ltd) to myself, dated 28 August 2020; 4.22pm), the applicant proposed to limit the maximum exposed area across the stockpile 1 and clay borrow areas during landfill operation to no more than 5ha, however, this did not include the topsoil stockpile area. I support this approach and have used this figure to provide clarity on expectations regarding exposed area during landfill operations via a condition of consent and I believe a limit of 5ha is a realistic expectation for the stockpile area, clay borrow and topsoil stockpile areas. Without a limit, total exposed areas could theoretically reach the maximum extent of these areas, although it is unrealistic to expect that that the landfill would require the full extent of the stockpile and clay borrow areas to be exposed at any one time.

4.24 The applicant assumes a total area of 3.4ha in the USLE calculations for the landfill footprint, however, I would expect the area of exposed soil to be significantly less than this when considering the nature of landfill operations. I have not included a recommended condition of limiting open area regarding the landfill footprint and instead recommend that detail reading the extent of earthworks areas within the actual landfill footprint be provided in the final LMP and ESCPO. This is because the production of sediment from the landfill activity itself is a much lower risk and that landfill operations requiring earthworks (use of clay and topsoil) are innately worked in a staged manner across multiple small areas.

Adaptive Management Regime

4.25 The applicant has also proposed an adaptive management regime to manage the proposed earthworks for both establishment and operation of the landfill. Adaptive management is defined in section J of the AUP:OP as *"a systematic, iterative process of decision making in the face of uncertainty, with an aim of reducing uncertainty over time through system monitoring and changes to management in response to the results of monitoring".* An adaptive management regime is deemed appropriate in this instance due to the sensitivity of the receiving environment. This means that even where best practice measures (GD05) are being implemented, changes in methodologies can occur as part of the feedback loop when monitoring indicates that the earthworks are generating or will potentially generate significant adverse effects. For adaptive management to be successful, the regime will rely heavily on setting appropriate threshold trigger levels as part of the monitoring, and detail the types of responses and actions that will be undertaken as part of the feedback loop that go above and beyond any standard maintenance measures such as those detailed in GD05.

4.26 The applicant has not provided a detailed Adaptive Management Plan (AMP) as part of the application material. The applicant has offered to submit an AMP to Council prior to works commencing to allow time for further baseline monitoring of the receiving environment to be completed which will inform the determination of appropriate trigger levels and management responses subject to eth approval of Auckland Council. Information of the proposed adaptive approach can be found within the SECR, SWITAR, LMP and the s92 responses dated 06 December 2019 and 21 February 2020. The following measures have been proposed to be included in the AMP:

1. Completion of baseline monitoring prior to works which will aid in setting

appropriate trigger levels based on deviation from baseline conditions.

2. Monitoring of the receiving environment during the earthworks for both the establishment and enabling works, and operation of the landfill.

3. Tiered trigger levels – where level 1 is a warning that a significant adverse effect may occur if no action is taken, and level 2 is described as a firm indication that significant adverse effects or breaches of consent requirements have occurred.

4. Responses to address trigger level exceedances. This includes stabilisation of open areas to reduce further potential for sediment generation, minimising opening of new areas, implementation of additional controls and reviewing the use of chemical flocculants and performance. (Note that the use of chemical treatment and my recommendation regarding this is discussed in sections 4.7 – 4.12 above).

4.27 I believe a key requirement that should be included in an adaptive management response for earthworks, is the ability to close open areas, thereby addressing the main source of sediment generation. The applicant included stabilisation of open areas as a response action in their s92 response dated 21 February 2020 (question 55) and I support this approach. I recommend that this detail be included in the AMP.

4.28 Stabilisation of all or part of an exposed area when heavy rain is forecast is an effective way to reduce sediment discharges. It is during large rain events that the sediment removal efficiency of a SRP, DEB or silt fence is compromised. Being proactive with weather forecasting and stabilising open areas prior to these events will be key in managing sediment discharges to the receiving environment. Other large earthworks sites within Auckland contain weather stations on site and have the ability to receive alerts by email or text in order to proactively respond to large rainfall or storm events. As such, I recommended that the proactive use of weather forecasting and stabilisation of some of the earthworks areas prior to these events is included as an action within the AMP.

4.29 The applicant was questioned on whether they would use automated samplers on any SRPs. Automated sampling is more efficient than manual sampling and can accurately record the efficiency of a SRP. Manual sampling can be difficult especially during heavy rain or storm events where health and safety requirements mean that sampling may not be undertaken at the time of discharge. Due to the site being in a high rainfall area and considering the sensitivity of the receiving environment, I recommend that the use of automated sampling for SRPs be included in the AMP.

4.30 I summary, I support the adaptive management approach proposed by the applicant. I recommend a final AMP be submitted to Council for approval prior to any earthworks commencing. A freshwater monitoring regime should also form part of the AMP including sufficient baseline monitoring data of the receiving environment. This means the applicant will need to have undertaken sufficient monitoring of the receiving environment to develop baseline parameters and trigger levels prior to finalising the AMP for Council approval and

prior to works commencing.

4.31 The applicant's ecologist has specifically noted the potential for Kākahi (freshwater mussel) to be present on site and their sensitivity to sediment discharges. However, as Kākahi need sediment to bury in, some of the hard-bottomed streams on site are unlikely to contain Kākahi. If Kākahi are present within any of the stream reaches on site, there is potential for chronic discharges of sediment to cause a decline in their population. As such, I recommend that in stream surveys be undertaken prior to works commencing in areas identified as being suitable for freshwater mussel to establish. If any Kākahi populations are found in the survey, the populations should be monitored throughout the duration of earthworks. I recommended that this be included as part of the final AMP where the applicant can detail potential actions should kākahi be identified and a decline is recorded through ongoing monitoring i.e. relocation or additional erosion and sediment controls.

Methodologies for works within streams and wetlands

4.32 Stream and wetland works methodologies are included in this assessment as they coincide closely with the proposed establishment and enabling earthworks and require consideration of the practices recommended in GD05. Stream and wetland works are proposed to be undertaken during the establishment and enabling works for the proposed landfill. These include:

- Extensive stream and wetland reclamation.
- Construction of several culverts including a large culvert construction of approximately 105m in length (tributary stream crossing).
- Bridge construction (Waiteraire Stream crossing).
- Regrading of stream banks.

4.33 The applicant has not provided detailed construction methodologies for these activities despite them being requested as part of the section 92 process. The applicant did however, provided a draft outline of how these works would be undertaken within the section 92 response dated 06 December 2019 (question 59). This included:

- Adherence to GD05 chapter G4; works within a watercourse.
- Works to be undertaken in dry weather and during periods of low stream flow.
- Upstream flows will be dammed and diverted or pumped around the work areas.
- Silt fences to be placed downstream of works.
- Native fish capture and relocation prior to dewatering (discussed in a separate report by Mark Lowe, Freshwater Ecologist for Council).
- Exposed surfaces stabilised as works completed and in advance of heavy rain.
- Stream beds restored to the natural profile (where bed is to be retained).
- Refuelling and machinery kept out of stream bed and floodplains.

4.34 Although a detailed methodology has not been provided, dam and divert methodologies based on the guidance of GD05 are considered best practice to undertake works within streams or wetlands. The applicant's proposed methodology adheres to best practice except for one aspect, being the placement of silt fence downstream of the works. Silt fence within a stream will require additional stream bed disturbance for it to be installed and as a dam and divert

methodology is proposed, silt fence downstream of the works area provides no value as non-erodible dams would be placed at both the upstream and downstream extent of the work areas.

4.35 If the applicant adheres to best practice methodologies, by undertaking native fish capture and relocation, dewatering the stream or wetland, diverting water around the works areas and keeping a dry construction area, potential sediment discharges to the downstream environment can be minimised, if not prevented altogether. As such, I recommend that Site Specific Stream and Wetland Management Plans be provided for approval prior to commencement of works for each specific activity. These plans shall expand upon the indicative methodology provided by the applicant and provide details regarding timing and duration, machinery and operational requirements, stabilisation methods both during and after the works, and the exact location, sizing, dimensions and capacity of proposed controls

4.36 I also note that the proposed culvert crossing would total approximately 105m in length. Concerns regarding the suitability of a culvert of this length in a stream (as opposed to a bridge) has been raised by multiple Specialists from Council. The culvert is proposed in a very large and steep stream gully with high ecological value. As a result, a long culvert length would be required to create large batter slopes either side of the proposed crossing. This area will be very difficult to work in and will require significant stream diversions or pumping, provided a pump can be sought that has capacity to pump the upstream flows around the works area. I also consider that a bridge would be a far better option. In addition to no stream bed loss or modification, a bridge would eliminate the risk and difficulty associated with construction of a culvert in this steep stream gully. I also note that the volume of fill required to fill the gully could be more valuable to the proposed landfill as cover material.

Sediment loading of the receiving environment

4.37 In order to understand the level of effects of sediment discharges on the receiving environment, the applicant has calculated sediment loads as a result of the proposed works and the percentage increase from the baseline scenario, being the existing environment which includes farming and forestry environments.

4.38 The applicant has used the EIANZ guideline, Ecological Impact Assessment (EcIA) (2018) to assist in determining the level of effect from potential sediment discharges. In the SECR, the applicant has concluded that the magnitude of potential sediment discharges is low, where a low magnitude is described by the guideline as *"Minor shift away from existing baseline conditions. Change arising from the loss/alteration will be discernible, but underlying character, composition and/or attributes of the existing baseline condition will be similar to pre-development circumstances or patterns; AND/OR Having a minor effect on the known population or range of the element/feature"*. I agree that earthworks that are managed appropriately should not result in a magnitude of effect greater than low. The Ecology report concludes the ecological value of the receiving environment is high to very high, and when combined with a low magnitude of effect, results in a low to moderate level of effect following proposed mitigation measures.

4.39 For the establishment works, the estimated sediment increases within the immediate catchments on site (identified as Southern Wetland, Northern Wetland, Southern Valley and Landfill) as a result of the establishment and enabling works, averages 9% based on mitigation measures with sediment removal devices that have an overall sediment removal efficiency of 75%. I acknowledge that greater efficiencies from sediment retention devices can be obtained where SRPs can achieve over 90% efficiency. The applicant has also provided figures based on 95% sediment removal efficiency which would result in less than a 1% increase of sediment within each of the immediate catchments proposed to contain earthworks. However, the applicant has not proposed SRPs to treat all of the earthworks areas, and during large rainfall events the efficiency of SRPs can decrease. In the SECR, the applicant states that SRPs will be utilised for construction within the landfill valley, landfill access road bridge and bin exchange area. However, DEBs are noted as the likely sediment control within the landfill access road area and the clay borrow and stockpile areas. The applicant believes that due to site catchment constraints within the stockpile and clay borrow areas, SRPs will not be viable, although SRPs are not ruled out. As such, I am more comfortable relying on conservative calculations that use a 75% removal efficiency, but I do acknowledge that greater efficiencies will be achieved for some of the earthworks areas. A final set of USLE calculations prior to works commencing and once SSESCPs have been prepared, will assist in narrowing down sediment yields based on the final selection of sediment controls. I have recommended that updated USLE calculations are provided within the final SSESCPs and to ensure that once the SSESCPs are finalised, sediment yields are no greater than proposed within the application material. I also note that the DEBs could be upgraded though their design to provide for a higher sediment removal efficiency where SRPs cannot be built, for example; a DEB with the addition of a forebay and level spreader essentially creating a mini SRP.

4.40 Although this report does not cover the treatment system for the proposed landfill footprint, I note that for the landfill operation, the applicant has estimated sediment loads of approximately 144 t/km^2/annum, based on the proposed treatment from a sequence of sediment ponds. This calculation did not include sediment removal from the engineered wetland as this will only provide treatment in rain events over the 95th percentile. As such, the applicant has overestimated the sediment load in this regard. In comparison, the current baseline sediment loads from the site have been estimated by the applicant as 139 t/km^2/annum. This means the percentage increase in sediment load from the landfill areas current baseline is estimated by the applicant as approximately 3.5%, or less when considering treatment from the engineered wetland.

4.41 In an email (*'RE: Hydrogeology addendum report'* from Rachel Signal-Ross (Tonkin and Taylor Ltd) to myself, dated 28 August 2020; 4.22pm), the applicant provided ongoing percentage sediment increase for the northern wetland catchment (clay borrow and stockpile area). This proposed a less than 1% increase in sediment over the baseline scenario based on a 95% sediment removal efficiency throughout the earthworks. Based on the proposed SRP for each stockpile and clay borrow area, the maximum open area is limited of 5ha, my recommendations regarding chemical treatment and the ongoing adaptive monitoring regime, I believe a 95% sediment removal efficiency is appropriate.

4.42 In consideration of the above points, my main concern regarding sediment loads is discharge

to the immediate receiving environment, being the streams and wetlands onsite with high ecological value and excellent water quality. These habitats will include some freshwater species that are adapted to these conditions and in general, less tolerant of sediment than other native freshwater fish and fauna. In particular, the applicant's ecologist identified impacts on banded kokopu, and potentially kākahi (which have been found in the wider catchment), which are particularly sensitive to sediment.

4.43 The applicant's proposed adaptive management regime would assist to monitor the adverse effects of sediment and implement management responses to further reduce and manage these discharges. For potential kākahi, which are particularly sensitive to sediment, I recommend that the applicant survey downstream of each discharge point prior to earthworks commencing. Where kākahi populations are identified during the survey, monitoring of these populations should be included within the final AMP. This means that should a decline in their population be recorded through monitoring, relocation or changes to the erosion or sediment controls can be undertaken to reduce impacts on identified populations.

Submissions

4.44 I have reviewed the submissions for the proposed land fill application and note four key themes throughout the submissions that are relevant to the proposed earthworks:

1. General concern regarding sediment discharge to the receiving environment.

2. Concern specifically relating to sediment discharges to the Hoteo River and Kaipara Harbour (being sensitive receiving environment), noting the importance of seagrass within the harbour to support juvenile snapper populations and other marine life.

3. Concern relating to flooding and above average rainfall events that will lead to sediment discharges.

4. General note that the proposed earthworks are inconsistent with the National Policy Statement for Freshwater Management (NPS:FM).

Point 1 is covered in general by this assessment and points 2-3 have been addressed in the sections above (4.14 and 4.37-4.43). Regarding the NPS:FM (amended 2017), the objectives and policies assessment primarily form part of the planner's assessment, however, I believe the following objectives are most relevant to the regional earthworks application:

Objective A1
To safeguard:

a) the life-supporting capacity, ecosystem processes and indigenous species including their associated ecosystems, of fresh water;

b) the health of people and communities, as affected by contact with fresh water; in sustainably managing the use and development of land, and of discharges of contaminants.

Objective A2

The overall quality of fresh water within a freshwater management unit is maintained or improved while:

a) protecting the significant values of outstanding freshwater bodies;

b) protecting the significant values of wetlands; and

c) improving the quality of fresh water in water bodies that have been degraded by human activities to the point of being over-allocated.

Objective A3

The quality of fresh water within a freshwater management unit is improved so it is suitable for primary contact more often, unless:

a) regional targets established under Policy A6(b) have been achieved; or

b) naturally occurring processes mean further improvement is not possible.

4.45 I also note that a new NPS:FM becomes effective as of 3rd September 2020 and is also relevant to this application. Regarding the NPS:FM (2020), I believe the provisions below are relevant the earthworks assessment. Note that although I consider policy 1 and 2 relevant, my assessment does not cover effects on mana whenua:

2.1 Objective

(1) The objective of this National Policy Statement is to ensure that natural and physical resources are managed in a way that prioritises: (a) first, the health and well-being of water bodies and freshwater ecosystems

(b) second, the health needs of people (such as drinking water)

(c) third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.

2.2 Policies

Policy 1: *Freshwater is managed in a way that gives effect to Te Mana o te Wai.*
Policy 2: *Tangata whenua are actively involved in freshwater management (including decision-making processes), and Māori freshwater values are identified and provided for.*
Policy 3: *Freshwater is managed in an integrated way that considers the effects of the use and development of land on a whole-of-catchment basis, including the effects on receiving environments.*
Policy 4*: Freshwater is managed as part of New Zealand's integrated response to climate change.*
Policy 5: *Freshwater is managed through a National Objectives Framework to ensure that the health and well-being of degraded water bodies and freshwater ecosystems is improved, and the health and well-being of all other water bodies and freshwater ecosystems is maintained and (if communities choose) improved.*
Policy 8: *The significant values of outstanding water bodies are protected.*
Policy 9: *The habitats of indigenous freshwater species are protected.*
Policy 12: *The national target (as set out in Appendix 3) for water quality improvement is achieved.*
Policy 13: *The condition of water bodies and freshwater ecosystems is systematically monitored over time, and action is taken where freshwater is degraded, and to reverse deteriorating trends.*

4.46 Given the level of sediment increases predicted for this proposal, I consider that the adverse

effects resulting from potential sediment discharges from this earthworks proposal, will be to the streams and wetlands located on site (immediate receiving environment) as opposed to the ultimate receiving environment (Kaipara Harbour). The applicant has described the immediate receiving environment, being many of the streams and wetlands on site, as having high ecological values with macroinvertebrate scores indicative of excellent water quality. I consider that the level of effects from sediment discharges to the immediate receiving environment will be low given the full implementation of mitigation measures and an adaptive management regime (including my specific recommendations discussed in the sections above), and as such the applicant should be able to manage the earthworks to ensure consistency with both versions of the NPS:FM.

Conclusion

4.47 Although detailed erosion and sediment control drawings have not been provided with the application, the detail within the SECR and LMP is sufficient to demonstrate how the applicant would manage the effects relating to potential sediment discharges resulting from the proposed earthworks, including implementation of an adaptive management regime.

4.48 The Hoteo River and Kaipara Harbour are sensitive receiving environments that are already under stress from sediment discharges related to land development, stream bank erosion, forestry & farming activities, and highly erodible soils. Many of the streams and wetlands proposed to be retained at the subject site contain high ecological values and contain aquatic fauna that is sensitive to sediment discharge. The applicant has calculated estimated sediment loads within the immediate catchments resulting from the proposed earthworks. Comparisons against the baseline sediment loads are also provided. The applicant has calculated that the percentage increases within the immediate catchments will be small. As such, it is not expected that large quantities of sediment will be deposited in the Kaipara Harbour that would lead to significant adverse effects within the Harbour. In Addition to this, I have recommended further measures in this report that will further mitigate the potential adverse effects that would result from the proposed earthworks.

4.49 Should the proposed landfill be granted consent, provided the erosion and sediment controls are installed, constructed and maintained in accordance with the application documents, any additional requirements as deemed necessary by the guidance outlined in GD05, my specific recommendations, along with the adaptive management regime, I consider the sediment discharges generated during the earthworks can be managed appropriately to maintain a low level of effect.

5.0 STATUTORY CONSIDERATIONS

Objectives and Policies of the AUP

5.1 The relevant regional land disturbance objectives and policies are found in sections E11.2 and E11.3 of the AUP (Objectives 1-3 and Policies 1-8). These objectives and policies seek to ensure that earthworks are undertaken in a manner that protects people and the environment, does not exacerbate natural hazards and minimises sediment generation.

5.2 Chapter E1 of the AUP for objectives and policies pertaining to water quality is also considered relevant.

Other Statutory documents

5.3 The following statutory documents are considered relevant to the planner's assessment of the application:

AUP Regional Policy Statement (AUP RPS)

1. Chapter B7, Natural Resources of the AUP RPS is considered relevant as the objectives and policies in section B7.4 seek to ensure the progressive improvement of degraded coastal water, the quality of good or excellent coastal water is maintained and that any adverse effects are avoided, remedied or mitigated.

New Zealand Coastal Policy Statement 2010 (NZCPS)

2. As the ultimate receiving environment of the proposed activity is the CMA of the Kaipara Harbour, the NZCPS is considered relevant to these applications. The NZCPS seeks to protect the coastal environment and its special values and states that adverse effects of development should, as far as practicable, be avoided. As potential discharges from the development will ultimately reach the CMA, this statutory document is considered relevant.

National Policy Statement: Freshwater Management 2014 (amended 2017)

- As the applications relate to works adjacent to and within streams and wetlands, the NPS Freshwater Management is considered relevant to this application. Objectives of the NPS: Freshwater Management centre on safeguarding the life supporting capacity, ecosystem processes and indigenous species of water bodies in terms of water quality and quantity.

National Policy Statement: Freshwater Management (effective 3rd September 2020)

- A new NPS for Freshwater Management becomes effective on 3rd September 2020 and is considered relevant to this application. The objective of the NPS: Freshwater Management (2020) centres on ensuring the natural and physical resources are managed to prioritise the health and well-being of water bodies and freshwater ecosystems, the health and needs of people and the ability of people and communities to provide for their social, economic, and cultural well-being.

6.0 RECOMMENDATION AND CONDITIONS

Adequacy of information

6.1 The above assessment is based on the information submitted with the Application, including all subsequent information. It is considered that the information submitted is sufficient to enable the consideration of the above matters on an informed basis:

a. The level of information provides a reasonable understanding of the nature and scope of the proposed activities as they relate to the relevant planning documents.

b. The extent and scale of any potential adverse effects on the environment can be understood and assessed, however detail around the final works approach is incomplete and further recommendations have been made to bridge the information gaps.

Recommendation

6.2 The assessment in this memo does not identify any reasons to withhold consent, and the aspects of the proposal considered by this memo could be granted consent, subject to recommended conditions, for the following reasons:

a. The expected level of effect is low within the immediate receiving environment. It is unlikely that the sensitivity of the receiving environment to the potential adverse effects of sediment discharge will be compromised given the expected level of discharge, suitable control technologies, appropriate on-site management techniques and adaptive management regime; and

b. Subject to the imposition of consent conditions, it is considered that the potential effects on the receiving environment will be appropriately managed.

Conditions

6.3 The applicant has provided a draft set of key conditions that are generally consistent with Council's standard earthworks conditions and have subsequently been incorporated into my recommended conditions below, however, some amendments have been made.

6.4 I have amended or adopted the following key draft conditions provided by the applicant that relate to sediment discharges and have included tracked changes separately for reference in appendix two to this memo:

- Draft condition 51 has been adopted with minor changes in condition **X2**.
- Draft condition 52 requiring a sediment monitoring programme has not been adopted. Conditions **X18** – **X23** regarding an adaptive management plan replaces this condition.
- Draft condition 53 has been mostly adopted with the removal of the word "general" in condition **X3.** (Condition **X3** combines draft conditions 53 and 54)
- Draft condition 54 has been mostly adopted in condition **X3** with removal of "beyond the boundaries of the site", replaced with "to receiving water bodies". The term "beyond the boundaries" is not appropriate as the streams and wetlands located on site are the immediate receiving environment.
- Draft condition 55 has been mostly adopted with some edits in condition **X4**.
- Draft condition 56 has been adopted in condition **X9**.

- Draft condition 57 has been mostly adopted with the removal of "no less than monthly" in condition **X14**. I do not consider monthly to be regular.

- Draft conditions 76-78 have been partially adopted with amendments and are reflected by recommended conditions **X27 – X29** . This includes the incorporation of works within a wetland.

- Draft condition 174 has been mostly adopted with a minor edit in condition **X43**.

- Draft condition 175 and 176 have not been adopted. I find these conditions unclear as earthworks for ongoing operation of the proposed landfill will be required all year round and should not need winter approval. I have recommended standard erosion and sediment control certification and maintenance conditions separately for both initial site construction works and landfill operation.

- Draft condition 221 has been adopted with edits in conditions **X31**. This includes inclusion of a time frame for submission of the plan to Council and the removal of "beyond the boundaries of the site", replaced with "to receiving water bodies".

- Draft condition 222 has been mostly adopted with edits in condition **X32**.

- Draft condition 223 has not been adopted. Monitoring is covered by the AMP conditions **X18 – X23**.

- Draft condition 224 has been somewhat adopted with edits in condition **X36**.

6.5 I have also included additional conditions as per my recommendations above regarding winter earthworks, adaptive management and staging of exposed areas. Standard earthworks conditions regarding monitoring and maintenance, stabilisation, implementation and compliance with the standards are also included. The inclusion of these conditions is consistent with similar earthworks operations for which consent has been granted in the Auckland Region, and the wider site, and will ensure that the effects of the proposed earthworks will be appropriately managed.

General conditions

6.6 **The following general conditions are recommended:**

- S36 and charges;
- consent expiry;
- access to the site; and
- works undertaken in accordance with the plans.

6.5 The following additional conditions are recommended:

Erosion and Sediment control for Initial Site Construction Works

Pre-commencement meeting

X1. Prior to the commencement of the initial site construction works, the consent holder shall hold a pre-start meeting for the earthworks activity that:

- is located on the subject site
- is scheduled **not less than five days** before the anticipated commencement of earthworks
- includes Auckland Council Compliance Monitoring officer[s]
- includes representation from the contractors who will undertake the works

The meeting shall discuss the erosion and sediment control measures, the streamworks and earthworks methodologies, the adaptive management regime and shall ensure all relevant parties are aware of and familiar with the necessary conditions of this consent.

The following information shall be made available at the pre-start meeting:

- Timeframes for key stages of the works authorised under this consent;
- Resource consent conditions;
- Construction Erosion and Sediment Control Plan
- Site Specific Erosion and Sediment Control Plans;
- Chemical Treatment Management Plan; and
- Adaptive Management Plan.

A pre-start meeting shall be held prior to the commencement of the earthworks activity in each period between October 1 and April 30 that this consent is exercised.

Advice Note:

To arrange the pre-start meeting please contact the Council to arrange this meeting on monitoring@aucklandcouncilgovt.nz, or 09 301 01 01. The conditions of consent should be discussed at this meeting. All additional information required by the Council should be provided 2 days prior to the meeting.

Construction Erosion and Sediment Control Plan

X2. At least three months prior to the Construction Commencement Date, the consent holder shall submit to Auckland Council for certification, an updated Construction Erosion and Sediment Control Plan (CESCP) for the initial site construction works, prepared in general accordance with the 'Construction Erosion and Sediment Control Plan', prepared by Tonkin + Taylor, dated May 2019. The purpose of the CESCP is to provide a framework of controls for the construction earthworks to avoid, remedy and/or mitigate the potential adverse effects on the receiving environment, including measures to ensure sediment generation is minimised and the works are conducted in accordance with best practice.

Site Specific Erosion and Sediment Control Plans

X3. Prior to the Commencement of earthworks for each stage of the initial site construction works, a Site Specific Erosion and Sediment Control Plan (SSESCP) shall be prepared by a suitably

qualified person in accordance with Auckland Council Guideline GD05, Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region and the CESCP. The consent holder shall submit the SSESCP to Auckland Council at least two months prior to the commencement of that stage of works. The purpose of the SSESCP is to set out the specific measures to be implemented during construction to minimise erosion and the discharge of sediment to receiving water bodies.

X4. The SSESCP shall include the following information as appropriate to the scale, location and type of earthworks:

a. The location and total area of earthworks, including catchment boundaries and contour information;
b. Details of construction methods to be employed, including timing and duration;
c. The volume of earthworks. This is to include details of the volumes to be excavated, stockpiled, re-used and disposed of off-site;
d. The location of erosion controls of the types described in GD05 (e.g. perimeter control such as a clean water diversion bunds) and any other controls;
e. The location of sediment controls of the types described in GD05 (e.g. silt fence along low point of site where surface water will discharge from site or around stockpile areas) and any other controls;
f. Supporting calculations for erosion and sediment controls including updated USLE calculations and estimated sediment loads;
g. Staging of the earthworks including details of progressive stabilisation of exposed areas for each stage;
h. Key responsibilities for implementing and maintaining the controls detailed in the SSESCP during the project;
i. The location of site entrance points and means to control tracking of sediment off-site;
j. The frequency and responsibility for monitoring the effectiveness of controls, downstream water quality, and the undertaking of any maintenance on controls;
k. The details for decommissioning controls;
l. Contingency plans in case of unexpected sediment discharges during works and to respond to extreme weather events;
m. Detail of the location of erosion and sediment controls in relation to flood plains and how flood risk will be managed;
n. Specific detail of how erosion and sediment controls will avoid adverse effects to vegetation where earthworks are located adjacent to and within the rootzone of SEA vegetation.
o. Drawings showing items a, c, d, e, g, m and n above.

Chemical Treatment Management Plan

X5. Prior to the commencement of any earthworks at the site, a Chemical Treatment Management Plan (CTMP) shall be submitted for the written approval of the Council, that details how all impoundment devices utilised throughout the enabling and establishment, shall be treated. The plan shall include as a minimum:

a) Specific design details of the chemical treatment system based on a rainfall activated methodology for the site's sediment retention ponds and decanting earth bunds;

b) Monitoring, maintenance (including post storm) and contingency programme (including a record sheet);

c) Bench testing results;

d) Details of optimum dosage (including assumptions);

e) Results of initial chemical treatment trial;

f) A spill contingency plan; and

g) Details of the person or bodies that will hold responsibility for long term operation and maintenance of the chemical treatment system and the organisational structure which will support this system.

X6. No earthworks for each stage of the initial site construction works shall commence until written certification for the CESCP, CTMP and relevant SSESCP has been provided from Council as required by conditions **X2, X3** and **X5** above.

X7. All decanting earth bunds, sediment retention ponds and any other authorised impoundment devices, shall be chemically treated in accordance with the approved Chemical Treatment Management Plan (CTMP). Any amendments to the CTMP shall be submitted in writing to Council, for written certification prior to implementation.

Seasonal Restriction

X8. No earthworks for the initial site construction works shall be undertaken between 01 May and 30 September in any year, without the prior written approval of the Council. Revegetation/ stabilisation is to be completed by 30 April in accordance with measures detailed in GD05 and any amendments to this document.

Winter Earthworks shall only be considered for approval by the Council in the following scenarios:

- Completion of a specific earthworks area is required to prevent a specific risk or hazard which may result in sediment discharge, or harm to people or the environment if left un-completed.
- Where irregular climate conditions allow for earthworks to be completed throughout prolonged periods of dry weather.
- Where an area of less than 2,500m^2 is proposed to be worked at any one time.

Erosion and sediment controls certification

X9. Prior to any earthworks commencing within a works area for each specific stage or activity for the initial site construction works, a certificate signed by an appropriately qualified and experienced person shall be submitted to the Council, to certify that the erosion and sediment controls have been constructed in accordance with the approved SSESCP required by **condition X4** and Auckland Council Guideline GD05. Certified controls shall include but not be limited to the sediment retention ponds, decanting earth bunds, clean and dirty water diversion bunds, stabilised construction entrances, silt fence and super silt fence. Information supplied, if applicable, shall include:

a) Contributing catchment area;

b) Shape and capacity of structures (dimensions of structure);

c) Position of inlets/outlets;

d) A statement that the erosion and sediment control measures have been constructed in accordance with Auckland Council Guideline GD05; except where a higher standard is detailed in the documents referred to in the CESCP required by condition **X3,** in which case the statement shall confirm that the higher standard has been constructed.

X10. The sediment and erosion controls for each stage of the initial site construction works shall be inspected on a regular basis, and within 24 hours after each rainstorm event that is likely to impair the function or performance of the control measure. A record shall be maintained of the date, time and extent of any inspection, maintenance and repair undertaken in association with this condition which shall be forward to Auckland Council on request.

X11. Throughout the duration of the initial site construction works, the works shall be staged in a manner to meet the following criteria:

a. The maximum area of earth exposed at any one time must be no greater than 6 hectares.

b. The site shall be progressively stabilised against erosion at all stages of the earthworks activity and shall be sequenced to minimise the discharge of sediment to surface water.

Advice Note:

Earthworks shall be progressively stabilised against erosion during all stages of the earthwork activity. Interim stabilisation measures may include:

- *the use of waterproof covers, geotextiles, or mulching*
- *top-soiling and grassing of otherwise bare areas of earth*
- *aggregate or vegetative cover that has obtained a density of more than 80% of a normal pasture sward*

It is recommended that you discuss any potential measures with the Council's monitoring officer

who may be able to provide further guidance on the most appropriate approach to take. Please contact the Council for more details. Alternatively, please refer to Auckland Council Guidance Document GD05, Erosion and Sediment Control Guidelines for Land Disturbing Activities in the Auckland Region.

X12. The applicant may apply to Council to increase the exposed area limits in condition **X11** above, on preparation of the final SSESPs, or on analysis of the results of ongoing monitoring of erosion and sediment controls and the receiving environment required by the Adaptive Management Plan (referred to in condition **X18**). No increase in maximum exposed area shall be undertaken without the prior written approval of Council.

Advice Note:

This condition is intended to provide some flexibility to the consent holder to ensure final earthworks methodologies and plans can be implemented, however, it is not expected that significant increases to exposed area would be approved and the consent holder should limit exposed area to the extent practicable to reduce adverse effects on the receiving environment.

X13. Earthworks undertaken during the initial site construction works shall be managed to avoid deposition of earth, mud, dirt or other debris on any road or footpath resulting from earthworks activity on the subject site. In the event that such deposition does occur, it shall immediately be removed. In no instance shall roads or footpaths be washed down with water without appropriate erosion and sediment control measures in place to prevent contamination of the stormwater drainage system, watercourses or receiving waters.

Advice Note:

In order to prevent sediment laden water entering waterways from the road, the following methods may be adopted to prevent or address discharges should they occur:

- *provision of a stabilised entry and exit(s) point for vehicles*
- *provision of wheel wash facilities*
- *ceasing of vehicle movement until materials are removed*
- *cleaning of road surfaces using street-sweepers*
- *silt and sediment traps*
- *catchpit protection*

In no circumstances should the washing of deposited materials into drains be advised or otherwise condoned.

It is recommended that you discuss any potential measures with the Council's monitoring officer who may be able to provide further guidance on the most appropriate approach to take. Please contact the Council for more details. Alternatively, please refer to Auckland Council Guidance Document GD05, Erosion and Sediment Control Guidelines for Land Disturbing Activities in the Auckland Region.

X14. The sediment and erosion controls for the initial site construction works shall be inspected on a regular basis, and within 24 hours after each rainstorm event that is likely to impair the function or performance of the control measure. A record shall be maintained of the date, time

and extent of any inspection, maintenance and repair undertaken and shall be made available for Council review upon request.

X15. The operational effectiveness and efficiency of all erosion and sediment control measures required by the SSESCPs provided in accordance with condition **X3**, shall be maintained throughout the duration of any land disturbing activities associated with those activities, or until the site is permanently stabilised against erosion.

X16. Erosion and sediment control measures for the initial site construction works shall be constructed and maintained in general accordance with Auckland Council Guidance Document GD05; Erosion and Sediment Control Guidelines for Land Disturbing Activities in the Auckland Region and any amendments to this document, except where a higher standard is detailed in the documents referred to in the consent conditions, in which case the higher standard shall apply.

X17. Upon completion or abandonment of the initial site construction works on the subject site all areas of bare earth shall be permanently stabilised against erosion to the satisfaction of the Council.

Advice Note:

Should the earthworks be completed or abandoned, bare areas of earth shall be permanently stabilised against erosion. Measures may include:

- *the use of mulching;*
- *top-soiling, grassing and mulching of otherwise bare areas of earth;*
- *aggregate or vegetative cover that has obtained a density of more than 80% of a normal pasture sward; and*

The on-going monitoring of these measures is the responsibility of the consent holder. It is recommended that you discuss any potential measures with the Council's monitoring officer who will guide you on the most appropriate approach to take. Please contact the Council for more details. Alternatively, please refer to Auckland Council Guidance Document GD05, Erosion and Sediment Control Guidelines for Land Disturbing Activities in the Auckland Region.

Adaptive Management Regime

X18. At least three months prior to commencement of the initial site construction works, the consent holder shall prepare and submit to Council for certification, an Adaptative Management Plan (AMP) for all earthworks which are to be undertaken throughout the full duration of consent including the initial site construction works and landfill operation. The AMP shall address monitoring requirements and changes to management procedures in response to the results of monitoring, and shall include but is not limited to, the following details:

a) Pre-construction baseline monitoring data of the receiving environment, including but not limited to:

i. In-stream results for turbidity and/or total suspended solids (TSS) over a range of weather conditions/seasons;

ii. identification and condition of erosion prone stream areas;

iii. description of sediment inputs, transport, substrate composition and embeddedness; and

iv. actual and potential areas of spawning habitat.

b) Baseline instream survey results that identify the presence or absence of Kākahi (freshwater mussel);

c) Weather forecasting and monitoring, including implementation of an onsite weather station with a telemetered system that provides txt and email notifications;

d) Trigger levels for water quality, rainfall (actual and forecasted events), and population decline;

e) Ongoing monitoring and sampling regime for the receiving environment, including turbidity and TSS monitoring downstream of works within the Tributary of the Waiteraire Stream;

f) Ongoing monitoring and sampling regime for sediment retention devices including the incorporation of automated samplers and sampling at the inlet and outlet of devices;

g) Ongoing monitoring regime of any Kākahi populations identified in the baseline survey;

h) Management responses when a trigger level is exceeded, including the ability to reduce exposed area; and

i) Reporting to Council.

No earthworks shall commence until certification has been received from the Council.

Advice Note:

Turbidity results can be substituted providing a correlation between TSS and turbidity has been established. This correlation should be re-assessed every year due to changes in soil conditions change.

X19. All earthworks must be undertaken in accordance with the Adaptive Management Plan (as referred to in **Condition X18**) and any subsequent revisions of the adaptive management plan certified by Council.

X20. Any proposed revisions to the Adaptive Management Plan must be submitted to the Council for written certification prior to formalising and implementing the revised Adaptive Management Plan.

X21. An earthworks area that has been stabilised or reduced (through stabilisation) as a result of a trigger level exceedance as defined by and required by the Adaptive Management Plan (referenced in **Condition X18** and any subsequent versions approved by the Council) may only be re-opened or increased on the written approval of the Council.

X22. Council may request changes to the AMP as a result of observed inefficiencies on site or identified within the site reporting, in order to address those inefficiencies. If such a request is made by the Council, the revised AMP must be submitted to the Council within 5 working days of the request for written approval prior to implementation.

Advice Note:

The AMP is a live document and updates are expected to address unforeseen circumstances or changes in the earthworks methodology as the site responds though its adaptive monitoring regime to ensure sediment discharges are minimised and the potential for significant adverse effects are avoided.

X23. Upon request by the Council, the consent holder must make available any monitoring results and data recorded in accordance with the Adaptive Management Plan.

Advice Note:

A report containing sampling and monitoring results may be requested by Council. This report is expected to contain the following details:

- *the results of all monitoring within that period;*
- *a summary of receiving environment effects, including any ecological changes and subsequent ecological response;*
- *a summary of any event trigger levels exceedance that occurred and any subsequent change of the AMP.*

Construction methodologies for works within Streams and Wetlands

X24. Prior to the commencement of any works within a stream or wetland (i.e. bridge and culvert construction, and reclamation), the consent holder shall hold a pre-start meeting that:

a. is located on the subject site;

b. is scheduled not less than five days before the anticipated commencement of streamworks;

c. includes an Auckland Council Compliance Monitoring officer; and

d. includes representation from the contractors who will undertake the works.

The meeting shall discuss the erosion and sediment control measures and the streamworks methodologies and shall ensure all relevant parties are aware of and familiar with the necessary conditions of this consent.

The following information shall be made available at the pre-start meeting:

e. Timeframes for key stages of the works authorised under this consent.

f. Resource consent conditions.

g. Native Fish Capture and Relocation Plan.

h. Streamworks Methodology including associated site-specific erosion and sediment control plans.

Advice Note:

Pre-start meetings can be staged in relation to specific works areas. To arrange the pre-start meeting please contact the Council on monitoring@aucklandcouncil.govt.nz or 09 301 0101. The conditions of consent should be discussed at this meeting. All additional information required by the Council should be provided 2 days prior to the meeting.

X25. Dewatering of streams and wetlands as authorised by LUS60339672**,** shall only be carried out after native fish capture and relocation has been undertaken in accordance with the approved Native Fish Capture and Relocation plan.

X26. No machinery shall enter the wetted cross section of the bed of any stream to be retained at any time. All machinery shall be operated (including maintenance, lubrication and refuelling) in a way, which ensures no hazardous substances such as fuel, oil or similar contaminants are discharged. In the event that any discharge occurs, works shall cease immediately, and the discharge shall be mitigated and/or rectified to the satisfaction of the Council.

Advice Note:

Refuelling, lubrication and maintenance activities associated with any machinery should be carried out away from any water body with appropriate methods in place so if any spillage does occur that it will be contained and does not enter the water body. Maintenance / servicing areas should be detailed in the final Streamworks Methodology.

X27. Prior to any works within a stream or wetland commencing, a detailed Stream and Wetland works Methodology Management Plan (SWMMP) shall be prepared, submitted to, and certified by the Council. The SWMMP shall include but is not limited to:

a. Methodologies and erosion and sediment control measures specific to the stream or wetland works being undertaken (providing location, dimensions, capacity, supporting calculations and design drawings), and confirmation that all controls are in accordance with industry best practice or the guidance contained in GD05, whichever higher standard is applicable;

b. timing and duration of works (in relation to the staging and sequencing of both stream

and wetland works, and any associated earthworks), including scheduling at times when normal (for the time of year) in-stream flows can be diverted around the works and a four-day weather forecast predicts no rainfall;

c. reference and adherence to (where applicable) the requirements of the Native Freshwater Fish and Fauna Management Plan;

d. contingency plans and measures, including stabilisation of works areas over night or during rain;

e. monitoring and maintenance requirements for the proposed erosion and sediment controls; and,

f. Permanent stabilisation measures of stream bed and banks upon completion of the specific works.

Advice Note:

The streamworks methodology may be submitted for the whole site or as a number of plans for specific works areas to allow for different methods within different areas and different timing/staging of works.

X28. Stream and wetland works shall only be carried out in accordance with the approved SWMMP required by Condition **X27**.

X29. Notwithstanding condition **X28** above, no stream or wetland works on the subject site shall be undertaken between 01 May and 30 September in any year, without the prior written approval of Auckland Council.

Erosion and Sediment control for landfill operation

Pre-commencement meeting

X30. Prior to the commencement of the operation of the landfill, the consent holder shall hold a pre-start meeting for each of this activity that:

- is located on the subject site
- is scheduled **not less than five days** before the anticipated commencement of earthworks
- includes Auckland Council Compliance Monitoring officer[s]
- includes representation from the contractors who will undertake the works

The meeting shall discuss the erosion and sediment control measures, ongoing adaptive management regime and shall ensure all relevant parties are aware of and familiar with the necessary conditions of this consent.

The following information shall be made available at the pre-start meeting:

- Timeframes for key stages of the works authorised under this consent;
- Resource consent conditions;
- Erosion and Sediment Control Plan for Landfill Operation (ESCPO) ; and
- Adaptive Management Plan.

Advice Note:

To arrange the pre-start meeting please contact the Council to arrange this meeting on monitoring@aucklandcouncilgovt.nz, or 09 301 01 01. The conditions of consent should be discussed at this meeting. All additional information required by the Council should be provided 2 days prior to the meeting.

Erosion and Sediment Control Plan - Landfill Operations

X31. At least two months prior to the commencement of earthworks for the landfill operation, an Operational Erosion and Sediment Control Plan (ESCPO) shall be prepared by a suitably qualified person in accordance with Auckland Council Guideline GD05, Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region. The purpose of the ESCPO is to set out the specific erosion and sediment control measures which are to be implemented during operation of the landfill to minimise erosion and the discharge of sediment to receiving water bodies.

X32. The ESCPO shall include the following information as appropriate to the scale, location and type of earthworks:

a. Drawings showing location and quantities of earthworks, contour information, catchment boundaries and erosion and sediment controls (location, dimensions, capacity);
b. The location of erosion and sediment controls including their position in relation to flood plains and how flood risk will be managed;
c. Supporting calculations for erosion and sediment controls;
d. Catchment boundaries and contour information;
e. Details of construction methods to be employed, including timing and duration;
f. Dewatering and pumping methodology (if applicable);
g. Details of the proposed water treatment devices (if applicable);
h. A programme for managing exposed area, including staging detail and progressive stabilisation considerations;
i. The location of site entrance points and means to control tracking of sediment off-site;
j. The details for decommissioning controls;
k. Key responsibilities for implementing and maintaining the controls detailed in the SSESCP during the project;
l. Monitoring, maintenance and record-keeping requirements; and
m. Updated USLE calculations and estimated sediment loads to ensure consistency with the application documents.

X33. Prior to the commencement the landfill operation, an Chemical Treatment Management Plan for operation (CTMPO) shall be submitted for the written approval of the Council, that details

how all impoundment devices utilised throughout the landfill operation, shall be treated. The plan shall include as a minimum:

h) Specific design details of the chemical treatment system based on a rainfall activated methodology for the site's sediment retention ponds treating the stockpile and clay borrow areas;

i) Provision for chemical treatment of the landfill ponds.

j) Monitoring, maintenance (including post storm) and contingency programme (including a record sheet);

k) Bench testing results;

l) Details of optimum dosage (including assumptions);

m) Results of initial chemical treatment trial;

n) A spill contingency plan; and

o) Details of the person or bodies that will hold responsibility for long term operation and maintenance of the chemical treatment system and the organisational structure which will support this system.

X34. No earthworks for the landfill operation shall commence until written certification has been provided from Council for the ESCPO and CTMPO required by conditions **X31** and **X33** above.

X35. All decanting earth bunds and sediment retention ponds utilised throughout the landfill operation shall be chemically treated in accordance with the approved Chemical Treatment Management Plan (CTMPO). Any amendments to the CTMP shall be submitted in writing to Council, for written certification prior to implementation.

X36. Prior to the 01 October for every year throughout the operation of the landfill, the consent holder shall undertake an annual review of the ESCPO and re-submit for certification to Auckland Council. The ESCPO shall detail if works are proposed in a new area of the landholding or to re-disturb an area which has been vegetated on a temporary basis, any changes to the proposed erosion and sediment controls, and changes to incorporate updates in accordance with industry best practice.

X37. Throughout the duration of the landfill operation, the works shall be staged in a manner to meet the following criteria:

a. The maximum area of earth exposed at any one time for the topsoil stockpile, stockpile 1 and clay borrow areas combined, must be no greater than 5ha.

b. The site shall be progressively stabilised against erosion at all stages of the earthworks activity and shall be sequenced to minimise the discharge of sediment to surface water.

Advice Note:

Earthworks shall be progressively stabilised against erosion during all stages of the earthwork activity. Interim stabilisation measures may include:

- *The use of waterproof covers, geotextiles, or mulching;*
- *top-soiling and grassing of otherwise bare areas of earth; and*
- *aggregate or vegetative cover that has obtained a density of more than 80% of a normal pasture sward.*

It is recommended that you discuss any potential measures with the Council's monitoring officer who may be able to provide further guidance on the most appropriate approach to take. Please contact the Council for more details. Alternatively, please refer to Auckland Council Guidance Document GD05, Erosion and Sediment Control Guidelines for Land Disturbing Activities in the Auckland Region.

X38. At least two months prior to the commencement of earthworks for the landfill operation, the consent holder shall provide an updated AMP (as required by condition **X18**) that specifically addresses the adaptive management and monitoring regime for the duration of the landfill operation.

Erosion and Sediment Control Certification

X39. Prior to any earthworks commencing for the landfill operation, a certificate signed by an appropriately qualified and experienced person shall be submitted to the Council, to certify that the erosion and sediment controls for the clay borrow and stockpile areas have been constructed in accordance with the approved ESCPO required by **condition X31**. Certified controls shall include but not be limited to the sediment retention ponds, clean and dirty water diversion bunds, stabilised construction entrances, silt fence and super silt fence. The certification for these and any subsequent measures shall be supplied immediately upon completion of construction of those measures. Information supplied, if applicable, shall include:

e) Contributing catchment area;

f) Shape and capacity of structures (dimensions of structure);

g) Position of inlets/outlets;

h) A statement that the erosion and sediment control measures have been constructed in accordance with Auckland Council Guideline GD05; except where a higher standard is detailed in the documents referred to in the ESCPO required by condition **X31,** in which case the statement shall confirm that the higher standard has been constructed.

Erosion and Sediment Control Maintenance

X40. The sediment and erosion controls implemented throughout the landfill operation shall be inspected on a regular basis, and within 24 hours after each rainstorm event that is likely to

impair the function or performance of the control measure. A record shall be maintained of the date, time and extent of any inspection, maintenance and repair undertaken in association with this condition which shall be forward to Auckland Council on request.

X41. Earthworks shall be managed throughout the landfill operation to avoid deposition of earth, mud, dirt or other debris on any road or footpath resulting from earthworks activity on the subject site. In the event that such deposition does occur, it shall immediately be removed. In no instance shall roads or footpaths be washed down with water without appropriate erosion and sediment control measures in place to prevent contamination of the stormwater drainage system, watercourses or receiving waters.

Advice Note:

In order to prevent sediment laden water entering waterways from the road, the following methods may be adopted to prevent or address discharges should they occur:

- *provision of a stabilised entry and exit(s) point for vehicles*
- *provision of wheel wash facilities*
- *ceasing of vehicle movement until materials are removed*
- *cleaning of road surfaces using street-sweepers*
- *silt and sediment traps*
- *catchpit protection*

In no circumstances should the washing of deposited materials into drains be advised or otherwise condoned.

It is recommended that you discuss any potential measures with the Council's monitoring officer who may be able to provide further guidance on the most appropriate approach to take. Please contact the Council for more details. Alternatively, please refer to Auckland Council Guidance Document GD05, Erosion and Sediment Control Guidelines for Land Disturbing Activities in the Auckland Region.

X42. The operational effectiveness and efficiency of all erosion and sediment control measures required by the ESCPO provided in accordance with Condition **X31**, shall be maintained throughout the duration of any land disturbing activities associated with the operation, or until the site is permanently stabilised against erosion.

X43. Erosion and sediment control measures implemented for the landfill operation shall be constructed and maintained in general accordance with Auckland Council Guidance Document GD05; Erosion and Sediment Control Guidelines for Land Disturbing Activities in the Auckland Region and any amendments to this document, except where a higher standard is detailed in the documents referred to in the consent conditions, in which case the higher standard shall apply.

X44. Upon completion or abandonment of earthworks for the landfill operation on the subject site, all areas of bare earth shall be permanently stabilised against erosion to the satisfaction of the Council.

Advice Note:

Should the earthworks be completed or abandoned, bare areas of earth shall be permanently stabilised against erosion. Measures may include:

- *the use of mulching;*
- *top-soiling, grassing and mulching of otherwise bare areas of earth;*
- *aggregate or vegetative cover that has obtained a density of more than 80% of a normal pasture sward; and*

The on-going monitoring of these measures is the responsibility of the consent holder. It is recommended that you discuss any potential measures with the Council's monitoring officer who will guide you on the most appropriate approach to take. Please contact the Council for more details. Alternatively, please refer to Auckland Council Guidance Document GD05, Erosion and Sediment Control Guidelines for Land Disturbing Activities in the Auckland Region.

7 REVIEW

Memo prepared by:

Fiona Harte

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Specialist Unit, Resource Consents

Date: 01 September 2020

Technical memo reviewed and approved for release by:

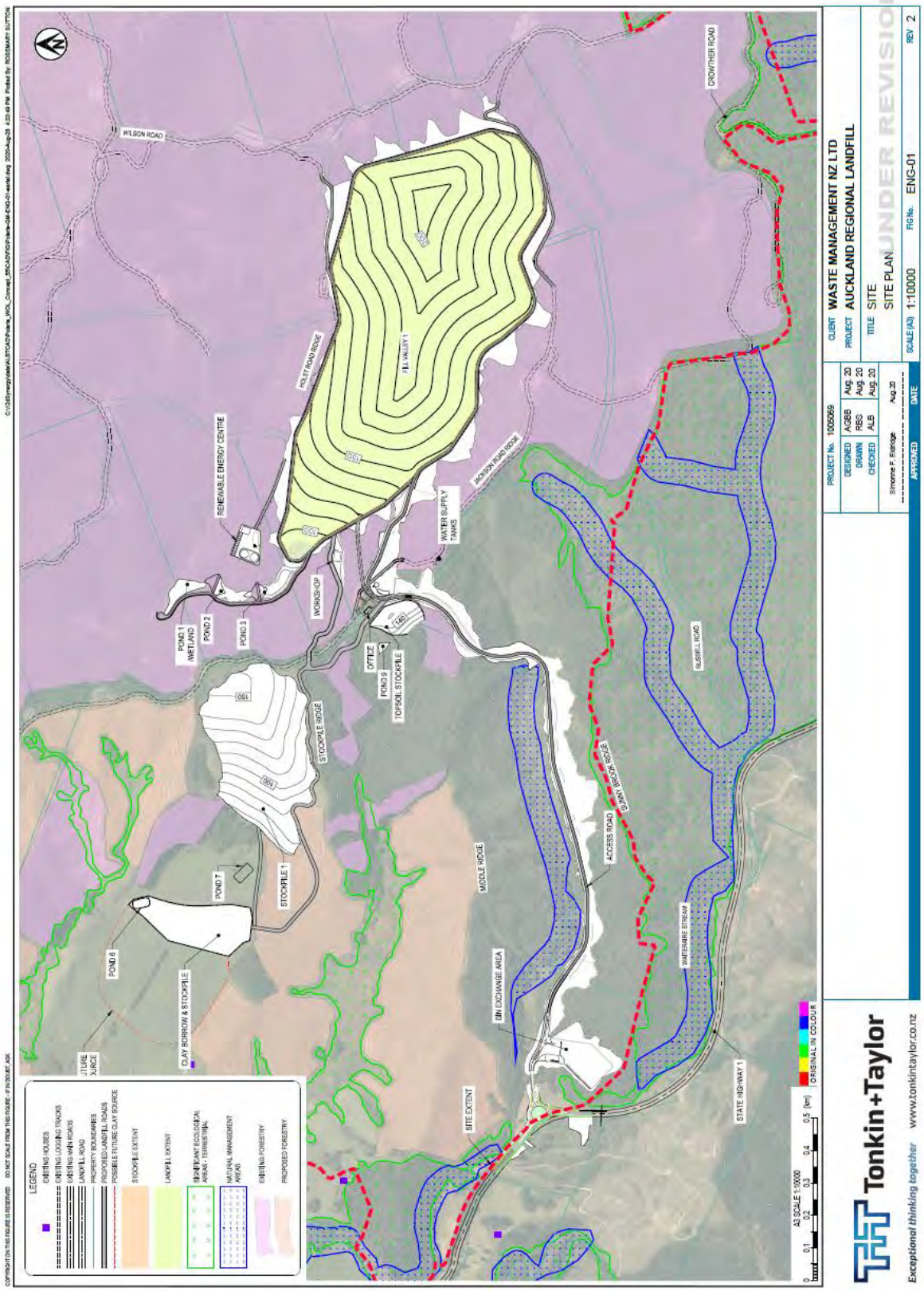
David Hampson

Team Leader – Earth, Streams and Trees
Specialist Unit, Resource Consents

Date: 02 September 2020

Appendix 1

Overview of proposed earthworks and site layout as shown on the Site Plan provided by the applicant.



Appendix 2

Tracked changes between the applicant's proposed draft key conditions and recommended conditions in this memo. Deletions are stricked through and additions are underlined.

Construction Erosion and Sediment Control Plan

X51. At least three months prior to the Construction Commencement Date, the consent holder shall submit to Auckland Council for certification, an updated Construction Erosion and Sediment Control Plan (CESCP) for the ~~site establishment and enabling works earthworks~~ initial site construction works, prepared in general accordance with the 'Construction Erosion and Sediment Control Plan', prepared by Tonkin + Taylor, dated May 2019. The purpose of the CESCP is to provide a framework of controls for the construction earthworks to avoid, remedy and/or mitigate the potential adverse effects on the receiving environment, including measures to ensure sediment generation is minimised and the works are conducted in accordance with best practice.

~~X52. The CESCP required by Condition 24 shall include a sediment monitoring programme with the following information:~~

~~a Details of the baseline monitoring for suspended solids and turbidity within the catchments of the works;~~

~~b Monitoring, including frequency of monitoring, to be undertaken during the construction works including:~~

- ~~Programme for regular visual inspections of all receiving environments, and sediment control devices;~~
- ~~Rainfall and weather forecasts ingforecasting;~~
- ~~Rainfall trigger levels for supplementary visual inspections;~~
- ~~Sampling at inlets and outlets of sediment settlement devices;~~
- ~~Sampling in the receiving environment;~~
- ~~Turbidity monitoring downstream of any works within any tributary of the Waiteraire stream; and~~
- ~~Turbidity monitoring downstream of the landfill footprint.~~

~~c Development of monitoring response trigger levels triggers and associated actions in the event that the trigger levels triggers are exceeded.~~

Site Specific Erosion and Sediment Control Plans

X53. Prior to the Commencement of earthworks for each stage of the initial construction works, a Site Specific Erosion and Sediment Control Plan (SSESCP) shall be prepared by a suitably qualified person in general accordance with Auckland Council Guideline GD05, Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region and the CESCP. The consent holder shall submit the SSESCP to Auckland Council at least two months prior to the commencement of ~~that~~ each stage of works. The purpose of the SSESCP is to set out the specific measures to be implemented during construction to minimise erosion and the discharge of sediment ~~beyond the boundaries of the site~~ to receiving water bodies.

~~X54. The consent holder shall submit the SSESCP to Auckland Council at least two months prior to the commencement of that stage of works. The purpose of the SSESCP is to set out the specific measures to be implemented during construction to minimise erosion and the discharge of sediment beyond the boundaries of the site.~~

X55. The SSESCP shall include the following information as appropriate to the scale, location and type of earthworks:

a. The location and total area of earthworks, including catchment boundaries and contour information;

b. Details of construction methods to be employed, including timing and duration;

c. The volume of earthworks. This is to include details of the volumes to be excavated, stockpiled, re-used and disposed of off-site;

d. The location of erosion controls of the types described in GD05 (e.g. perimeter control such as a clean water diversion bunds) and any other controls;

e. The location of sediment controls of the types described in GD05 (e.g. silt fence along low point of site where surface water will discharge from site or around stockpile areas) and any other controls;

f. Supporting calculations for erosion and sediment controls including updated USLE calculations and estimated sediment loads;

g. Staging of the earthworks ~~(if appropriate). If works are to be staged then the details of a to e above need to be provided for each stage and the means of progressive stabilisation of exposed areas need to be provided for each stage~~ including details of progressive stabilisation of exposed areas for each stage;

h. Key responsibilities for implementing and maintaining the controls detailed in the SSESCP during the project;

~~A description of any proposed chemical treatment, with consideration given to preferential use of organic flocculants;~~

i. The location of site entrance points and means to control tracking of dirt off-site;

j. The frequency and responsibility for monitoring the effectiveness of controls, downstream water quality, and the undertaking of any maintenance on controls;

k. The details for decommissioning controls;

l. Contingency plans in case of unexpected sediment discharges during works and to respond to extreme weather events;

~~Drawings showing items a, c, d, e and g above..~~

m. Detail of the location of erosion and sediment controls in relation to flood plains and how flood risk will be managed;

n. Specific detail of how erosion and sediment controls will avoid adverse effects to vegetation where earthworks are located adjacent to and within the rootzone of SEA vegetation;

o. Drawings showing items a, c, d, e, g, m and n above.

Erosion and sediment controls certification and maintenance

X56. Prior to any earthworks commencing within a works area for each specific stage, a certificate signed by an appropriately qualified and experienced person shall be submitted to Auckland Council, to certify that the erosion and sediment controls have been constructed in accordance with the approved SSESCP required by Condition XX 26 and Auckland Council Guideline GD05. Certified controls shall include but not be limited to the sediment retention ponds, decanting earth bunds, clean and dirty water diversion bunds, stabilised construction entrances, silt fence and super silt fence. Information supplied if applicable, shall include:

a. Contributing catchment area;
b. Shape and capacity of structure (dimensions of structure);
c. Position of inlets/outlets;
d. Stabilisation of the structure; and

e. A statement that the erosion and sediment control measures have been constructed in general accordance with Auckland Council Guideline GD05; except where a higher standard is detailed in the documents referred to the CESCP required by Condition 24, in which case the statement shall confirm that the higher standard has been constructed.

X57. The sediment and erosion controls for each stage of the initial construction works shall be inspected on a regular basis, ~~no less often than monthly,~~ and within 24 hours after each rainstorm event that is likely to impair the function or performance of the control measure. A record shall be maintained of the date, time and extent of any inspection, maintenance and repair undertaken in association with this condition which shall be forward to Auckland Council on request.

~~*Advice note: Erosion and Sediment Control during operations and seasonal construction are addressed in Conditions 168 - 170.*~~

Streamworks Methodology Management Plan

X76. Prior to any works within a stream or wetland ~~streamworks~~ commencing, a detailed Stream and Wetland ~~w~~Works Methodology Management Plan (SWMMP) shall be prepared, submitted to, and certified by Auckland Council. The streamworks methodology shall include but is not limited to:

a. ~~A SSESCP in accordance with Condition 53, and~~ Methodologies and erosion and sediment control measures specific to the stream or wetland works being undertaken (providing location, dimensions, capacity, supporting calculations and design drawings) ~~for the streamworks and any wetland reclamations. All controls should be in line with industry best practice~~ and confirmation that all controls are in accordance with industry best practice or the guidance contained in GD05, whichever higher standard is applicable;

b. timing and duration of works (in relation to the staging and sequencing of both stream and wetland works, and ~~any associated~~ earthworks), including scheduling at times when normal (for the time of year) in-stream flows can be diverted around the works and a four-day weather forecast predicts no rainfall;

c. reference and adherence (where applicable) to the Native Freshwater Fish and Fauna Management Plan required by condition ~~(~~Condition XX~~)~~;

g. contingency plans and measures, including stabilisation of works areas over night or during rain; and

d. monitoring and maintenance requirements for the proposed erosion and sediment controls~~, in reference to the CESCP required by Condition 24~~.

e. Permanent stabilisation measures of stream bed and banks upon completion of *the specific works.*

Advice note: The streamworks methodology may be submitted for the whole site or as a number of plans for specific works areas to allow for different methods within different areas and different timing/staging of works.

X77. Stream and wetland works shall only be carried out in accordance with the approved ~~Streamworks Methodology~~ SWMMP required in Condition XX.

X78. Notwithstanding condition XX above, no stream or wetland works on the subject site shall be undertaken between ~~30 April~~ 01 May and ~~1 October~~ 30 September in any year, without the prior written approval of Auckland Council.

Erosion and Sediment control for operations and seasonal earthworks

X174. The operational effectiveness and efficiency of all erosion and sediment control measures required by the ESCPO provided in accordance with Condition XX shall be maintained throughout the duration of earthworks activity, or until the area of works is permanently stabilised against erosion.

~~X175. No bulk construction earthworks shall be undertaken between 30 April and 1 October in any year, without the submission of a 'Request for winter works' to Auckland Council. All requests for winter works must be renewed annually, and must be submitted at least 10 days prior to 30 April each year of proposed winter works. No works shall occur until written certification approval has been received from Auckland Council.~~

~~X176. Prior to any earthworks commencing each October or later within each summer construction season, a certificate signed by an appropriately qualified and experienced person shall be submitted to Auckland Council, to certify that the erosion and sediment controls have been constructed in accordance with the approved ESCPO and Auckland Council Guideline GD05 except if there is a difference then the current certified ESCPO shall prevail. The certificate required by this Condition shall not be required if the impending season's proposed earthworks and installed controls are the same as in the previous certificate.~~

Erosion and Sediment Control Plan - Landfill Operations

X221. An Operational Erosion and Sediment Control Plan (ESCPO) shall be prepared by a suitably qualified person in general accordance with Auckland Council Guideline GD05, Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region, and submitted to Auckland Council for certification. The purpose of the ESCPO is to set out the measures to be implemented to minimise erosion and the discharge of sediment ~~beyond the boundaries of the site~~ to receiving water bodies after the landfill commencement date.

X222. The ESCPO shall include the following information as appropriate to the scale, location and type of earthworks:

a. Drawings showing location and quantities of earthworks, contour information, catchment boundaries and erosion and sediment controls (location, dimensions, capacity);
b. The location of erosion and sediment controls including their position in relation to flood plains and how flood risk will be managed;
c. Supporting calculations for erosion and sediment controls;
d. Catchment boundaries and contour information;
e. Details of construction methods to be employed, including timing and duration;
f. Dewatering and pumping methodology (if applicable);
g. Details of the proposed water treatment devices ~~(if applicable)~~;

   ~~Specific location of stockpile areas (if applicable);~~
h. A programme for managing exposed area, including staging detail and progressive stabilisation considerations;

   ~~Roles and responsibilities under the ESCPO and identification of those holding roles including the suitably qualified person; and~~
i. The location of site entrance points and means to control tracking of sediment off-site;
j. The details for decommissioning controls;
k. Key responsibilities for implementing and maintaining the controls detailed in the SSESCP during the project;

l. Monitoring, maintenance and record-keeping requirements.

m. Updated USLE calculations and estimated sediment loads to ensure consistency with the application documents.

~~X223 The Consent Holder shall carry out monitoring in accordance with the ESCPO and shall keep records detailing:~~

~~a. The monitoring undertaken;~~

~~b. The erosion and sediment controls that required maintenance;~~

~~c. The time when the maintenance was completed; and~~

~~d. Areas of non-compliance with the erosion and sediment control monitoring plan (if any) and the reasons for the non-compliance.~~

~~This information shall be made available to Auckland Council upon request.~~

X224. Prior to the ~~commencement of seasonal earthworks each October for the life of this consent~~ 01 October every year throughout the operation of the landfill, the consent holder shall undertake an annual review of the ESCPO~~,~~ and re-submit for certification to Auckland Council. The ESCPO shall detail if works are proposed in a new area of the landholding or to re-disturb ~~excavate~~ an area which has been vegetated on a temporary basis~~.~~, any changes to the proposed erosion and sediment controls, and any changes to incorporate updates in industry best practice.

Technical memo – Specialist Unit, Resource Consents

To:	Mark Ross, Consultant
CC:	Rod Dissmeyer, Team Leader– Stormwater Wastewater & Industrial and Trade Activities Specialist Unit, Resource Consents Department
From:	Arsini Hanna, Senior Specialist – Stormwater Wastewater & Industrial and Trade Activities -Specialist Unit, Resource Consents Department
Date:	07 September 2020

1.0 APPLICATION DESCRIPTION

Application and property details

Applicant's name:	Waste Management NZ Ltd
Application numbers:	BUN60339589 – Consent bundle number DIS60343735 - Diversion and discharge of stormwater DIS60343781- Land Use - Industrial and trade activity and discharge of contaminants WAT60343937, WAT60343938, WAT60343939 - Damming of surface water within three ponds
Activity type:	Diversion and discharge of stormwater Land use and discharge of contaminants from an industrial and trade activity Stormwater damming
Purpose description:	To authorise the diversion and discharge of stormwater associated with the establishment and operation of a new regional landfill To authorise the use of land and the discharge of contaminants from a high risk industrial and trade activity area being a regional landfill, and To authorise damming of surface water with three dams for the purpose of treating runoff associated with the establishment and operation of a new regional landfill
Site address:	1232 State Highway 1, Wayby Valley

2.0 PROPOSAL, SITE AND LOCALITY DESCRIPTION

2.1 Proposal relevant to this permit/consent only

The applicant seeks land use resource consent to establish and operate the construction of a new landfill at 1232 State Highway 1, Wayby Valley , Wellsford, because the existing solid waste management and disposal facility at Redvale Landfill which currently provides for disposal of approximately 50% of Auckland's solid waste is nearing capacity.

The new solid waste landfill will require several resource consents from Auckland Council.

The applicant has applied for all required consents; however this technical input memo addresses the following consents:

Stormwater diversion and discharge consent

- To authorise the diversion and discharge of stormwater from impervious areas associated with the establishment of a regional landfill at 1232 State Highway 1, Wayby Valley, Wellsford.

Industrial or trade activity consent

- To authorise the use of land and the discharge of contaminants from a high risk industrial and trade activity site (total activity area of 632,428.8m^2), being a regional landfill at 1232 State Highway 1, Wayby Valley, Wellsford.

Damming of surface water consent

- To authorise the damming of surface water within three dams (which is part of the stormwater management system) of the regional landfill at 1232 State Highway 1, Wayby Valley, Wellsford.

A resource consent application and associated assessment of environmental effects has been developed for the proposal and is presented in the document entitled '*Resource consent application and Assessment of Environmental Effects'* prepared by Tonkin & Taylor and dated 30 May 2019, herein referred to as the 'application report'.

A full description of the proposal is provided in the following documents:

- *'Engineering Report'*, dated 30 May 2019 and prepared by Tonkin & Taylor, information is hereby referred to as the 'Engineering Report'.

- *'Stormwater and Industrial and Trade Activity',* dated 30 May 2019 and prepared by Tonkin & Taylor, information is hereby referred to as the 'Stormwater and ITA Report'.

- *'Draft Industrial and Trade Activity Environmental Management Plan'*, dated 30 May 2019 and prepared by Tonkin & Taylor.

- *'Stormwater pond damming'* dated 20 December 2019 and prepared by Tonkin & Taylor, information is hereby referred to as the 'Stormwater Damming Report'.

Additional information in response to a request for further information under section 92 of the Resource Management Act (RMA) was received by emails to the Auckland Council on 06, 11 & 20 December 2019. This information is hereby referred to as the s92 response.

Further technical information on the flood mitigation approach and dam designs are provided in the supporting appendices to the application report and s92 response, including geotechnical assessments, hydraulic modelling report, and proposed design plans.

In brief, the applicant is proposing to:

- Establish a regional landfill (defined by the Landfill Guidelines as Class 1 Landfill, designed and operated in accordance with the most recent guidelines *for New Zealand – Technical Guidelines for Disposal to Land published by the Waste Management Institute New Zealand in 2018* ('the Landfill Guidelines'). The landfill will have a capacity of approximately 25.8Mm^3 safe disposal of municipal solid waste and will be developed in three stages as follows:

    1. Stage 1: filling of the landfill with waste starting from the middle of the valley.

    2. Stage 2: Filling the landfill to the top of the valley.

    3. Stage 3: Final filling of the landfill base of the valley.

- The waste will include residential and commercial waste, construction and demolition waste, some industrial waste (that meet specific defined criteria) and contaminated soils. The operation of the landfill, including acceptance criteria and monitoring, will be in accordance with the application documents.

- Construct a low permeability lining system with a leachate collection system above this lining.

- Establish a landfill gas collection (LFG) system and energy plant.
- Create a stormwater management system.
- Create a leachate management system.
- Establish a bin exchange area.
- Establish an access road (approximately 2 km in length) from State Highway 1 commencing at an intersection on SH1 and climbing up a valley before crossing a ridge into the main landfill valley.
- Construct a weighbridge and vehicle wheel wash area.
- Create 50 parking bays which will be located after passing the weighbridge.

The landfill will be rehabilitated back to pasture as each stage is completed; and that the finished profile will be a balance between maximising the life of the landfill and minimising the visibility of the operation.

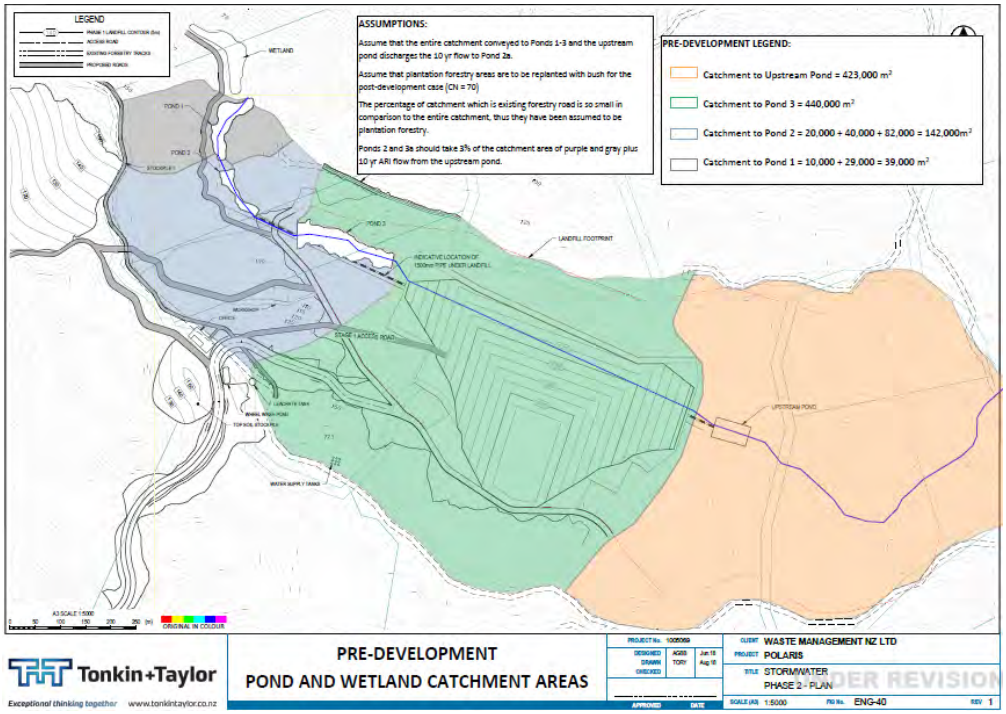
Stormwater

Preparatory works and operation of landfill are provided in the application reports submitted by the applicant.

The overall site stormwater system will be designed to achieve the following principal objectives:

- Stormwater run-off which has been in contact with waste will be kept separate from stormwater from all other places and will be treated as leachate. This run-off is collected as part of the leachate collection system and is not discharged to the environment. Consequently, this volume is not included in the stormwater or ITA applications documents or plans but is accounted for in the design of the leachate collection system.
- Leachate will be pumped through a fixed pipe system from the toe of the landfill to an elevated storage tank. Leachate will gravitate to a tanker loading area at the landfill office area.
- A branch from the fixed leachate pumping line will be diverted towards the active landfill face for leachate circulation system. At the landfill additional amounts of leachate will be pumped directly to a holding tank (200 to 500m^3 capacity) located above the office area. Leachate generation is rainfall dependent. Collected leachate will be taken off-site to an appropriate treatment facility by specific contractors for disposal.

- Stormwater run-off from the landfill footprint and ITA activity areas (excluding any leachate) will pass through the stormwater treatment detention ponds deigned in accordance with Stormwater Management Devices in Auckland Region; Guidance Document (GD01) and a wetland (to provide water quality treatment based on the 90th percentile storm depth and extended detention for the 95th percentile storm depth for erosion protection), to reduce sediment and potential contaminant discharges. This includes stormwater from the landfill footprint including earthworks construction areas as well as the workshop, generator centre, and water from the wheel wash.
- These ponds are labelled Ponds 1 to 5 (pond 1 is a wetland being the furthest downstream from the landfill; ponds 2 and 3 will be permanent ponds over the life of the landfill; pond 4 will be the closest, and will be constructed on the footprint of the future Stages of the landfill; with pond 5 will be upstream of Stage 1 and is considered as a temporary pond. This pond will provide flow attenuation and sediment control until Stage 3 of the landfill is constructed), and their locations are shown on the below Drawing No. ENG 40.



- Stormwater from completed landfill areas (finished contours with final cover in place) will be controlled by permanent drainage systems and by practices such as grassing to minimise erosion.
- The ponds for Stage's 1 and 2 will be designed to capture and contain the rainwater generated from each stage, release the stormwater flows to pre-development conditions for the 2, 10 and 100 ARI year storm events.

- Ponds 2, 3 and 4 are considered surface water damming ponds. The dams will be earth embankment dams constructed from locally sourced soils with a 5m wide crest, a low permeability core, and likely to have 1V:3H side slopes subject to detail design.
- The dams will have a filter compatible internal drainage system including chimney and drainage under the downstream shoulder. The primary spillway will consist of a drop manhole discharging to an outlet pipe and auxiliary spillway designed for 100 year flood event.

As stated above the landfill will be developed in three stages, the following stormwater management controls will be undertaken at each stage:

Stage 1

- Install a stormwater pipe beneath the landfill liner. This line will be sized to convey flows up to the 10 percent Annual Exceedance Probability (AEP). Details can be found in Figure No. 47 attached to the engineering report.
- Stormwater runoff from the upstream of this stage of the landfill will be collected in Pond 5 located upstream of the landfill.
- Stormwater will drain via the stormwater pipe beneath the landfill liner.
- During heavy rain events greater than the capacity of the stormwater pipe, the additional runoff volume will be detained in Pond 5.
- Stormwater from Pond 5 will discharge into Pond 3.
- Stormwater runoff from the access roads within Valley 1 and areas around the landfill footprint will discharge into Pond 4.
- Stormwater runoff from Pond 4 will flow towards Pond 3, prior to draining into Pond 2.
- Flows from Pond 2 (up to the 95th Percentile storm event) will pass through the engineered wetland for treatment purposes.
- Flows greater than the 95th percentile storm event will discharge via a lined channel directly to the downstream watercourse, bypassing the wetland.

Stage 2

- The stormwater pipe underneath the landfill will be decommissioned, and flows will be directed around the landfill to Pond 4.
- Surface water from the access roads, the covered landfill stages, and the development of the new stages in the upper valley, will drain into Pond 4.
- Stormwater runoff from the workshop and gas plant will flow towards Pond 3.

Stage 3

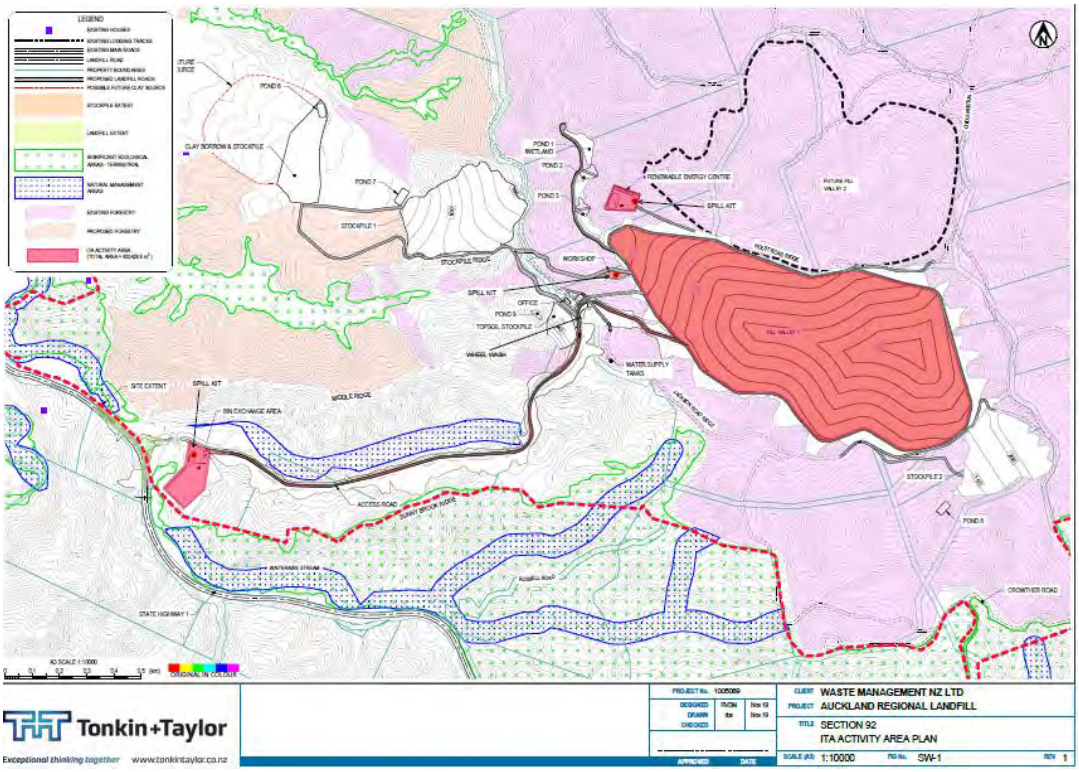
Stage 3 involves the final stages of the landfill at the base of the valley.

- Pond 4 will be decommissioned resulting in a lower overall pond volume, at this stage the landfill would have been capped and grassed.

Industrial and trade activity

The Landfill is listed in Table E33.4. 3 of the Auckland Unitary Plan (Operative in Part) (AUP) – Recycling, recovery, reuse or disposal/ Landfill. Any activity of this type of industrial and trade activities is considered as a high-risk activity.

Areas considered as part of an industrial and trade activity area are listed in section 5.1 of the Stormwater and ITA Report and presented in Figure SW1 attached to the s92 response letter prepared by Tonkin and Taylor and dated 6 December 2019.



In brief the potential contaminants of concern of stormwater contamination arising from the operations are pH, Heavy Metals, Ammonia, TSS, Organic material (measured as Chemical or Biochemical Oxygen Demand (COD/BOD)), Total Petroleum Hydrocarbon (TPH) and Oil and Grease.

The applicant proposes to undertake the following stormwater management controls for the following industrial and trade activity impervious areas on site:

Access Road

The landfill access road, and access roads within the landfill footprint, have been considered as ITA area. This is due to potential deposition of refuse material and sediment from the hauling of waste to and from the landfill working area.

- The access road has been divided into two sections for the purpose of stormwater management (ENG-30 Bin Exchange area and Landfill Access Road Overall Plan attached to the S92 response letter):

- Section 1: catchment within the Eastern Block, stormwater runoff from this catchment will discharge into the landfill pond system.

- Section 2: Catchment from State Highway 1 to the crossing of the ridgeline into the Eastern Block. The applicant is proposing to provide stormwater quality treatment for this catchment runoff by means of filter strips located along the road.

- The filter strips are designed in accordance with the 'New Zealand Transport Agency, Stormwater Treatment Standard for State Highway Infrastructure, May 2010', and will comprise a scruffy dome which will discharge via spreader dispersal bars (designed in accordance with the Auckland Council TR2013/18 guidelines) laid along the slope to land.

Bin exchange area

The bin exchange area includes parking areas, waste transport parking and storage of full and empty waste bins.

- Provide stormwater quality treatment for the stormwater runoff from the proposed impervious areas by means of two rain gardens. This device is designed in accordance with Auckland Council GD01.

- Stormwater runoff from the rain gardens will discharge into the Waiteraire Tributary via the new outlet structure.

- Flows exceeding the 95% percentile will bypass the raingardens and will discharge directly to the stream via the same outlet or a second outlet.

- Install a drop manhole with a higher-level outlet orifice, because there is an elevation (level) difference between the bin exchange area and the outlet location.

- The outlet will be designed to convey 10year ARI storm events through the pipe network and will designed in accordance with GD01.

Landfilling area

- Provide stormwater quality treatment for the stormwater runoff from the completed landfilled areas by means of four stormwater management ponds. The ponds are designed in accordance with Auckland Council GD01.
- The ponds will be designed to provide 2, 10 and 100year ARI storm event mitigation.
- The ponds will flow towards a final engineered wetland to provide final stormwater quality treatment prior of discharging into the receiving environment.
- Stormwater runoff from upstream of the first stage of the landfill will be collected in a pond (Pond 5) located on the upstream side of the landfill.
- Stormwater runoff from the inert roof area will be collected in downpipes and then piped to the stormwater treatment Pond 3.
- Stormwater discharges from the stormwater treatment system (specifically from the final wetland) will discharge into the Hotea River via a new outfall structure.
- Provide appropriate energy dissipation and erosion control at the outlet of the stormwater outlet, by means of rock rip-rap erosion protection designed in accordance with GD01.

Wheel wash

The wheel wash will be located at the top of the landfill access road for cleaning the wheels of all vehicle leaving the landfill footprint. The wheel wash will comprise a ramp into a flooded basin through which vehicles drive. It may also include fixed water jets and/or a handheld water blaster for manual cleaning of vehicles, and rumble bars located where they won't hinder cleaning out.

- Runoff from the wash-bay area will drain to a Humes proprietary Oil and Grid Interceptor (3,000L).
- Sediments from the wheel wash will be removed from time to time by a front-end loader and placed on the ground to dry within the landfill footprint, and will be disposed of within the landfill as waste.
- Overflows from the wheel wash will be diverted to a sediment pond adjacent to the wheel wash for settling of any sediments. Discharges from this pond will flow or be pumped into the landfill stormwater treatment system (specifically the ponds).

Energy Centre

The energy centre will be located on the ridge between Valley 1 and the adjacent valley to the north-east. This centre will include:

The landfill gas flare(s), the electricity generators and transformers, diesel electricity generator, condensate removal system, leachate evaporate (leachate storage tank and a small workshop for gas generator maintenance)

- Stormwater runoff from the energy centre will drain to the landfill Pond 3, then to the receiving environment via the wetland for stormwater quality treatment.

Refuelling area

Stormwater runoff from this area will be treated by means of an API oil – water separator (specifically Humes proprietary 'API Oil Interceptor') prior of discharging into the site stormwater treatment devices.

Leachate tanks, generator units and gas condensate

The leachate tanks, generator units and landfill gas condensate will be fully bunded with no discharges of any contaminated water to the stormwater system. Any contaminated water will be pumped into the leachate system or removed via sucker truck for off-site treatment.

Maintenance workshop

Stormwater runoff from the workshop impervious areas will be directed to the landfill stormwater treatment ponds.

Environmental management plan (EMP)

The applicant has prepared an EMP that describes the proposed management controls and mitigation of potential sources of contaminants that are to take place on site. The EMP includes control system procedures along with operational control measures for hazardous wastes, site maintenance plans, the drainage system, a list of unacceptable waste and a spill response plan. The EMP also states the roles and responsibilities of employees on site and once completed will include staff training.

Emergency spill response plan (ESRP)

All environmentally hazardous substances on site will be stored and managed in accordance with the EMP. To minimise effects to the environment in case of an emergency spill, these will be managed in accordance with the ESRP.

Stormwater monitoring

The applicant's consultant has also proposed:

- A new maintenance and stormwater monitoring programme for the site. The purpose of this programme is to monitor the discharges from the site impervious areas to the receiving environment. This will ensure that the site management practices are implemented and maintained in order to minimise the potential discharge of contaminants associated with the site activities.

Damming of surface water

To support the consent application process, Auckland Council engaged Mr. Don Tate (from Riley Consultants) to assess the surface water damming safety aspects. The information provided by the applicant was considered sufficient for notification, however it was considered there was insufficient information on geotechnical aspects to confirm feasibility. Although one approach could be to rely on consent conditions to address this uncertainty Mr Tate was of the opinion this information should be provided by the applicant because it could not be concluded on present information that all hazards have been identified and are manageable (as per Module 1 of New Zealand Dam Safety Guidelines).

2.2 Site description

The site is located at 1232 State Highway 1, Wayby Valley and is shown in the map below.

The applicant has provided an overview description of the site and associated receiving environment and its history in section 2.0 of the application report. In brief:

1. The site is located approximately 6km southwest of Wellsford and 70km north of Auckland.

2. The WMNZ landholdings cover an area of approximately 1020Ha that comprises a mixture of terrain and landuse typologies, including pastoral farmland and plantation forestry. The applicant is proposing to develop and operate a regional landfill on part of the WMNZ landholdings.

3. Access to the site is via Forestry Road off State Highway.

The proposed development is located within four tributary valleys (sub-catchments) of the Hoteo River.

4. Western Block (total catchment 302.0Ha): The sub-catchment is flat to gently sloping; becoming steeper as it moves eastward away from the Hoteo River.

5. Eastern Block (110.0Ha): has a catchment area of approximately 4.5km^2 and is characterised by ridges and several gullies (including 1.09km^2 catchment within Valley 1 (V1 Stream)) which have been deeply incised by west-north - west draining watercourses that form tributaries of the Hotea River, or east draining to the Waiwhiu Stream.

6. Southern Block (85.4Ha): The south facing slopes are steeper than those facing north; this sub- catchment is delineated by two ridgelines oriented in an east-west direction, with the central valley containing a stream (AC River Number 457361) running westward into the Hoteo River via the Waiteraire Stream. The access road and bin exchange area will be developed within this block.

7. Waiteraire Tributary Block (143.0Ha): comprises an area of plantation forestry and native vegetation at the south eastern extent of the landholding.

8. There are two valleys on the overall site:

    - Valley 1: located in the Eastern Block, the proposed landfill will be developed within this Valley. A detailed description of this valley is referenced in section 4.2.2 of the engineering report and section 4.0 of the application report.

    - Valley 2: the northern most valley.

9. The geological map of Auckland shows that the surface geology of the site is Pakiri Formation, part of Waitemata Group. Most of Waitemata Group consists of gently inclined undulating sedimentary strata, interrupted by some geological faulting, with localized deformed intervals.

10. The site landform is strongly influenced by weathering and slope movements along an arc-shaped ridgeline formed in the Waitamata Group deposits.

11. There are several intermittently flowing and permanent streams and tributaries including the Waiwhiu and Waiteraire Streams (all watercourses

within the site are tributaries of the Hoteo River.

12. The stream within Valley 1 flows toward the north-west where it ultimately discharges into the Hoteo River at the western boundary of the site.,The Hoteo River flows in a southerly direction towards the Kaipara Harbour.

13. Holocene (recent) river deposits of the Tauranga Group are located to the west of Valley 1 and follow the course of the Hoteo River. The river deposits typically consist of sand, silt and clay with local gravel and peat beds.

14. There are many streams along the floor and slopes of Valley 1.

2.3 Background and site history relevant to these consents only

No Industrial and trade activity consents have been held for this site prior to this application.

Waste Management New Zealand (WMNZ) has purchased approximately 1,020 ha of land in Wayby Valley and is proposing to construct and operate an engineered modern municipal solid waste landfill on that land. The landfill would be known as the Auckland Regional Landfill.

In May 2019, WMNZ lodged a comprehensive resource consent application seeking to obtain the required consents under the AUP (OP).

In August 2019 WMNZ requested a private plan change to the AUP (OP) introduce a new precinct into the Unitary Plan – the Auckland Regional Landfill Precinct. This plan change request is being considered along the resource consent applications.

3.0 REASON FOR CONSENT – STORMWATER

3.1 Reasons for consent

Auckland Unitary Plan (Operative in Part) (AUP O-P)

Stormwater

Diversion and discharge of stormwater

Consent is required as a **Discretionary Activity** under rule E8.4.1(A10) for the diversion and discharge of stormwater runoff from an impervious area greater than 5000m^2 within the rural area.

Industrial and Trade Activities (ITA)

ITA - Use of land

Consent is required as a **controlled** activity under Chapter E33.4.1(A8) for the use of land for a new industrial or trade activity listed as a high risk in Table 33.4.3.

ITA activities - Discharge of contaminants from high risk industrial or trade activity

Consent is required as a **Discretionary** activity under Rule E33.4.2 (A24) for the discharge of contaminants from a new industrial or trade activity area listed as high risk in Table E33.4.3.

Surface water damming

Consent is required as a **Discretionary Activity** under rule E7.4.1(A35) for the creation of dams (three) through the formation of stormwater ponds in the base of Valley 1. Surface water damming from an impervious area greater than 5,000m^2 doesn't meet the permitted activity criteria.

4.0 TECHNICAL ASSESSMENT OF EFFECTS

4.1 Assessment of effects on the environment

Stormwater

Water quality

As contaminants generally adhere to sediment particles, the treatment of stormwater is gauged by the amount of sediment removed through a water quality treatment device. GD01 recommends that in order to mitigate potential adverse effects from a water quality perspective, treatment devices should be designed and implemented to remove 75% of total suspended solids (TSS) on a long-term average basis.

Section 2.1 of this report summarised the overall site stormwater system approach.

The applicant has identified and presented an assessment of the environmental effects associated with the proposed stormwater management in Section 9.0 of the application report and through the s92 responses.

Adequate treatment systems have been proposed to remove sediment from stormwater at all stages of development and operation of the landfill.

In general, the applicant is proposing to provide water quality treatment devices to treat the stormwater from all activity areas on site (excluding any leachate) where contaminants may become entrained in stormwater. The stormwater devices chosen

for the site are stormwater detention ponds and a wetland, and these devices have been confirmed as meeting the design requirement of Auckland Council GD01 to provide treatment of stormwater from the site contributing catchments for 75% TSS removal. This adequately mitigates the effects of contaminants generated (such as, heavy metals, organic materials and TPH) on a long-term average basis in accordance with the requirements of the AUP.

Surface water from the up gradient of the landfill cells and development areas will be diverted around the work areas (via open channels) to minimise the potential for sediment generation. The runoff will drain via a stormwater pipe constructed beneath the landfill liner into Pond 5, and then will be piped into Pond 3 for detention only.

Once the landfill extends up into the valley, the stormwater pipe underneath the landfill will be decommissioned, and flows will be directed around the landfill to Pond 4 for stormwater detention and preliminary quality treatment.

The access road is a potential high source of contaminants, and to ensure these are prevented from entering the receiving environment, the applicant is intending to minimise the tracking of material from the landfill onto the public road and the highway through various controls.

The applicant has proposed collecting the runoff from the Section 1 catchment (the Eastern Block) by means of several catchpits and direct the flow into the landfill ponds/wetland system for quality treatment.

Stormwater quality is also proposed for the Section 2 catchment (the catchment from SH1 to the crossing of the ridgeline into the Eastern Block) impervious areas by means of filter strips located along the road (12 filter strips). The filter strips are designed in accordance with the 'New Zealand Transport Agency, Stormwater Treatment Standard for State Highway Infrastructure, May 2010'. Locations of the filter strips can be found in Figure Number ENG-30 prepared by Tonkin and Taylor and dated May 2019.

The applicant is proposing to mitigate potential water quality effects associated with roof runoff through source control measures in the form of using an inert roof material. By using inert roof material, the potential for contamination is significantly reduced.

In section 2.1 of this report the applicant confirmed and demonstrated that the stormwater run-off which has been in contact with waste will be kept separate from stormwater from all other places and will be treated as leachate.

Leachate collected from the landfill will be recirculated into incoming waste at the landfill. Additional amounts will be pumped through a fixed pipe system from the toe of the landfill directly to a holding tank to minimise the quantity that needs to be transferred off-site. Collected leachate will be taken off-site to an appropriate treatment facility by specific contractors for disposal. Leachate will only be taken off

site until sufficient LFG is available at which time it will processed through the evaporator.

Industrial and trade activity (ITA)

Inappropriate management practices from industrial or trade activities can result in discharges of environmentally hazardous substances associated with the activity onto or into land or water. These environmentally hazardous substances accumulate within receiving environments after becoming entrained in stormwater, leading to adverse environmental effects.

The AUP (OP) has identified a number of industrial or trade activity areas, listed in Table 33.4.3, as being high risk in relation to the use of land. As such these have an increased potential for the discharge of environmentally hazardous substances in the form of contaminants. With respect to these industrial or trade activities, the primary focus of the Council is to ensure that discharges of contaminants onto or into land or water are avoided where practicable; or the effects of discharges are remedied or mitigated where they cannot be avoided. The key method for addressing this issue is the preparation and implementation of site-specific environmental management plans (EMP), which identify the environmentally hazardous substances associated with an industrial or trade activity, and set out the methods to avoid, remedy or mitigate discharges.

The application report submitted in support of the application notes that the activities undertaken on site can contribute large quantities of contaminated total suspended particulates into discharges from the site.

The applicant has identified and presented an assessment of the environmental effects associated with the proposed stormwater management through the application report and the s92 response.

The applicant has acknowledged the potential effects arising from the activity and has proposed structural and procedural controls in the submitted EMP.

Measures to avoid, remedy or mitigate these effects have also been addressed in the submitted EMP.

Contaminants of Concern

The applicant identifies and assesses the effects of the proposed activity on the environment that are likely to arise and any mitigating factors in Appendix P attached to the application report.

The following potential contaminants of concern (COC) and effects from the total site operations on receiving environment have been identified by the applicant as follows:

Contaminant of concern	Source of contaminant	Potential effect
pH	All activities	Can kill fish by burning their gills and skin. pH has significant adverse effects on aquatic fauna and can damage sensitive mucus membranes such as the gill surfaces on fish.
Heavy metals	Main workshop (Wash area Main workshop, Outside covered workshop area and Primary wash-bay) Energy Compound, land waste disposal area, wheel wash, vehicle movements around the access roads, weighbridge Bin exchange	Inhibit plant growth, and are toxic to aquatic creatures, by accumulating in their systems. Metals do not break down in the environment and they build up in the bed sediments of a water body. High concentration of Zinc can be fatal to benthic organisms and cause hormone imbalances leading to mutations.
Ammonia	Main workshop (Outside covered workshop area and Primary wash-bay) Energy compound (Leachate collection tanks and evaporator, Condensate drain system Landfill development area (Roadways and Working face/ filling Area) Wheel wash	Can kill fish by burning their gills and skin. Increase the acidity of the receiving environment.
Total Suspended Particulate (TSS)	Main workshop (Wash area, Outside covered, workshop area and Primary wash-bay) Working face/ filling area, preparing intermediate and final cover including earthworks Final covered cell area Main roadway, office area and weigh bridge (Main roadway, Weighbridge) Energy compound (Leachate collection tanks and evaporator, Generator	Elevated TSS in stormwater can have several adverse effects on flora and fauna, which include: Inhibiting natural behaviours such as feeding due to reduced visibility. Blocking gills of fish species. Suffocation of benthic flora and fauna. Carrying of contaminants such as heavy metals and oils into the benthic layer.

	Workshop area, Condensate drain system Landfill development area (Cell preparation including earthworks, roadways (vehicle movements) Wheel wash Bin exchange area Main roadway, office area, vehicle movements, and Weigh bridge	
Organic material (measured as Chemical or Biochemical Oxygen Demand (COD/BOD)) and Ammonia	Main workshop (Outside covered workshop area and Primary wash-bay) Energy compound (Leachate collection tanks, evaporator and Condensate drain system) Landfill development area (Roadways and Working face/ filling area) Wheel wash Bin exchange area	Waterways can become depleted of oxygen by a high organic strength environment.
Total Petroleum Hydrocarbon (TPH) and Oil & Grease	Main workshop specifically from: (Storage diesel tank, Refuelling area, Waste oil tank (30,000L oil tank and 6,000L waste oil,000L) and Compressor room) Wash area Dangerous goods store Main workshop Energy compound: (Generator oil tanks (30,000L oil tank and 6,000L waste oil tank), plus unloading area, Back-up diesel generator, Leachate collection, tanks and evaporator) Landfill gas blowers and flare – leaks/ servicing of equipment Landfill gas generators Generator (Transformers, Generator workshop Area, Flare site dangerous goods store) Landfill development area (Roadways, Working face/ filling Area) Wheel wash Main roadway and office area Weigh bridge, and Bin exchange area	Oil products can form an oily film on the surface of water thereby preventing the entry of oxygen to the water components of oils also accumulate in the bed sediments of a water body.

The total industrial and trade activity area at the site is 632,428.8m^2 (Industrial and trade activity catchments tabulated on Figure No. SW1 attached to the s92 response).

Structural and procedural controls

The applicant's consultant (Tonkin & Taylor) has provided an assessment of these actual and potential sources of stormwater contamination and proposed structural and procedural controls to limit the discharge of these contaminants to the receiving environment (refer to Appendix P attached to the application report specifically in Table 5.1).

Multiple mitigation measures have been proposed in order to prevent contaminants from leaving the site. These include treatment devices, an EMP outlining structural and procedural practices to prevent discharges of contaminants, and an emergency spill response plan (ESRP) which identifies the environmentally hazardous substances associated with a particular industrial or trade activity, and sets out the methods to avoid, remedy or mitigate discharges.

As stated above, the applicant is proposing to provide stormwater quality treatment devices for the runoff from the site risk activity areas / hardstand impervious areas (all are considered as an ITA activity area), to achieve 75% total suspended solids removal by means of GD01 stormwater treatment devices (specifically four ponds and a wetland). These devices are considered to represent best practice as they are effective at removing 75% of contaminants such as TSS, heavy metals, organic materials and TPH.

The main activities located outside the development area (landfilling workface area) which are determined to be "activity areas" include the following:

- Workshop area and office: Includes the diesel tank, refuelling area, waste oil tank, wash bay and primary wash bay areas. The stormwater run-off from these areas is piped to Pond 3 via an oil - water separator for contaminant treatment purposes targeting the parameters listed in the table above, ensuring that the discharge of contaminants from the treatment system is reduced to an acceptable level.

- The energy compound stormwater system includes stormwater cesspits and an underground pipe network which ultimately discharges to the on-site treatment system (specifically Pond 3) for contaminant treatment purposes targeting the parameters listed in the table above.

- The generator centre fuel area includes bunded areas with shut-off valves. When stormwater runoff has accumulated, the valves are manually opened. Runoff is drained through an interceptor system for hydrocarbon treatment before being discharged to a conveyance channel leading to Pond 3 for

contaminants treatment purposes targeting the parameters listed in the table above. This process is further outlined within Section 3.7 of the EMP.

- Thermal effects: The relative impact of temperature on the receiving environment depends on the fauna present and the values being protected. However, Macroinvertebrate indices in the downstream Valley 1 reach and Upper Waiteraire were indicative of excellent water and habitat quality, with more sensitive species dominant in the community. The Western block is indicative of poor water quality and a community made up of more tolerant species. Sensitive aquatic species such as those within Valley 1 and Upper Waiteraire prefer a maximum water temperature of 20oC, however more tolerant species (such as those within the Western Block) can withstand up to 26oC. Slight, moderate and severe adverse effects occur at water temperatures of 22oC, 24°C and 26°C respectively.

  The Applicant's Agent has undertaken an assessment of the potential thermal effects associated with runoff from the ponds. The assessment has calculated the anticipated thermal increase within the stream, immediately downstream of the discharge location. This includes the discharge from the wetland as well as the flows from the adjacent upstream catchment. The assessment has been undertaken based on 90th percentile rainfall events. The assessment has made the following assumptions:

  1. The discharge temperature from the wetland is 25°C (based on summer temperatures from wetland).
  2. The temperature within the stream is 15°C (based on reported temperature of bush catchments)
  3. The contributing stream catchment is 95 hectares.

  Design Effluent Quality Requirements (DEQR's) were established as part of the development of the AUP rules and are presented within guidance document Auckland Unitary Plan stormwater management provisions: Technical basis of contaminant and volume management requirements August 2013 (TR2013/035). TR2013/035 proposes a DEQR of a maximum of 25°C for temperature. This is further supported by research presented within Temperature as a Contaminant in Streams in the Auckland Region, Stormwater Issues and Management Options October 2013 (TR2013/044) which includes a study on the potential temperatures on different fish and macroinvertebrate species and reports that acute effects are limited to increases in temperature of 20°C to 25°C. While the DEQR's were not adopted in full into the Unitary Plan provisions, Policy E1.3.8(d) still allows for consideration of effects on temperature from discharges of stormwater runoff.

  The anticipated temperature downstream of the mixing zone has been calculated at 20°C. In Valley 1 and the Upper Waiteraire, water temperatures of 20°C degrees are expected to be tolerated by instream species. In the

Western Block, the water may be warmer, but as the species in the Western Block are more tolerant of temperature increases, the warmer water should not result in adverse effects.

The applicant has also indicated plans to draw down water stored within stormwater ponds for dust suppression on the site. This would provide additional temperature benefits on the basis of volume reduction and provide a live storage buffer before the pond discharges.

The Applicant's Agent has proposed conditions which include monitoring of stormwater runoff and specifically include temperature. These conditions are supported.

As the anticipated temperature within the stream is <20°C, the anticipated temperature is below the temperature at which adverse effects are likely within the receiving environment and the discharge is not expected to exceed 25°C, I consider the proposal is therefore consistent with both TR2013/035 and TR2013/044 and the anticipated effects associated with temperature are adequate.

- Wheel wash area: Surface water from around the wheel wash is diverted to the wheel wash pond. The water collected in the wheel wash pond is re-used for the wheel wash system. If surplus water is present in the wheel wash pond, water can be released to the Pond 3 treatment system via an oil interceptor (API oil – water separator (specifically Humes proprietary 'API Oil Interceptor' ((3,000L)) and after testing it (for TPH) in the adjacent sediment pond. The API Oil Interceptor will remove maximum amount of oil particles from the water prior to discharging into the site stormwater treatment devices. ensuring that the discharge of contaminants from the treatment system is reduced to an acceptable level.

- Bin exchange area: the applicant has proposed to provide stormwater quality treatment for the stormwater runoff from the proposed impervious areas within the bin exchange area by means of two rain gardens. This device is designed in accordance with Auckland Council GD01.

The applicant has confirmed that in the event of a spill during a servicing breakdown, it will be contained, and the receiving stormwater drains are to be covered with a polyurethane drain protector to prevent discharges into the downstream environment.

If a leachate breakout is identified in surface water, site personnel will follow the spill response and contingency procedure attached to the EMP.

In addition, any surface water with evidence of leachate will be held in the stormwater treatment ponds for treatment or management. No discharge would occur from the ponds until monitoring results demonstrate that the water quality is suitable for

discharge.

It is considered that the treatment train detailed above will adequately mitigate the effects of contaminants generated by the site's activities (such as TSS, heavy metals, organic materials and TPH).

In order to ensure that the discharge of contaminants from the treatment system is reduced to an acceptable level, maintenance and monitoring of the system will be required as a condition of consent.

Once the treatment system is completed, contaminant discharges from the site will be reduced to a level that ensures that adverse effects arising from the proposal will be adequately managed.

Overall, the proposed water quality treatment for the site is considered appropriate.

Detailed designs of all stormwater quality devices including any relevant drawings, plans and calculations will be submitted to Auckland Council and approved at the time of application for Engineering Plan Approval. It is recommended that a condition be attached to the stormwater discharge permits requesting the above documentation to be submitted in detail during the Engineering Plan Approval.

Water quality monitoring

To obtain existing water quality data to provide a baseline and to prepare a draft stormwater monitoring programme, the applicant undertook surface stormwater monitoring at four locations on site. Details of the monitoring locations and parameters can be found in section 1.5 of the application report. The results to date are reported in the baseline monitoring report (Technical Report F, Volume 2) attached to the stormwater and ITA report.

To date 10 rounds of stormwater monitoring have been undertaken. The results have been compared to Auckland Council monitoring data for the Mahurangi Redwood Catchment. This was chosen for comparison, because it has a similar catchment (plantation forest located approximately 15 km to the south of the site) with available surface monitoring data. The monitoring results indicated that they are within similar ranges to the Redwood site and are generally indicative of good water quality. This is expected as the catchment is small and there are limited sources for COC in the area. For details please refer to Water quality Baseline Monitoring Report prepared by Tonkin and Taylor and dated May 2019).

As part of the proposed stormwater treatment approach the applicant has proposed to undertake monitoring at the discharge points where stormwater exits the site.

A draft stormwater monitoring programme has been provided. To ensure that the stormwater quality and the management practices are implemented and maintained

at these areas, it is recommended that a condition be attached to the ITA permit requesting a stormwater sampling programme from the stormwater discharge points (outlet from the wetland and the outlet from the rain garden) to monitor the quality of the site stormwater discharge.

The following stormwater monitoring parameters are recommended:

- pH
- Total suspended particulate (TSS)
- Total petroleum hydrocarbon (TPH)
- Heavy metals, totals, dissolved and traces (including: Aluminium, Zinc, Arsenic, Cadmium, Chromium, Nickel, lead and Copper)
- Semi Volatile Organic Compounds (SVOC's), Volatile Organic Compounds (VOC's)
- Turbidity
- Temperature
- Nitrate – N
- Oil and Grease
- Chemical Oxygen Demand
- Electrical Conductivity
- Total Phenols
- Total Alkalinity
- Ammonia; and
- Total hardness
- Total (Aluminium, Calcium, Iron, Magnesium, Potassium, Sodium, Chloride and Total Ammoniacal – N
- Sulphate
- Total Phosphorus
- Boron
- Titanium

It is also recommended that the results of the above analysis be compared to the 95% trigger value for fresh water given in Table 3.4.1 of the ANZECC Guidelines.

TPH does not have a guideline value in the ANZECC Guidelines, however, a level of 15 g/m3 (Section 10 of Auckland Council Design Guideline Manual 2004 (TP10)) is often used by Auckland Council as the maximum acceptable level of petroleum hydrocarbons in natural water.

The applicant proposes to submit the monitoring results to the Auckland Council in the form of a brief report within one month of receipt of the laboratory report. The results will be summarised in each annual report required by a condition of consent. Should the monitoring results exceed the trigger levels then further investigation will be conducted to determine the need for any additional source control treatment devices.

In order to ensure that the discharge of contaminants from the stormwater system is at an acceptable level, maintenance and monitoring of the system will be required as a condition of consent.

To ensure that the stormwater quality and the management practices are implemented and maintained at these areas, it is recommended that a condition be attached to the diversion and discharge of stormwater and the industrial and trade activity, requesting implementation of the stormwater monitoring programme to monitor the quality of the site stormwater discharge for the proposed parameters.

Further conditions are also recommended to require that the results of the above analysis be compared to the triggers levels proposed within the stormwater monitoring programme and to the 95% trigger value for fresh water given in Table 3.4.1 of the ANZECC Guidelines for parameters without identified trigger levels. If the results of the monitoring exceed the agreed trigger values further investigation into any exceedances will be required to determine the need for any additional source controls.

The applicant concludes that all of the above measures, plus a weekly inspection of the bunds and weekly sweeping of the yard floor areas to remove any residual contaminants from all areas that are potential stormwater contaminants, will help to ensure that the effects of discharging stormwater runoff from the site activities to the receiving environment will be adequately managed.

The stormwater quality management proposed is considered appropriate in the context of the development and the anticipated level of contaminants such that the effects of stormwater discharging to the receiving environment will be suitably avoided.

Overall, the proposed water quality treatment for the site is considered appropriate.

Emergency spills

Several chemicals in small quantities will be stored in different locations at the site. All environmentally hazardous substances on site will be stored and managed in accordance with the EMP. To minimise effects on the environment in case of a spill, these will be managed in accordance with an Emergency Spills Response Plan that is part of the EMP.

The SRP states that spill kits are to be located in key areas around the site, and that staff are to be trained in spill response. These measures will reduce the risk of contaminants reaching the receiving environment.

Hazardous substances

The largest volumes of hazardous materials stored on-site are:

- Electricity generator at the gas flare site workshop with its own 1,500 litre diesel tank which is fully bunded.
- Oil storage tanks for new and used oil within a concrete bund. Any discharges will pass through an oil interceptor, and then to the Pond 1 system.
- Diesel fuel storage tanks: self-bunded in addition to a secondary steel bund.
- Oil storage drums inside workshop building: Interceptor and a sump with manual valve.
- Dangerous Goods store located at the south side of the workshop

The applicant is not proposing to bund the dangerous goods facility because it is under cover (inside building), the floor of the building is sloping and there is a sump inside the building which acts as secondary containment in case of major spills.

Condensate sumps in the flare site and on the landfill are bunded, and discharge into the landfill leachate system.

Details of the hazardous substance's management is dealt by the contamination Air Noise Team specialist. Please refer to the hazardous substances specialist technical input memo.

Water quantity/flooding/overland flow

GD01 identifies many primary objectives for mitigating effects associated with stormwater quantity, i.e. ensuring that post-development peak flow rates for the 100 year ARI storm event are limited to pre-development levels to prevent downstream flooding, and maintaining pre-development hydrology in greenfield catchments by ensuring that post-development peak flow rates for the 2 and 10 year ARI events are limited to pre-development rates.

The applicant has proposed to provide detention and retention for the proposed impervious area for 90th percentile stormwater events by means of the compliant GD01 wetland.

The applicant has provided a Hydrological report with the ponds being hydraulically modelled. Information has been supplied in support of the four ponds and the wetland being generally designed to incorporate a live storage function within each pond footprint together with a controlled outlet system to maintain the existing pre-development peak flow rates from the full catchment for 2, 10 and 100 year ARI storm events.

In the Engineering report the applicant has provided a hydrological analysis for the development on the site in general accordance with Technical Publication 108 *'Guidelines to Stormwater Run-off Modelling of Auckland Region'* developed by the former Auckland Regional Council. This analysis demonstrates that the implementation of the proposed stormwater management will ensure that the proposed stormwater hydrological management will provide hydraulic neutrality for the 90th percentile storm event. Details of the design and calculations for this device can be found in Appendix E, attached to the ITP Application.

Preliminary designs for these systems have been provided and are attached to the Engineering Report. The design and specification of these devices would be completed at Engineering Plan Approval stage and they will be designed in accordance with the recommended guidelines

The design and specification of the proposed wetland would be completed at Building Consent Approval stage and should be in accordance with Council's relevant guideline documents, including TP108.

The assessment summarised through this report focuses on matters relevant to the regional stormwater consent framework and should be read in conjunction with separate Development Engineering reporting, which addresses other detailed matters including flooding and overland flow paths and pipe capacities specifically.

It has been assessed that, given the proposed mitigation measures, the water quantity effects from stormwater discharging from proposed new landfill site will be adequate.

Stream stability and channel erosion

The proposed pond systems also have the potential to cause adverse downstream effects associated with discharged pulses of warm water from the ponds. The applicant submitted an ecological assessment in this regard and concluded that the potential effects are less than minor (Ss92 response dated 20 December 2019 and prepared by Tonkin & Taylor). This will be covered in detail in the Ecological technical memo.

Outfall

The applicant has proposed to implement and maintain erosion protection at the proposed discharge points by means of a Geotextile cloth and rock rip rap. Preliminary designs for these systems have been provided and are attached to the s92 response. The design and specification of these outfalls would be completed at Engineering Plan Approval stage and they will be designed in accordance.

The provision of erosion protection at the outlets has been assessed as ensuring that the effects of outfall and channel erosion are adequate.

Cumulative effects

The natures of the contaminants of concern mean that uncontrolled or unmanaged discharges could lead to cumulative effects in the receiving environment if they are not appropriately avoided, remedied or mitigated. The ongoing management of the site through the operation and maintenance of the site's stormwater system and the implementation of the site's environmental management plan and the EMP will reduce the potential for contaminant discharges, and the potential cumulative effects that may arise from the activities.

In order to ensure the ongoing performance of the existing or proposed mitigation measures, ongoing reviews of the EMP and regular maintenance of the installed structural controls and devices will be required.

It is considered that the applicant's assessment adequately identifies the effects resulting from the proposal, and that there are no additional effects that may be generated.

Operation and maintenance

Ongoing maintenance of the proposed devices is crucial to ensuring that the effects continue to be mitigated. The devices are located on private land. The devices will stay in the ownership of the consent holder. The applicant proposes to enter into a maintenance contract with the proprietary device provider to ensure the long-term performance of the Hynds Up-Flow Filter.

An operation and maintenance OMP has not been provided. To ensure that the stormwater management devices are maintained properly, it is recommended that a condition be attached to the ITA permit requesting a maintenance OMP be developed and provided following completion of the installation of the devices undertaken under this consent.

Long term ownership devices

All devices will remain in the ownership of the consent holder. Draft operation and maintenance plans (OMP) for the management of the stormwater system have been provided as part of this application. A condition of consent will require that a Final O & M plan be provided

The applicant notes that the ownership and long-term operation and maintenance responsibilities of the stormwater treatment devices (ponds, wetland outlets, oil separators etc.) will remain with the consent holder.

Dam Preliminary design

In Section 2.0 of the s92 response letter dated 20 December 2019, the applicant has demonstrated Pond 2, Pond 3B and Pond 4 dams all have a low Potential Impact Classification (PIC).

Preliminary key design parameters and estimated storage volumes for the Pond 2, Pond 3B and Pond 4 dams, based on the flood routing assessment results, are summarised in Table 4.1 and Table 4.2 of the Stormwater pond damming s92 response report prepared by Tonkin & Taylor and dated December 2019 attached to the s92 response letter dated 20 December 2019.

The dams are assessed in the report as low potential impact classification in terms of downstream consequences if the dams were to fail (New Zealand dam safety guidelines have 3 categories low, medium and high).

The three of these larger dams (i.e. Pond 2,3B and 4) will require building consents as they exceed the height and volume thresholds and investigations will be required for these at a later stage

The applicant provided a preliminary flood routing model for sizing Pond 2, Pond 3B and Pond 4 dams, as well as their primary and auxiliary spillways, using HEC-HEM version 4.3. Also, storage volumes for the three ponds were determined based on LiDAR and landfill design contours.

Embankment design

The applicant is proposing to have the following three dam embankments:

- 5m crest width for access
- 1V:3H batter slopes both upstream and downstream for stability maintenance
- A foundation cut off to mitigate against internal erosion through the foundation. Details will be provided once the additional required geotechnical investigation is carried out.
- A central or upstream low permeability core
- A chimney filter draining along the downstream side of the low permeability core and a drainage blanket at the dam foundation downstream of the chimney to mitigate erosion, control seepage and increase the factor of safety against stability.

Dam safety

Preliminary safety of the dam and effects of dam failure on the downstream environment have been considered by the applicant in their geotechnical engineering assessment and subsequent correspondence forming the Section 92 responses. Reference is made in the application to the NZSOLD Dam Safety Guidelines where a corresponding Potential Impact Category Assessment (PIC) has been completed concluding the dams have a Low PIC status.

Riley Consultants have peer reviewed the design and dam safety aspects on behalf of the Auckland Council and requested S92 further information to demonstrate that the proposed dam safety hazards have been identified and that the proposed dam design addresses these hazards. (Please refer to the Riley Consultants report *'Review of Dam Safety Aspects Proposed Stormwater Ponds'* and dated 27 August 2020, attached with this memo.

Following receipt of Section 92 information, Riley Consultants prepared a report 'Review of Dam Safety Aspects Proposed Stormwater Ponds' dated 27 August 2020. (Report attached to this memo).

Overall, Riley Consultants are satisfied that the level of information provided by the applicant is sufficient.

Conclusion

Stormwater and ITA

The applicant's assessment adequately identifies and addresses the above potential effects resulting from the proposal and as such there are no additional effects that may be generated.

This conclusion is based on undertaking the proposed stormwater management system to avoid, remedy or mitigate effects in accordance with the application documents. Ongoing monitoring of discharges is required to determine whether positive long-term environmental outcomes can be achieved or whether further site adjustments are required to meet agreed trigger levels.

5.0 REVIEW

Memo prepared by:

Arsini Hanna

Senior Stormwater & Industrial and Trade Activities & Wastewater-Specialist Unit, Resource Consents Department

Date: 7 September 2020

Memo and technical review reviewed and approved for release by:

Rod Dissmeyer	
Team Leader– Stormwater & Industrial and Trade Activities & Wastewater-Specialist Unit, Resource Consents Department	
Date:	7th September 2020

Technical memo – Specialist Unit

To:	Warwick Pascoe, Principal Project Lead, Resource Consents, Premium
From:	Stephen Crane, Senior Specialist- Water Allocation
Date:	4 September 2020 Final

1.0 APPLICATION DESCRIPTION

Application and property details

Applicant's Name:	Waste Management NZ Ltd
Activity type:	Take and use surface water
Purpose description:	An application to take and use surface water from the impoundments of three on-stream stormwater detention dams in the Hoteo River catchment for dust suppression, road washing, wheel wash and other non-potable water use for landfill purposes.
Service centre application number:	WAT60339673
Site address:	1232 State Highway 1, Wayby Valley, Warkworth.

2.0 PROPOSAL, BACKGROUND AND CATCHMENT DESCRIPTION

2.1 Proposal

Waste Management NZ Limited (WMNZ) has made an application for a new consent to take and use 150 m^3/day and 54,750 m^3/year of surface water from the impoundments of proposed on-stream stormwater detention dams in the Hoteo River catchment for dust suppression, road washing, wheel wash and other non-potable water use for landfill purposes.

2.2 Relevant documents

A description of the proposal is provided in the report titled "Auckland Regional Landfill Private Plan Change Request, Assessment of Effects and Section 32 Analysis" (AEE) and Appendices A to G (including B: CTs), prepared for Waste Management NZ Ltd by Tonkin & Taylor Ltd, dated July 2019. Further information is provided in 20 Technical Reports numbered A to T in the Assessment of Effects on the Environment (AEE) Volumes 2A-2C, all dated May 2019; in the Assessment of

Effects on the Environment Volume 3 Drawing Set, dated May 2019; and in the S92 Responses Tranch 1 -5 by Tonkin & Taylor.

The AEE Technical Report G "Assessment of Aquatic and Terrestrial Ecological Values and Effects" discussed these matters. Sections 7.8 and Table 7.12 of the AEE Technical Report P "Stormwater and ITA Report" discussed Stormwater Pond Design. Section 7.4 of the AEE Technical Report N "Engineering Report" discussed potable and non-potable site water supply.

Appendix C of the Tranch 5 Response dated 20 February 2020 discussed the water takes from the Stormwater Ponds in Questions 35 to 42.

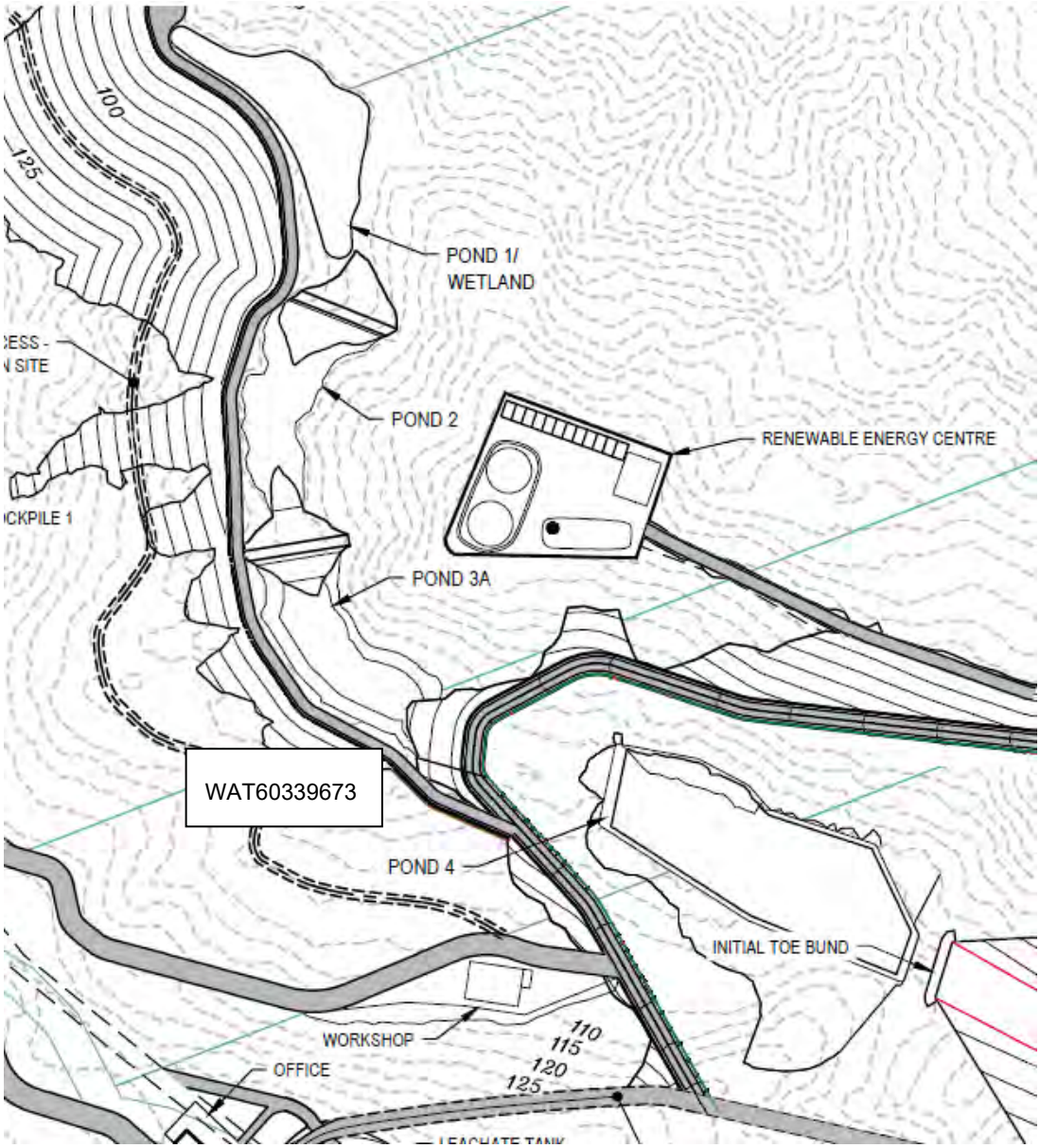


Fig 1 Waste Management NZ Ltd – wetland pond #1 and stormwater ponds # 2 - 4

2.3 Background

An application WAT60343935 has also been made to take 50 m^3/day from a proposed bore for potable water supply and is reported separately in the Groundwater Effects Technical Memo. Any water for firefighting will also be drawn from the storm water ponds and bore supply.

The legal descriptions of the land parcels affected by the proposal are provided in table 1.1 of the AEE. The WMNZ landholdings cover 1020ha and are located within four tributary valleys (sub-catchments) of the Hoteo River, termed in the AEE as the Southern, Western, Eastern and Waiteraire Tributary Blocks. The 110 ha Eastern Block comprises several gullies including a 109ha catchment which is termed “Valley 1” where the landfill will be located. The landfill will be located in the valley between two ridges named in the AEE as Holst Rd ridge to the north and Jackson Rd ridge to the south.

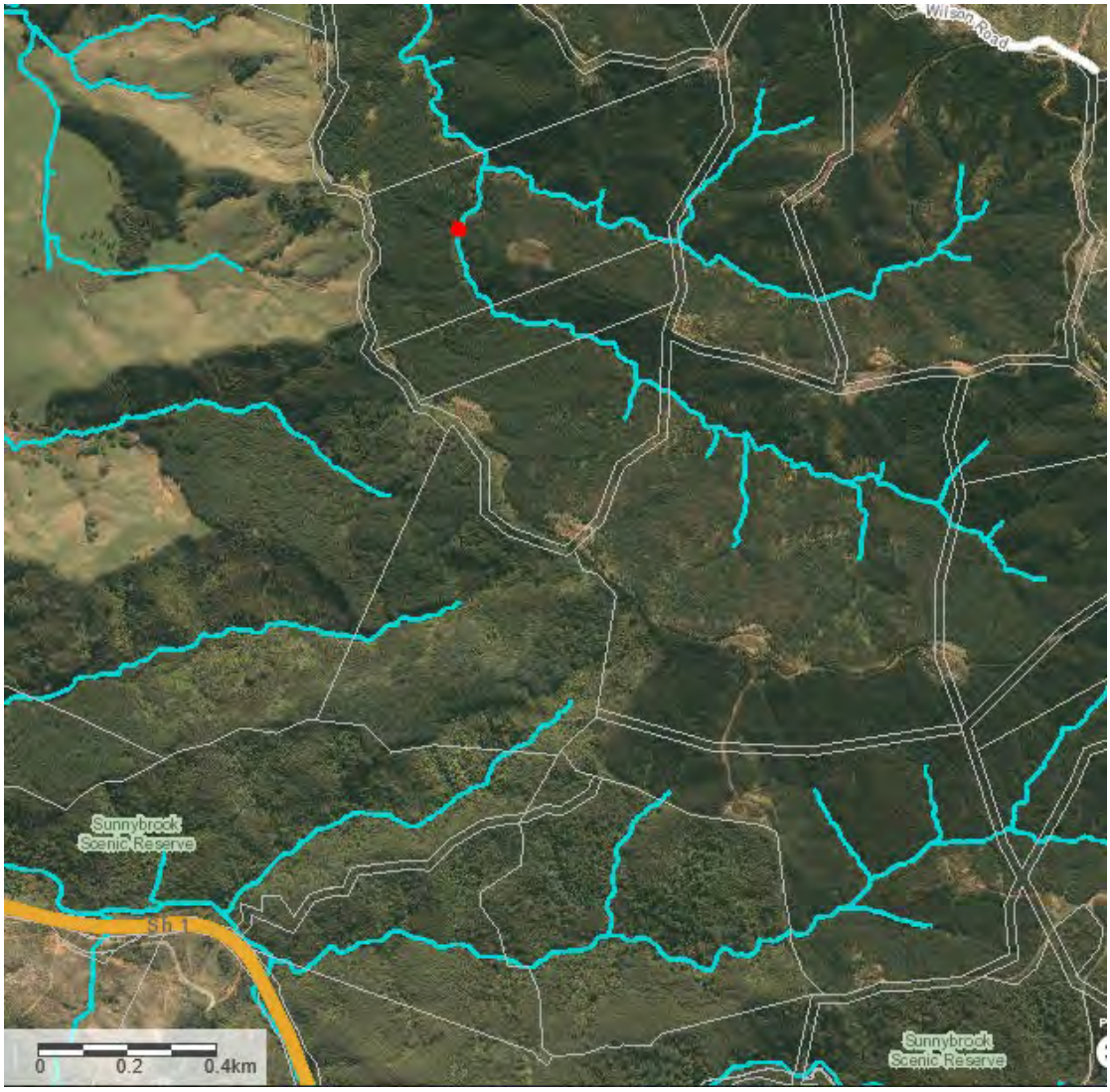


Fig 2 Waste Management Ltd – Location of proposed lower stormwater pond #2 in “Valley 1” of the proposed landfill and in relation to SH1

Table 7.12 of Technical Report N "Engineering Report" lists the four storm water ponds named Pond 2, 3 and 4 and Upstream pond. The volume of storm water ponds 2, 3 and 4 range from 15,600 to 44,000 m³. The four dam impoundments (labelled Ponds 1 to 4) and their locations are illustrated in the Assessment of Effects on the Environment Volume 3 Drawing Set, May 2019, Drawing ENG-04 "Landfill layout plan-Phase 1-6" reproduced above in Fig 1. They are all located in "Valley 1". The location of the lowest stormwater Pond #2 is illustrated in Fig 2 above to provide a broader perspective.

The stormwater detention dams and impoundments are described in the 2020 Technical Memo on Stormwater Damming and Industrial & Trade Activity by Arsini Hanna, AC senior specialist, stormwater.

The landfill will be developed in three stages. In stage 1 a stormwater pipe will be installed beneath the landfill liner in Valley 1. In Stage 2 the pipe will be decomissioned and surface water flows will be directed around the landfill to Pond 4. Stage 3 involves the final stages of the landfill at the base of the valley, and Pond 4 will be decommissioned. The reclamation of the stream in valley 1 will therefore affect the on-stream dams and stormwater ponds by requiring the removal of Stormwater dam and Pond no.4. Non-potable water for dust suppression, road washing, and wheel wash will be required for the life of the landfill.

The landfill and Stormwater ponds 2 to 4 are located on tributary no. 457405 of the lower Hoteo River. Off-stream Stormwater Wetland Pond 1 is located at the confluence of this tributary and the main local stream no. 457400.

2.4 Catchment Description

The surface water and stream ecology of the site are described in sections 4.3.5 to 4.3.7 of the AEE.

Sections 3 and 7 of the AEE Technical Report P "Stormwater and ITA Report" briefly discussed the existing Environmental Setting and Stormwater Catchments.

The AEE Technical Report G "Assessment of aquatic and Terrestrial Ecological Values and Effects" provides an assessment of the existing and potential values of the stream and wetland environments within the landfill site as well as an assessment of the actual and potential effects on these values resulting from the proposed activities. The Report also outlines the proposed means to manage any actual or potential adverse effects through a combination of avoidance, mitigation, offset and compensation measures.

Further detail is provided in section 4.3 below.

3 REASON FOR CONSENT – WATER TAKE

3.1 Reasons for consent

Consent is required under the provisions of the AUP(OP) Rule E7.4.1 (A9): "Take and use of surface water including [from] dams not meeting the permitted activity, controlled activity or restricted discretionary activity standards or not otherwise listed."

The taking of surface water is discretionary activity.

3.2 Other activities considered

There are many other regional resource consents required, including for damming water and Stream Works.

The Council Stream Works Technical Memo considers the landfill application with regards to actual and potential effects on freshwater ecology resulting from the proposed activities in, on under or over the bed of rivers streams and wetlands, with reference to chapter E3 of the AUP-OP. It also considers the proposed 'effects management package' including measures to avoid, remedy, mitigate, offset and compensate adverse effects.

4 TECHNICAL ASSESSMENT OF APPLICATION AND EFFECTS

4.1 Assessment of Permitted baseline

The relevant permitted baseline is that provided by AUP(OP) Rule E7.4.1 (A4): "Up to 5 m^3/day of water from a lawfully established on-stream dam".

The application maximum daily quantity is for 30 times the Permitted Activity.

In this case the proposal has actual and potential effects of a significantly differently scale to an activity that could be undertaken as a permitted activity and hence the permitted baseline does not provide a useful comparison for the purpose of discounting effects.

4.2 Assessment of application quantity

(a) Justification of water quantities sought by applicant

It is not possible to calculate the landfill non-potable water requirements in an "empirical manner". Water requirements were calculated from comparison with past use at another regional scale landfill. I consider this an appropriate method.

Water requirements are discussed in Appendix C of the Tranch 5 S92 Response (page 309 of 505 page document) dated 20 February 2020 in Questions 35 to 42.

"The quantity of water for dust suppression, road washing and other non-potable site uses has been estimated by WMNZ on the basis of water usage at Redvale Landfill. Redvale currently uses an average of 169 m^3/day for site water. With some efficiencies, WMNZ considers that this could be reduced to 150 m^3/day at the Auckland Regional Landfill (ARL).

The use of water has been shown to be an effective means for dust control which is required for worker safety and control of environmental effects. The use of water is proposed at ARL for this purpose. Water will only be applied when required for dust control. The higher rainfall at the ARL site may result in less water being required than at Redvale, and this would be reflected in the actual water used.

The other significant use of non-potable is for wheel washing. A wheel wash is provided at the exit from the "dirty" area of the site to remove dirt from wheels. This is in the form of a drive-through pond. Water will discharge to a settling pond and decanted water will be returned to the main wheel wash to conserve water."

No specific annual return period security of supply was sought in the AEE. Security of supply in a 1:20 year drought was investigated as a S92 Request for further information. A spreadsheet water balance model was set up to test performance of the proposed ponds to supply water required for dust control and site water. The compensation release was assumed to be 0 m^3/day. This model was based on the total working storage volume of 31,000 m^3, available from Ponds 2 and 3B combined. The results indicate that there are no shortfalls within the 56 years of data analysed.

Because of the relative remoteness of the ponds from operational activities, taking water would likely comprise a fixed pumping arrangement in Pond 4 (initially) or Pond 3. This may be a pump mounted on a floating pontoon to only draw water from the surface. This would be pumped to water tanks located at a convenient location to allow filling the water carts by gravity.

In the light of the information presented, I consider that the applicant has made a reasonable assessment and the proposed take would be consistent with efficient allocation and use (E2.3.4(a)(ii)) & (e).

4.3 Assessment of effects on the environment

AUP(OP) policies E2.3(6), (9), (10), (13) and (14) apply to the take and use of surface water from lakes. The waters proposed to be impounded by the dams are considered to be lakes (see RMA definition of lake). The assessment of effects on the environment stated in those policies are addressed below.

Effect of landfill on the values of streams within the footprint

The AEE Technical Report G "Assessment of aquatic and Terrestrial Ecological Values and Effects" section 4.3 regarding effects of the landfill proposal on freshwater ecology states: *"Hard-bottom streams are relatively rare in the Auckland region and are common on site. Across the site, SEV scores, presence of native fish and water and habitat quality are high. As a result, the streams across the site scored reasonably high for ecological value….Streams within the Eastern Block were assessed as having 'Very high' ecological values due to the presence of threatened native fish, high macroinvertebrate indices and the presence of high habitat heterogeneity and hard substrates."*

Regarding this, the Report Executive Summary concludes: *"Many of the longer term effects of the project can also be minimised or mitigated, by ensuring fish passage where possible and implementation of good practice sediment and stormwater controls in respect of water quality and/or quantity.*

The most substantial effects on freshwater ecology will occur from the permanent reclamation of 15.4 km stream length across the WMNZ landholdings (which has an estimated total stream length of 135 km), mainly within the landfill footprint. These effects cannot be mitigated, however an offset and compensation package has been prepared which goes some way to addressing these effects. This includes close to 15 km of stream enhancement within the WMNZ landholdings and a commitment to undertake enhancement on a further 30 km of stream over the lifetime of the landfill."

The assessment criteria as specified in the policy essentially seeks to maintain and enhance, where appropriate, instream values and uses. Those values will be directly affected by the proposed reclamation of the stream valley, as recognised by the applicant. As the reclamation will have a greater effect on those values than the proposed water take I rely (and adopt) the review and assessment of the applicant's assessment of effects on the environment downstream of the proposed surface water takes as reported in the Stream Works Technical Memo by Mark Lowe of Morphum Consultants dated 2020.

As reported in section 2.2 of that Technical Memo, the proposal for the stream environment are: culverting a 105m length of stream with part in a Natural Stream Management Area; reclamation of 15,280m of stream including 6,764m of permanent stream; and reclamation of 1.79ha of wetland. The adverse effects on the stream environments in section 4.2 of that Technical Memo are considered to be: injury and/or mortality to native fish during reclamation; reduced fish passage; and loss of stream ecological function and habitat area. The adverse effects on the wetland environments are considered to be: injury and/or mortality to fauna including native fish during reclamation; the loss of habitat and vegetation; and the increase of edge effects and habitat fragmentation, and the loss of opportunity for wildlife corridors; and the loss or reduction in ecosystem services provided by the wetlands such as carbon sequestration and contaminant storage.

Conditions of consent are recommended to offset, mitigate and compensate those adverse effects in the Initial Site Construction Ecological Management Plan; and in the ongoing Landfill Management Ecological and Landscape Enhancement and Restoration Plan; and Off-site Stream Compensation Plan (including monitoring). (E2.3 (6)(10)(13) & (14).

<u>Effect of taking water from Stormwater dam impoundments (Ponds)</u>

Several stormwater dams and impoundments (referred to as stormwater ponds in the Application documents) will be constructed for removal of fine and course sediment and to provide stormwater detention. The ponds must have 200 m^3 of 'live storage' per ha of catchment for sediment detention. This is above the normal 'dead storage' water level in the ponds.

The advice of Jack Turner and Arsini Hanna, stormwater specialists is that, by drawing down on the dead storage zone, this shifts the balance and increases the live storage part of the system. This has a negative impact on the dead storage area in that the area is reduced and velocities would be higher, meaning potential for increased turbulence in the water column, leading to sediment resuspension and potentially decreased water quality performance. But the flip side is an increase in the live storage function which increases the residence time for water in the pond and improves the water quality performance – balancing out the previous negative.

The specialist conclude that they would not be too concerned about adverse impacts on the pond from drawing down on the dead storage volume, due to this balancing effect between increased turbulence (negative) and increased residence time (positive). They conclude that the effect of taking water on the water quality performance on the ponds would be low.

No take will occur from off-stream Stormwater Wetland Pond 1 which is located at the confluence of Valley 1 tributary no. 457405 and the main local stream no. 457400 (as illustrated in Figs 1 and 2). Therefore, flow from stream no. 457400 upstream of the confluence will bypass the wetland to the stream downstream of the confluence.

Effects of Climate change

AC commissioned NIWA to provide climate change projections for the region. Groundwater recharge, and subsequent discharges to streamflow, may decline due to projected reductions in soil moisture and mean annual low flow, and increases in potential evapotranspiration deficit. Under the mid-range scenario, where future emissions stabilise, this is predicted to increase by 25% by the 2090s to 450mm deficit. I consider this scenario can be addressed appropriately within the duration of consent timeframes (consent replaced at least twice).

4.4 Proposed monitoring of the activity

Monitoring is discussed in Appendix C of the Tranch 5 S92 Response dated 20 February 2020 in Questions 42.

"In accordance with AUP(OP) policy E2.3 (9) it is proposed to measure and record the daily volume of water removed from the ponds. If practicable measurement will be achieved using a water meter. If not practicable to use a water meter the volume used would be measured by tankers filled, pump run hours or similar. The remaining requirements of this policy are not relevant to a water take from a stormwater pond."

Recommended conditions require: maintenance of a water meter located on the pump to allow verification of compliance with both the daily and annual water take quantities, periodic verification of meter accuracy, and provision of water meter records to Council. In accordance with the Resource Management (Measurement and Reporting of Water Takes) Amendment Regulations 2020, because the take is at more than 5 l/s (18 m³/hour), the water meter must have an electronic pulse output. The Regulations apply to holders of water permits which allow freshwater to be taken. The water in the dam impoundments is freshwater.

The effects of the reclamation of streams by stormwater dam impoundments and landfill are separately addressed in measures to avoid, remedy, mitigate, offset and compensate adverse effects in the undated 2020 Technical Memo on Stream Works by Mark Lowe. Because the take is from stored water and not run of stream flow, I do not propose that any five yearly Water Efficiency Report be required.

4.5 Conclusions

The proposed 150 m^3/day and 54,750 m^3/year water requirement is consistent with the intended use for dust suppression, road washing, wheel wash and other non-potable water use for landfill purposes

Overall, for the reasons discussed above, while the reclamation of the Valley 1 stream by the landfill will have adverse effects, the actual and potential adverse effects of the taking of surface water from the stormwater damming are assessed as less than minor. This conclusion is based on the conclusions drawn in the applicant's assessment of effects and assumes the proposal will be undertaken in accordance with the application documents, best practice and subject to adherence with the recommended conditions of consent.

5.0 STATUTORY CONSIDERATIONS S104

5.1 Objectives and policies of the AUP(OP)

The AUP(OP) contains objectives and policies relating to the taking, use, damming and diversion of water.

The relevant objectives and policies of the AUP(OP) are contained in chapter B7 - Toitū te whenua, toitū te taiao – Natural resources, Policies B7.4.2 Coastal water, freshwater and geothermal water; Chapter E2 - Water quantity, allocation and use, Policies E2.3 1 to 17 (taking water); Chapter D1 - High Use Aquifer Management Areas Overlay, and Chapter M - Appendix 3 Table 1 Aquifer water availabilities. The relevant regional rules are contained in Chapter E7: Taking, using, damming and diversion of water and drilling.

5.2 Other statutory documents

- National Policy Statement: *Freshwater Management 2014*
- Resource Management Act 1991
- The Resource Management (Measurement and Reporting of Water Takes) Regulations 2010

5.3 Duration and review of consent

The Application sought a 35-year duration of consent.

It is recommended that the consent be granted for duration of 35 years, to expire on 31 May 2055 or for whatever lessor duration is determined for the landfill project suite of consents.

It is recommended that the consent have provision to review the conditions in June 2024 and at intervals of no less than five years thereafter. This recommendation is made in accordance with policy E2.3.17 of the AUP(OP) which provides for the setting of concurrent duration and review dates of consents within a catchment or aquifer. Most other surface water dam and take consents in the Hoteo River catchment may be reviewed in 2024, expire in 2029, and will likely be granted for further 15-year duration until 2044.

The review condition allows the Council to take into account a range of information, including water availability, alternative water sources; actual and potential water use; stream flows; and water quality in determining whether or not the conditions of consent should be changed.

6.0 CONDITIONS

I recommend the following conditions:

Specific conditions groundwater take consent WAT60339673

Activity in accordance with plans

1. The take and use of surface water from the impoundments of three on-stream stormwater detention dams located on tributary number 457405 of the Hoteo River at map references 1741683 mE 5978064 mN (dam no.4), 1741471 mE 5978165 mN (dam no.3) and 1741440 mE 5978305 mN (dam no.2) on land legally described as Middle and North Western Part Allotment 15 Parish of Hoteo (CT NA1149/48), and Allotment North Middle 15 Parish of Hoteo (CT NA643/294) at 1232 State Highway 1, Wayby Valley, Warkworth for dust suppression, road washing, wheel wash and other non-potable water use for landfill purposes on land legally described as XXX at 1232 State Highway 1, Wayby Valley, Warkworth shall be carried out in accordance with the plans and all information submitted with the application, and all referenced by Council as consent number WAT60339673.

Term of consent / duration

2. The taking of water permit WAT 60339673 shall expire on 31 May 2055 unless it has lapsed, been surrendered or been cancelled at an earlier date pursuant to the RMA.

Authorised Quantities

3. The abstraction shall comply with the following:

a. The total daily abstraction shall not exceed 150 cubic metres.

b. The total volume of water abstracted in each 12-month period, commencing 1 July of any year and ending 30 June of the following year, shall not exceed 54,750 cubic metres.

Installation of water meter:

4. Prior to exercise of this consent, a water meter with an electronic pulse output shall be installed and maintained at the outlet of the pump to the satisfaction of Council. The water meter shall:

- be fit for the purpose and water it is measuring;
- measure the volume of water taken, with an accuracy of +/- 5% of the actual volume taken;
- be tamper-proof and sealed;
- be installed and maintained in accordance to the manufacturer's specifications.

Verification of Water Meter/device accuracy

5. The water meter shall be verified as accurate by a suitably qualified professional at the following times:

- Prior to the exercise of this consent;
- Within 5 working days of the water meter being serviced or replaced;
- By 30 June of the fifth year from the commencement of consent, and thereafter at five yearly intervals.

The water meter, its verification and evidence of its accuracy shall be in accordance with the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010 (or any equivalent regulations that may replace them) and a copy of the verification shall be provided to Council within 10 working days of the meter/devices being verified as accurate.

Water meter readings

6. A water meter reading shall be taken at daily intervals consistently at one of these times:

a) before pumping starts for a day;
b) at the end of pumping for a day

The date and the water meter reading shall be recorded and provided to the council in accordance with the reporting condition below.

Advice Note:
If no water is taken during any period the current meter reading must still be

recorded.

Water Reporting

7. The following information shall be entered, at the frequency and date specified, to the council's Water Use Data Management System or to any replacement database identified in writing by Council.

Information	Due Dates for reporting
Water use water meter reading and date.	Every 15th day of March, June, September and December

Advice Note:
The web address for council's on-line Water Use Data Management System is:

http://aklc.hydrotel.co.nz/hydrotel/cgi-bin/WudmsWebServer.cgi

Your WUDMS customer number is P 2650636705 for consent WAT60339673, and the password is 1234. For the link to work properly you need to ensure that Council has your up-to-date email address for contact purposes. An on-line manual explaining how to enter and submit your water readings is available at the web address specified above.

Review Condition

8. Pursuant to Section 128 of the RMA, the conditions of this consent may be reviewed by Council at the Consent Holder's cost:

   In June 2024 and subsequently at intervals of not less than five years thereafter in order:

   (a) To deal with any adverse effect on the environment which may arise or potentially arise from the exercise of this consent and which it is appropriate to deal with at a later stage, in particular adverse effects on stream flow and stream water quality.

   (b) To vary the quantities, monitoring, operating and reporting requirements and performance standards in order to take account of information, including the results of previous monitoring and changed environmental knowledge, on: water availability, including alternative water sources; actual and potential water use; stream water flow and level regimes; stream water quality; efficiency of water use; Instream biota, including fish passage and the functioning of aquatic ecosystems; and the relationship of Maori with water.

Advice Note:

Under section 128 of the RMA the conditions of this consent may be reviewed by Council at the consent holder's cost in the following circumstances:

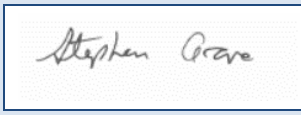
To provide compliance with rules in any regional plan relating to use of water, water or air quality etc. (refer section 128(1) (b) of the RMA) that have been made operative since the commencement of consent.

To provide compliance with any relevant national environmental standard that has been made since the commencement of consent.

At any time, if it is found that the information made available to the council in the application contained inaccuracies which materially influenced the decision and the effects of the exercise of the consent are such that it is necessary to apply more appropriate conditions.

Memo prepared by:

Stephen Crane



Senior Specialist Water Allocation
Specialist Unit, Resource Consents

Date: 4 September 2020

Memo and technical review reviewed and approved for release by:

Andrew Benson

Team Leader, Coastal and Water Allocation
Specialist Unit, Resource Consents

Date: 4 September 2020

Technical Memo – Ecology

To:	Mark Ross, Planning Consultant (Sentinel Planning), Processing Planner.
From:	Simon Chapman, Biodiversity Consultant (Ecology New Zealand) to the Ecological Advice Team, Infrastructure and Environmental Services.
Date:	18 September 2020

Applicant's Name:	Waste Management New Zealand Limited (WMNZ)
Application Number:	LUS60339672 (BUN60339589)
Application Type:	Terrestrial Ecology
Site Address:	1232 State Highway 1, Wayby Valley, Auckland.

1. Summary of Applicant's Proposal

The applicant seeks resource consents for the construction and operation of a new regional landfill facility within the Wayby Valley Area, between Warkworth and Wellsford.

A full description of the proposal is provided in the following application documents:

- *Auckland Regional Landfill: Assessment of Environmental Effects.* Prepared by Tonkin & Taylor Ltd. Dated 30 May 2019. (Herein referred to as the AEE).
- *Auckland Regional Landfill: Assessment of Aquatic and Terrestrial: Ecological Values and Effects.* Prepared by Tonkin & Taylor Ltd. Dated 30 May 2019. (Herein referred to as the EcIA).

2. Introduction (Credentials, Scope, Proposal, Site and Locality Description)

2.1. Role and credentials

My role on this project is to provide Auckland Council with terrestrial ecology expertise to assist with processing Waste Management New Zealand Limited's application for consent to construct and operate a landfill. I have a Bachelor of Science degree and a Post-graduate Diploma in Applied Science as well as over 20 years of experience as a consultant ecologist specialising in identifying and managing the ecological effects of large-scale projects (especially infrastructure). In addition to the many ecological assessments, management plans and peer reviews I have prepared, I have also provided expert evidence on ecological matters at numerous hearings, including Council, Environment Court and Board of Inquiry hearings. My experience includes the provision of peer review and expert witness inputs for applicants in some cases, and for consent processing authorities in others. Recent/relevant examples of projects I have provided terrestrial ecology expertise on include SH3 Mt Messenger and Awakino Tunnel Bypasses, SH1 Southern and Northern Corridor Improvements, Escarpment Mine, Kaimai Windfarm, Awahou Quarry, Northern Interceptor, and North Harbour Watermain.

2.2. Scope of Technical Assessment

This technical assessment considers the application with regard to actual and potential effects on terrestrial ecology (terrestrial fauna, flora and ecosystems including wetlands) resulting from the application with reference to chapter E15 of the Auckland Unitary Plan: Operative in Part (AUP: OP). It also considers the proposed 'effects management package' including measures to avoid, remedy, mitigate, offset, and compensate adverse effects on indigenous terrestrial fauna, flora and ecosystems.

At the time of preparing this memo I had been unable to undertake a site visit due to travel restrictions associated with the prevailing COVID-19 alert level. While I intend to visit the site prior to the hearing, I am already familiar with the general wider area through previous unrelated projects. In addition, I undertook a 'virtual' site walkover with one the applicant's team of ecologists (Justine Quinn of Tonkin and Taylor) on the 13th of August 2020. The virtual site walkover involved a 2.5-hour Microsoft Teams meeting during which a shared screen was used with GIS software to assist the applicant's ecologist in explaining the site's current ecological values, and the locations and extents of the project proposed footprint areas, and the methodologies and findings of the ecological investigations undertaken.

The following activities and effects are assessed by separate council specialists and are not considered by this technical assessment:

- Proposed activities in, on or under the bed of rivers, streams, and wetlands (Chapter E3 of the AUP: OP)
- The effects of surface water diversion, with reference to chapter E7 of the AUP: OP.
- The effects of contaminant discharge, including industrial trade activities and stormwater, from the ongoing operation of the landfill.

2.3. The Proposal (as relevant to this consent only - LUS60339672):

The proposal requires resource consent for the following matters:

- E15.4.1 (A10) Restricted discretionary - Vegetation alteration or removal, including cumulative removal on a site over a 10-year period, of greater than 250m² of indigenous vegetation that:

  (a) is contiguous vegetation on a site or sites existing on 30 September 2013; and

  (b) is outside the rural urban boundary

- E15.4.1 (A12) Restricted discretionary - Vegetation alteration or removal of any vegetation within a Natural Stream Management Areas Overlay
- E15.4.1 (A17) Restricted discretionary - Vegetation alteration or removal within 10m of rural streams in the Rural – Rural Production Zone and Rural – Mixed Rural Zone
- E15.4.1 (A18) Restricted discretionary - Vegetation alteration or removal within 20m of a natural wetland, in the bed of a river or stream (permanent or intermittent), or lake

Specifically, the proposal includes the following:

3.1 Vegetation and Habitat

The permanent loss of:

- 86.88 ha of plantation forestry
- 17.3 ha of pasture
- 9.11 ha of wattle forest
- 4.83 ha of indigenous regenerating forest (Ecosystem type VS2 Kānuka scrub/forest)
- 0.67 ha of indigenous mature forest
  - Ecosystems types:

AVS1 Anthropogenic tōtara forest (0.44ha)

WF12 Kauri, podocarp, broadleaved, beech forest (0.16ha)

WF9 Taraire, tawa, podocarp forest (0.04ha)

WF8 Kahikatea, pukatea forest (0.03ha)

- 0.70 ha of indigenous wetlands
    - Ecosystems types:

      WL12 Mānuka, tangle fern scrub/fernland [Mānuka fen] (0.58ha)

      WL19 Raupō reedland (0.12ha)
- 0.64 ha of exotic dominated wetlands

3.2 Other

- Edge effects including increased weed invasion and damage to integrity of indigenous forest
- Noise, vibration, light, and dust disturbance

3.3 Terrestrial Fauna

Direct and indirect effects including:

- Noise, vibration, light, and dust disturbance
- Fragmentation of habitat
- Injury or mortality of indigenous species including species which are regionally threatened and/or declining
- Permanent loss of habitat

2.4. Relevant Documents

A description of the proposal relevant to the terrestrial effects of the application is provided in the following application documents and s92 responses:

- *Auckland Regional Landfill: Assessment of Environmental Effects*. Prepared by Tonkin & Taylor Ltd. Dated 30 May 2019. (Herein referred to as the AEE).
- *Auckland Regional Landfill: Assessment of Aquatic and Terrestrial: Ecological Values and Effects*. Prepared by Tonkin & Taylor Ltd. Dated 30 May 2019. (Herein referred to as the EcIA).
- *Auckland Regional Landfill: Site Selection process.* Prepared by Tonkin & Taylor Ltd. Dated 20 May 2019.
- *DRAFT Ecological Management Plan*. Prepared by Tonkin & Taylor Ltd. Dated 20 February 2020. (Herein referred to as the OSSCP).
- *Memorandum: Auckland Regional Landfill s92 response - Tranche 5* addressed to Warwick Pascoe, from Rachel Signal-Ross. (Herein referred to as the s92 response tranche 5).

- *Memorandum: Auckland Regional Landfill S92 response*. Addressed to Bruce Horide from Marshall Day Acoustics. Dated 1st September 2019.
- *Auckland Regional Landfill outstanding terrestrial ecology s92 response report.* Prepared by Tonkin & Taylor Ltd. Dated 14 August 2020.
- *Memorandum: Auckland Regional Landfill Removal of Stockpile 2 from the Auckland Regional Landfill resource consent application BUN60339589*. Addressed to Warwick Pascoe, from Simonne Eldridge.
- *Bat Management Plan*. Prepared by Tonkin & Taylor Ltd. Dated 14th August 2020. (Herein referred to as the BMP).
- *Auckland Regional Landfill – Supplementary 2020 Frog Survey Report.* Prepared by Tonkin & Taylor Ltd. Dated 14th August 2020. (Herein referred to as the FSR).
- *DRAFT Hochstetter's Frog Management Plan.* Prepared by Tonkin & Taylor Ltd. Dated 14th August 2020. (Herein referred to as the HFMP).
- *Auckland Regional Landfill - Supplementary long-tailed bat report.* Prepared by Tonkin & Taylor Ltd. Dated 14th August 2020. (Herein referred to as the SLTBR).
- *Auckland Regional Landfill: Terrestrial and Wetland Biodiversity Offsets and Compensation Framework.* Prepared by Tonkin & Taylor Ltd. Dated August 2019

Further information relevant to this review was provided in the following documents:

- *DRAFT Off-site Stream Compensation Plan*. Prepared by Tonkin & Taylor Ltd. Dated 18 December 2019. (Herein referred to as the OSSCP).
- *Auckland Regional Landfill: Water Quality Baseline Monitoring Report*. Prepared by Tonkin & Taylor Ltd. Dated 30 May 2019.
- *Auckland Regional Landfill: Engineering Report*. Prepared by Tonkin & Taylor Ltd. Dated 30 May 2019.
- *Auckland Regional Landfill: Sediment and Erosion Control Assessment.* Prepared by Tonkin & Taylor Ltd. Dated 30 May 2019. (Herein referred to as the ESC Report).
- *Consent for Overseas Person to Acquire Sensitive New Zealand Land.* For Waste Management NZ Limited. Decision date 11th September 2018.

2.5. Site Description

The legal descriptions of the land parcels affected by the proposal are provided in table 1.1. of the AEE. The overall site area is approximately 1,020 ha (Subject Site), with the landfill footprint occupying approximately 60 ha of the Subject Site (Project Footprint). Section 4 of the AEE and section 2 of the EcIA provides a description of the wider site and its various ecological features.

The descriptions of the site in the application material and subsequent s92 responses are of an appropriate level of detail to carry out an informed assessment of the proposal's effects on terrestrial ecology.

3. Technical Assessment - Terrestrial Ecology

This Technical Memorandum provides an assessment of the aspects of the application relevant to terrestrial ecology, with a focus on vegetation removal and loss of habitat, including:

- The applicant's assessment of existing terrestrial ecological values within the subject site (Section 3.1 below)
- The applicant's assessment of the actual and potential effects on these terrestrial ecological values (Section 3.2 below)
- The applicant's proposed measures to manage actual and potential adverse effects on these terrestrial ecological values (Sections 3.3 – 3.8 below)

3.1. Methodology - Ecological Impact Assessment (EcIA)

The applicant's EcIA outlines the ecological factors and their associated values at the site. The EcIA used an appropriate methodology[1] to assess these values and provide both the magnitude and level of effect on the values of the factors identified. However, there were several inconsistencies and errors in the ecological factor values, and the consequent magnitude and effect levels provided within the EcIA. Attempts were made to resolve the issues with s92 requests for additional information, and the responses provided by the applicant's ecologists. However, some of the discrepancies remain unresolved. Overall, the discrepancies do not alter the findings of my assessment of the application, as an assessment of the entire application can be undertaken with the levels provided in terms of management approaches, certainty, and appropriateness. A summary of these discrepancies is shown in Table 1 below.

Table 1: Comparison of the applicant's assessed level of terrestrial ecology effects on terrestrial values.

Ecological Factor[2]	Value[2]	Magnitude after avoidance, remedy or mitigate[2]	Level[2]	Actual Level[3]
Indigenous Wetland	High*	Moderate	Moderate	**High**
Indigenous regenerating forest	High	Moderate	Moderate	**High**
Exotic Wattle	Moderate	Moderate	Low	**Moderate**
Exotic Pine	Moderate	Moderate	Low	**Moderate**
Pasture	Moderate	Moderate	Low	**Moderate**
Kauri	Very High	Low	Low	**Moderate**
White Rata	Very High	Low	Low	**Moderate**
Bittern	Very High	Low	Low	**Moderate**
Spotless Crake	High	Moderate	Moderate	**High**
Kauri Snail	High	Potentially Moderate	Low	**High**

** Note that indigenous wetland was changed from "very high" value to "high" between the original ecological assessment and the subsequent section 92 responses, with no explanation provided. When assessing against the EIANZ guidelines, most of the wetland areas on-site would meet at least three of the four criteria when assessing value and should therefore be assigned a very high value. This would then alter the overall level of effect for wetland loss and include the loss of wetland as habitat which must be offset or compensated for. Nevertheless, wetland loss is still acknowledged as requiring substantial management therefore it can be assessed accordingly.*

[1] Roper-Lindsay, et al. (2018). Ecological impact assessment. EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems. 2nd edition.

[2] From the Auckland Regional Landfill outstanding terrestrial ecology s92 response report. Prepared by Tonkin & Taylor Ltd. Dated 14 August 2020.

[3] Using table 10 page 84 from Roper-Lindsay et al., (2018). Ecological impact assessment. EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems. 2nd edition

Several other discrepancies noted within the EcIA and the assigning of value, magnitude and overall level were not addressed by the section 92 additional response – specifically the overall level of effects table (Table 6.13 on page 90 in the EcIA). When using this table to calculate the overall level of effect as per the EIANZ guidelines, there are several other factors that should have a higher overall level of effect than what is stated. However, the discrepancies do not significantly hinder the completion of this technical assessment.

a. Existing Ecological Values – Fauna

The EcIA generally provides a good understanding of the presence and use of the site by fauna. There was at least one omission in the terrestrial ecology surveys which were undertaken. Specifically, it is unclear why targeted surveys for Australasian bittern (*Botaurus poiciloptilus*; Threatened - Nationally Critical) were not carried out – especially given the significance of the species, and the suitability of the wetland habitats present at the subject site. The lizard surveys did not include some areas of likely suitable habitat. For example, lizard spotlighting surveys were only undertaken along a small proportion of the edge of the regenerating native forest in the Southern Block and excluded nearly all of the access road alignment. Overall, however, the information provided in the application documents and subsequent S92 responses collectively provide a good understanding of the site's ecological values.

b. Existing Ecological Values – Flora and Ecosystems

The EcIA provides a robust assessment of the vegetation at the site and the associated ecosystems. There are several at risk or threatened ecosystems and flora species present that will be impacted by the project. These include ecosystem types WF12 (IUCN threat status: Threatened [Critically Endangered]), WF9 (IUCN threat status: Threatened [Endangered]) and WF8 (IUCN threat status: Threatened [Critically endangered]). In addition, the presence of several threatened flora species has been considered. The application documentation has provided adequate certainty on terrestrial vegetation to assess the project's level of effects on flora and ecosystem ecological values appropriately.

c. Existing Ecological Values - Wetlands

The EcIA included delineation and mapping of all wetlands (SEA and non-SEA) on-site. The specific methodologies used to delineate wetlands were not specified within the application material, therefore further clarification on this was requested as a part of the Section 92 process. Further descriptors were provided for each wetland in the additional terrestrial ecology S92 response material, but detailed descriptions of methodologies were not provided. It appeared that the applicant's ecologists have relied heavily on the visual assessment of vegetation type and existing typography at the site and did not followed best practise protocols as outlined in Clarkson (2013)[4]. Soil composition and historical site use has not been considered in relation to the effects on the site's hydrology and potential changes in wetland composition over time. In addition, the applicant has not carefully considered the cumulative loss of wetlands in relation to the wider wetland complex that is present at, and beyond, the site. However, the mapped wetland extents, and the methodologies utilised to delineate them, were discussed at length during the virtual site walkover. As a result of those discussions, my opinion is that the mapping of the existing wetlands presented as part of the application material has captured the extent of the site's wetlands with sufficient accuracy to understand the level of adverse effects on wetland areas affected reclamation, and those proposed for restoration.

[4] Clarkson, B (2013). A vegetation tool for wetland delineation in New Zealand. Prepared for Meridian Energy by Landcare Research. Doi:10.7931/J2TD9V77.

3.2 Assessment of Effects on Terrestrial Ecology

a. Fauna

The EcIA generally identified the various types of actual and potential effects on terrestrial fauna correctly. The identified effects included fauna injury/mortality as well as the effects of habitat loss, dust, noise, and lighting.

b. Flora and Ecosystems

The EcIA adequately summarised the effects on terrestrial flora and associated ecosystems including permanent loss of biodiversity, fragmentation and reduction in indigenous biodiversity and threatened ecosystems, the increase of edge effects, and the loss of wildlife corridors. The loss of the indigenous understorey beneath exotic canopy forests (i.e. pine and wattle) are providing some value and was not considered as a component when assigning value for these areas. However, it is expected that this value is currently being diminished by the exotic canopies restricting the understorey species from spreading throughout the site and generally contributing less to recruitment in the other areas onsite.

c. Wetlands

In general, the EcIA adequately summarised the effects on wetlands at the site adequately including permanent loss of biodiversity, fragmentation and reduction in indigenous biodiversity and threatened ecosystems, the increase in edge effects and the loss of wildlife corridors, potential hydrological alteration and flow on effects and injury and/or mortality to fauna including native fish during reclamation activities. It is noted that the broad classification of 'exotic wetland' has the potential to lower the perceived value of these wetlands, when in fact the exotic wetlands onsite do contain indigenous vegetation.[5]

3.3 Assessment of Proposed Management of Adverse Effects on Terrestrial Ecology

a. Avoidance

i. Policy

AUP: OP Regional Policy Statement

Chapter B7, Natural Resources of the AUP: OP Regional Policy Statement is considered relevant as the objectives and policies in section B7.2 seek to ensure that indigenous biodiversity is maintained and degraded habitats are enhanced, the loss of indigenous biodiversity is minimised and that any adverse effects are avoided, remedied or mitigated. Similar Policies and Objectives are included within Objectives B7.3.1(2) and (3) and Policy B7.3.2 (4).

Objective E3.2(1) seeks that Auckland's lakes, rivers, streams and wetlands with high natural values are protected from degradation and permanent loss seeks, also objective E3.2(2) seeks that Auckland's lakes, rivers, streams and wetlands are restored, maintained or enhanced. Objective E3.2(6) seeks that reclamation and drainage of the bed of a lake, river, stream, and wetland is avoided, unless there is no practicable alternative.

Policy E3.3(13) seeks to avoid the reclamation and drainage of the bed of lakes, rivers, streams and wetlands; unless certain conditions are met, including there is no practicable alternative method for undertaking the activity outside the lake, river, stream or wetland; and

[5] Note that this categorisation does not account for the indigenous component of these wetlands. They are not completely exotic, just exotic dominated.

for the operation, use, maintenance, repair, development or upgrade of infrastructure; or to undertake mineral extraction activities.

However, the introduction to chapter E3 of the AUP: OP acknowledges that there is a balance to be struck between the need to provide for the ongoing growth of urban Auckland, including the requirements of infrastructure, and the protection, maintenance and enhancement of lakes, rivers, streams and wetlands.

Policy E15.3 (2) describes the requirement for the appropriate management of adverse effects on indigenous biodiversity from development by moving through the hierarchy of avoidance, minimise, remedy, or mitigate.

ii. Applicant's Avoidance

The applicant has provided some measure of avoidance with the removal of Stockpile 2 from the proposal that was initially lodged. The stockpile was proposed to be constructed in an area where one of the highest density frog populations was found at the subject site. Note however that the entire property was not surveyed for frogs, therefore it should not be assumed that all areas at the subject site with large/high-density frog populations have been detected. Other frog population clusters could occur elsewhere on-site.

iii. Selection of the Site

The Technical Guidelines for Disposal to Land[6] state that initial investigations should include an assessment of the sensitivity of biota and fauna at the site, and in downstream receiving environments. The guidelines further note that careful siting of a landfill is fundamental to protect the environment from potential adverse effects associated with the disposal of waste materials. The applicant's AEE states that the site selection process within this guidance was followed, however ecological field surveys were not undertaken until after the selection of the Wayby Valley site. Those field surveys subsequently identified numerous threatened species[7] at the site including Hochstetter's Frog (At Risk - Declining), long-tailed bat (Threatened - Nationally Critical) and fernbird (At Risk - Declining) as identified in the applicant's EcIA.

It seems likely that site selection was based on planning maps, overlays, etc., which provide only limited detail on a site's actual ecological value. The risk associated with such an approach is that an area of high ecological value may be selected for an inappropriate activity. Standard practise for a high-level desktop analysis of the ecological values of a site – especially where significant fauna species are known to occur in the wider area – would typically include an analysis of up to date local fauna records. Such analyses would have highlighted the potential ecological sensitivities of the site and the need for on-site preliminary ecological investigations to determine the feasibility of a landfill at the site from an ecological perspective. It is inappropriate for site selection of a development of this type and scale to not have undertaken initial ecological surveys on-site to verify assumptions prior to final site selection.

[6] WasteMINZ (2018). Technical Guidelines for Disposal to Land.

[7] The Department of Conservation (DOC) administers the NZ Threat Classification System which is used to assess the threat status of all NZ taxa. (Townsend et al., 2008). Relevant documents in the Threat Classification series can be found at this website https://www.doc.govt.nz/about-us/science-publications/conservation-publications/nz-threat-classificationsystem/

The ecological values identified once the site has been subjected to thorough ecological assessments presents uncertainty that the applicant did indeed consider alternatives appropriately as required under the RMA (Schedule 4).

iv. Design Layout

While the design layout has sought to minimise impacts within areas of SEA overlay, this has not been achieved everywhere across the project footprint (e.g., the 105m culvert proposed through high-quality frog habitat for access road construction). The SEA overlays were largely delineated as a desktop exercise and were defined based on the presence of predominantly indigenous vegetation cover (See AUP: OP definitions). Therefore, it is considered, that in determining appropriate avoidance of ecological values, the actual on-site ecological values should be considered irrespective of the location of the SEA overlay. Other overlays which relate to ecological significance are the wetlands management overlay[8] (NWMA) and Natural Stream Management Layer[9] (NSMA; AUP: OP). In general, areas of significant wetlands were also covered by the SEA layer and have been avoided, although due to the significance and functioning of a wetland it should be noted that the footprint of the development is proposed directly adjacent to some areas of these overlays.

b. Mitigation

Objective E15.2 (1) and (2) require that activities which have adverse effects are first avoided and minimised, then mitigated. It also provides direction for the restoration and enhancement of degraded and sensitive areas.

Objective E3.3 (5) seeks that activities in the bed of a river and wetland are managed to minimise adverse effects on streams and wetlands.

i. Fauna mortality and injury

The applicant has provided a suite of draft fauna management plans which generally propose current best practise methodologies to avoid injury and mortality to indigenous fauna. While the effects of injury and mortality of native fauna through vegetation clearance and other construction impacts will be mitigated to some extent, there are still likely to be some residual adverse effects that require offsetting and/or compensation – especially for frogs – as even current best practice mitigation techniques for some species remain unproven.

Note that except for frog salvage, fauna management is not proposed to be implemented within the Matariki owned/managed plantation pine forest at the site. Examples of other significant native species that may occur within the plantation pine forest include bats, birds, lizards and snails. It is likely that the exclusion of plantation forestry areas from all but one of the fauna management plans will lead to unmitigated adverse ecological effects on fauna. However, the pine forest removal is not part of the application as the applicant instead claims that the pine removal is tree harvesting which is part of normal forestry operations. Consequently, the adverse ecological effects of pine removal on fauna cannot be considered, and consent conditions requiring fauna management cannot be imposed. However, as the significant native fauna species of concern at this site are afforded absolute protection from

[8] Identifies the Wetland Management Areas as set out within the policy framework of D8 Wetland Management Areas Overlay and Schedule 1 Wetland Management Areas Schedule of the Plan.

[9] Identifies the Natural Stream Management Areas as set out in the policy framework of provisions in D4 Natural Stream Management Areas Overlay of the Plan.

disturbance, habitat loss and injury/mortality under the Wildlife Act, fauna mitigation will still be required for pine removal irrespective of its RMA planning context.

ii. Erosion and Sediment Control

Potential adverse ecological effects of the proposed streamworks activities include the potential for release of sediment laden water to the receiving environment and disturbance of streams and wetland areas. Deposited sediment potentially adversely affects aquatic fauna, including frogs, by degrading in-stream habitats. Fine particulate sediment can clog the interstitial spaces between hard substrates such as wood and cobbles altering habitat complexity resulting in restricted access to refugia for frogs, and cause habitat loss and increased mortality rates[10]. Deposited sediment high in organic matter can also reduce dissolved oxygen levels. Suspended sediment can also cause impacts on aquatic ecosystems. These effects can be mitigated with appropriate erosion and sediment management however the submitted Erosion and Sediment Control Plan and Stream Works Methodology was not assessed as part of this memo as it is addressed by a separate council specialist.

c. Offset and Compensation

The management of effects under the RMA can be represented as a continuum of responses: avoidance, mitigation and remediation, offsetting, environmental compensation, and lastly other forms of compensation[11]. This hierarchical approach to managing effects is further supported by the AUP: OP policies and objectives, including objective E15.2 (2). Appendix 8 'Biodiversity offsetting' of the AUP: OP outlines a framework to use when considering offset and compensation for a development. The following sections describe and review the offset and compensation package in relation to terrestrial ecology.

3.4 Assessment of the Proposed Effects Management Package

The applicant has offered an 'effects management package' including offset and compensation measures to address the residual adverse effects on terrestrial flora, ecosystems, fauna, and wetland values. The appropriateness of the proposed 'effects management package' is considered with regard to policies E3.3(4) and E15.3 of the AUP: OP which specify that restoration and enhancement actions for a specific activity should:

- Require legal protection, ecological restoration and active management techniques in areas set aside for the purposes of mitigating or offsetting adverse effects on indigenous biodiversity.
- be located as close as possible to the Subject Site;
- be 'like for like' in terms of the type of freshwater system affected;
- preferably achieve no net loss or a net ecological gain in the natural values, including ecological values; and
- consider the use of biodiversity offsetting as outlined in Appendix 8 Biodiversity Offsetting.

[10] Najera-Hillman, Eduardo & King, Peter & Baird, Andrea & Breen, Barbara. (2009). Effect of pest–management operations on the abundance and size–frequency distribution of the New Zealand endemic frog Leiopelma hochstetteri. New Zealand Journal of Zoology. 36. 389- 400. 10.1080/03014223.2009.9651471.

[11] Maseyk, Ussher, Kessels, Christensen & Brown (2018) The Biodiversity Offsetting under the Resource Management Act Guidance Document and New Zealand Government et al. (2014). Guidance on Good Practice Biodiversity Offsetting in New Zealand.

The appropriateness of the proposed 'effects management package' is also considered with regard to the national guidance documents available for biodiversity offsetting. This section will address specific fauna and flora separately due to the high level of detail required in understanding these species and the level of effects that the development will have on these, and the following factors considered for each factor and the proposed offset/compensation:

- Proximity
- Additionality
- Like for Like
- No Net Loss
- Permanence

3.5 Assessment of the Proposed Effects Management Package – Fauna

a. Hochstetter's Frog

i. Avoidance

The removal of Stockpile 2 from the design has reduced the effects on Hochstetter's frogs. However, the likelihood of the project adversely affecting frogs remains high. For example, there is a risk that the design and construction of the proposed main access road will impact frogs occupying the stream along the confirmed frog 'hotspot' where the proposed access road will cross the Southern Block stream. The culvert proposed for this length of stream area is 105m long, which does not demonstrate avoidance of effects on Hochstetter's frogs. Options for reducing the impact of stream reclamation on frogs in that location require further consideration, especially given that avoidance of adverse effects on frogs and the stream habitats that support them is a requirement of the conditions of the Overseas Investment Office decision that authorised the acquisition of the site[12].

ii. Hochstetter's Frog Management Plan

The Draft Hochstetter's Frog Management Plan (HFMP) provided by Tonkin and Taylor as part of the final s92 response package has described a range of methodologies for managing effects on frogs. The main elements of the mitigation specified within the HFMP are:

- Vegetation clearance protocols [Note: this refers to the Vegetation Clearance Management Plan within the draft Ecological Management Plan] including the salvage and relocation of Hochstetter's frogs and associated rock refugia into suitable habitats on WMNZ landholdings and Sunnybrook Scenic Reserve, and if required, Dome Forest Stewardship Area following initial control of introduced predatory mammals
- Seasonal constraints on vegetation clearance and streamworks (only during earthworks season during these drier months were frog ranges are more restricted and less widespread)
- Monitoring at relocation site(s), pre- and post-relocation to assess changes in relative abundance and spatial distribution to determine salvage and relocation success

[12] Condition 4 (6) and (7) states that the consent holder must adopt the best practicable option as part of the Landfill development and operation to avoid sedimentation entering any streams or waterways on the Land that provide habitats for Hochstetter's frogs. They must also protect water quality and stream habitat (in areas of the Land not affected by the Landfill or the Forestry Rights Agreements) supporting Hochstetter's frogs.

- Enhancement of relocation release site(s) through rock pile deployment (rocks sourced from impact habitats) to increase habitat abundance and mammalian pest control to improve the likelihood of survival

The offsetting and compensation proposed to manage residual effects on frogs include:

- Long-term control of mammalian pests within native forest areas on WMNZ landholdings (102 ha), within Sunnybrook Reserve (155 ha) and Dome Forest Stewardship area (401 ha) [Noting that the latter two sites are DOC-administered and would require landowner approval or a concession]
- A monitoring programme to better understand the effectiveness of proposed mitigation and compensation measures
- A research programme to better understand the effects of introduced predatory mammals on Hochstetter's frogs based on genetic analysis of rat stomachs to determine the presence of Frog DNA.

There is substantial uncertainty associated with many aspects of the mitigation, offsetting, and compensation proposed to manage effects on frogs. The draft HFMP omits several important aspects of the proposed frog relocation such as details of relocation release sites, existing frog abundance at the proposed release site(s), or the duration of pest control prior to carrying out the salvage-relocation operations. Such omissions add to the uncertainty around whether the effects of the project on frogs will be managed adequately. Examples of possible/likely areas of uncertainty identified during this review include:

- Translocating Hochstetter's frogs and their habitats, and creating new frog habitats, are experimental mitigation measures and there is no certainty that successful outcomes can and will be achieved.
- It is unclear whether pest management proposed as part of the frog management will achieve sufficiently additionality to the Auckland Council's existing pest control programme at Sunnybrook Reserve and Dome Forest. While the applicant's ecologists are of the view that the addition of rat control will provide sufficient additionality, no specifications or results of the existing pest control programme have been provided.
- Given that data on frog populations (size, density, etc.) and pest abundance at proposed release sites have not been obtained, it is unclear whether frog carrying capacity can be increased sufficiently at proposed frog relocation release sites and compensatory pest management sites to offset the project's adverse effects on frogs.
- Assuming pests are currently suppressing frog populations in the area, pest control carried out at relocation release sites would likely benefit individual frogs already resident in the area thereby limiting the ability to generate additional carrying capacity to accommodate salvaged frogs.
- It is unclear whether the frog relocation release sites on WMNZ land will be legally protected in perpetuity. Some of the streams within the WMNZ Holdings land are within areas proposed as future pine forest and the proposed plan change (PC42) associated with the project seeks to change the activity status of stream and wetland reclamation on-site from non-complying to discretionary. Frogs should only be relocated to suitable habitats (i.e., small rocky streams within native forest) that will be protected in perpetuity (by way of a covenant or similar).

- The HFMP relies on the Department of Conservation (DOC) providing permission and permits for the plan's implementation. No evidence has been provided to confirm that DOC will provide the required permissions and permits.
- The applicant's ecologists have not put forward any alternative plans to manage adverse effects in the event that DOC declines to provide the necessary approvals.
- While monitoring is proposed, the data generated are only intended to be used for research purposes, and will not be used to trigger remedial, additional or alternative management actions if any or all of the proposed mitigation, offsetting or compensation measures for frogs are found to be unsuccessful, or the results are inconclusive.

While the proposed Hochstetter's frog salvage-relocation programme is experimental, the findings of the research and monitoring elements will contribute to compensating effects on frogs regardless of the outcomes of the programme. The applicant's ecologists stated during a meeting on 18 August 2020 that discussions on frog management have been initiated with the Department of Conservation's Native Frog Recovery Group and Permissions Team. While no formal evidence was provided, the applicant's ecologists indicated that the authorisations (translocation permits, landowner access, etc.) required for the proposed frog management are unlikely to be declined.

While the approach the applicant's ecologists have proposed to manage effects on frogs appears comprehensive, some of the major components of the proposed management are best described as experimental and unproven (primarily because projects impacting native frog habitats are rarely, if ever, proposed). Consequently, there is a high degree of uncertainty as to whether the outcomes required to offset and compensate impacts on frogs will be achieved. Rather than accept that a relatively high degree of uncertainty is inevitable and hoping that a 'worst case scenario' does not eventuate, it would be preferable to bolster the management of effects on frogs to increase the certainty of achieving the required outcomes. To put it simply, if the experimental management fails, all that would remain to compensate for the project's effects on frogs would be the research which would indicate that the project should not have gone ahead. While it is beyond the scope of this review to explore and develop options for bolstering frog management, it is worth pointing out that potentially suitable options may be available (e.g., adaptive management with contingency/remedial actions).

b. Lizards

The proposed vegetation management protocols for lizards reflect current standard industry practise to minimise adverse effects of habitat removal on herpetofauna. Pest management proposed as a part of the wider residual effects management will also benefit the herpetofauna at the site, and any populations in the offset pest control sites, and will contribute to increasing carrying capacity to offset habitat loss. There is one identified issue with the proposed lizard management that needs to be addressed. The lizard management plan states that the salvage footprint is to be in the areas identified as habitat in table 5.2. Within this table, it identifies all habitat on the site as either moderate or high value for herpetofauna, but in the text, it is stated that management will not occur within the wattle and pine plantations due to low habitat values. In my view, those vegetation types provide suitable habitat for lizards therefore is not appropriate to exclude them from lizard management protocols. In particular, lizard management should be undertaken both within and around the edges of the wattle areas. It is beyond the scope of this review to insist upon a requirement to implement lizard management protocols within plantation forestry areas as pine removal is not included as part of the application. However, as all native lizards are afforded absolute protection from disturbance, habitat loss and injury/mortality under the Wildlife Act, lizard management will still be required within the plantation forest.

c. Long Tailed Bats

i. Vegetation Management Protocols

Long-tailed bats are known to roost, forage, and commute within plantation forests, including pine forests. The applicant's ecologists identified that some of the highest levels of activity on-site occur within pine forest areas. Furthermore, at least some of the pine trees on-site possess the features known to provide suitable roosting habitat (e.g., cavities, crevices). Protocols to avoid/minimise the adverse effects of tree removal on bats have been developed and adopted as industry standard practice. Those industry-standard protocols have been put forward by the applicant's ecologists in the Bat Management Plan (BMP). It is noted that the BMP specifically excludes the application of tree removal protocols for bat protection during removal of all plantation forestry that is under Matariki Forests ownership/management (BMP, Section 1.2). As mentioned above, it has been brought to my attention by Auckland Council's Processing Planner for this application that the adverse effects of plantation forestry harvesting cannot be considered within the context of this review. However, all native bats are absolutely protected from disturbance, habitat loss and injury/mortality under the Wildlife Act, therefore bat management will still be required within the plantation forest.

ii. Lighting

A review of the applicant's Landscape and Visual Assessment is beyond the scope of this memo. However, Auckland Council's lighting expert (John McKensey) pointed out that there is a discrepancy between the applicant's BMP and their Landscape and Visual Assessment prepared by Boffa Miskell. The BMP stated that "there will be minimal lighting on the proposed access road" whereas the Landscape & Visual Assessment stated that "the main access road will not be lit". I understand that Mr McKensey has since obtained confirmation from the applicant that the proposed access road will not be lit[13]. The BMP is flawed in that it lists ways in which the adverse effects of lighting on bats **can** be avoided/minimised, but it does not specify whether any of those actions **will** be implemented. In my opinion, the BMP should be definitive about what will be done to manage the project's adverse lighting effects on bats. The absence of lighting along the access road will favour bats, however, the lighting management measures suggested in the BMP should be applied as appropriate to the lighting associated with the project.

d. Kauri and Rhytid Snails

The Invertebrate Management Plan provided within the Draft Ecological Management Plan provides a robust basis for mitigating the effects of the landfill project on the at-risk snail species present within all suitable habitats on-site except the plantation pine forest. Information on the duration of the efforts is lacking. However, as a Department of Conservation permit is required to salvage and relocate protected snails, the Invertebrate Management Plan will be subject to the conditions of the DOC permit. As discussed above, the adverse ecological effects of plantation forestry harvesting cannot be considered within the context of this review. Kauri snails are absolutely protected from disturbance, habitat loss and injury/mortality under the Wildlife Act, therefore mitigation will be required for the plantation forest harvesting operation.

e. Whitehead

Whiteheads (an At Risk – Declining endemic bird species) were detected on-site. While their presence is considered significant, they are a highly mobile species with large home ranges and would therefore

[13] LDP Limited. Proposed Auckland Regional Landfill Development, Wayby Valley Proposed Lighting – Peer Review – [BUN 6033 9589] dated 14th September 2020.

be difficult to target with any form of mitigation. The applicant's ecologists have included whiteheads in their offset modelling, which I consider to be appropriate.

f. Australasian Bittern

Australian bitterns were recorded at the site with acoustic recording devices, which has placed their presence within the identified indigenous SEA wetland at the site. No targeted surveys were undertaken for this species in other wetland areas. It is likely that bittern utilise all or most wetland areas on-site. Australasian bittern is a cryptic species (i.e., difficult to detect and highly secretive[14]), and they are known to be susceptible to disturbance (by noise, dust, etc.)[15]. The provision of wetland infill and buffer planting at the existing wetlands on the site which are likely already being utilised is unlikely to be sufficient to offset the loss of habitat and space currently being provided by wetlands to be reclaimed. While noise and disturbance effects have been considered by the applicant, there is an uncertainty that the proposed habitat protection and management will result in an acceptable outcome for Australasian bittern.

g. Spotless Crake

All spotless crake observations were within the main SEA wetland proposed for enhancement. It is likely that spotless crakes are also using other wetlands at the site, and the loss of wetlands will result in a net loss of their habitat. The number of observations concentrated at the SEA wetland indicates that there may not be space and habitat for additional carrying capacity here, and there is an uncertainty that the amount of buffer planting proposed will offset this potential deficiency. The provision of wetland infill and buffer planting at the existing wetlands on the site which are likely already being utilised is unlikely to be sufficient to offset the loss of habitat and space currently being provided by wetlands to be reclaimed. This leaves uncertainty that the proposed management will result in an acceptable outcome for spotless crake.

h. Fernbird

The effects of the project on the site's fernbird population appear to have been inadequately assessed, and the management of adverse effects on fernbirds may not be adequate. The issue is that a substantial proportion of the fernbird detections on-site were within the indigenous wetland area proposed to be reclaimed for the project. While the main SEA wetland proposed for enhancement also had fernbird detections, fernbirds are highly territorial therefore it cannot be assumed that the wetland enhancement proposed will adequately off-set the adverse effects arising from the total loss of the 'exotic wetland'. For example, pest control and weed management may not increase carrying capacity, and fernbirds with territories within the impacted wetland may not be able to self-relocate to suitable alternative habitats.

In addition, the value of the wetland as habitat for fernbird and the level of effect has been underrepresented in the offset calculations. The loss of a 'low value wetland' that has very high values for fernbird with aural and visual observations being clustered here is likely to be highly significant for this species. The value of this, and the level of effect, were incorrectly aggregated with other wetland birds in the offset calculations. In the category "exotic dominated pasture wetlands" section, the wetland habitat favoured by fernbird at the site has been given a model input (prior to impact) of 1.5 – being low value. It is considered that the loss of this wetland which has a high value for fernbird and the proposed offset of pest control at lower value habitat for this species (with reduced buffers that are

[14] Whiteside, A.J. 1989. The behaviour of bitterns and their use of habitat. Notornis 36: 89-95

[15] Williams, E.M. 2016. Developing monitoring methods for cryptic species: A case study of the Australasian bittern *Botaurus poiciloptilus*. Unpubl. PhD thesis, Massey University, Palmerston North, New Zealand

not being protected in perpetuity) is unlikely to be sufficient to ensure an acceptable outcome for this species.

i. Pipit

The loss of 17 ha of pasture habitat utilised by pipits was classified as a low level of effect in the applicant's ecological assessment. As a result of the low level of effect classification, the loss of pasture would not require any offset once mitigation aspects of managing mortality during vegetation loss has been undertaken. In my opinion, the level of effect on pipit has been underestimated. In addition to the loss of over 17 ha of pasture habitat for this species within the project footprint, additional pasture habitat will be lost due to the proposed establishment of forestry plantations in pasture areas. However, alternative pasture habitat is abundant in the wider landscape, and proposed wetland restoration (especially pest control) is likely to benefit the local pipit population.

j. Other - Fauna Management in Pine Forestry Block

The national environmental standard for plantation forestry (NES-PF) only requires consideration of indigenous vegetation identified by the council as SEA, and avifauna that are nationally critical, threatened, or endangered when determining whether ecological mitigation is required during the harvesting process. There are no specific provisions for mitigating effects on other avifauna, lizards, frogs, invertebrates, or bats. Given the weaker fauna protection provisions of the NES-PF, my preference would be to consider the effects of forestry harvesting on indigenous fauna as part of this technical assessment, and require the inclusion of plantation forest areas in the fauna management plans based on habitat suitability for each species' plan. However, as discussed above, the ecological effects of the forestry harvesting only need to be assessed in accordance with the NES-PF requirements. I would reiterate that in addition to those requirements, mitigation of adverse effects on protected fauna will still be required under the Wildlife Act.

3.6 Assessment of the Proposed Effects Management Package – Flora, Vegetation and Ecosystems

a. The permanent loss of 86.88 ha of plantation forestry and 9.11 ha of wattle forest with an indigenous understorey

The application stated that the effects on the loss of plantation forestry are to be primarily considered as habitat loss for threatened and indigenous fauna and have proposed that mitigation actions of fauna management will be undertaken. However, apart from frog and frog habitat salvage, according to the Vegetation Clearance Management Plan provided within the draft EMP no fauna management will not be undertaken within the plantation pine forest. Unfortunately, as discussed repeatedly above, it has been confirmed that the management of fauna within the forestry blocks cannot be required through this resource consent application, although the Wildlife Act will still apply in those areas.

While the indigenous understorey beneath the pine plantation is likely to be providing some botanical value, it was assessed as not requiring ecological effects management. Notwithstanding the possible fauna habitat value of the understorey vegetation, I concur with that assessment.

b. The permanent loss of 17.3 ha of pasture

The application has not provided any mitigation measures for the loss of pasture. This vegetation type provides habitat for New Zealand Pipit (see section 3.5(g) for further consideration of this). There are no other significant effects predicted to be associated with the loss of pasture vegetation.

c. 4.83 ha of indigenous regenerating forest (Ecosystem type VS2)

The application has proposed the restoration planting and protection via covenant of 9.9ha of forest within WMNZ landholdings comprising a large proportion of manuka and kanuka. The areas have not been differentiated between planting for indigenous mature forest restoration and planting and regenerating forest offset. The applicant has also proposed that pest control to be undertaken predominately for fauna management will also be considered as offset for the loss of indigenous forest and ecosystem. Pest control within the large tracts of indigenous vegetation and the future pine forests that includes goats and possum would allow the renewal of indigenous seedlings and enhance the regeneration process, providing resources for fauna.

d. 0.67 ha of indigenous mature forest

The applicant has proposed that pest control to be undertaken predominately for fauna management and offsetting will also be considered as offset for the loss of indigenous forest and ecosystem. Pest control including goats and possums would allow the renewal of indigenous seedlings and enhance the forest regeneration process. The applicant has also proposed the restoration planting of indigenous forests as mentioned in point 3.6 (b) above, however it is not clear how much of this is proposed to offset the loss of indigenous mature forest versus regenerating forest. The proposal also includes the protection via covenant of 111.9ha of indigenous forest areas.

e. Ecosystem types

I note that wetland ecosystems are considered separately in section 3.7 below. The proposal includes the loss of the following ecosystems types:

AVS1 Anthropogenic tōtara forest (0.44ha)

WF12 Kauri, podocarp, broadleaved, beech forest (0.16ha)

WF9 Taraire, tawa, podocarp forest (0.04ha)

WF8 Kahikatea, pukatea forest (0.03ha)

All forest ecosystems have been considered together in the management and offset of their loss, with a general approach of indigenous restoration planting of species appropriate to the ecosystem proposed and pest management to increase regeneration in mature forest tracts.

Overall, the applicant has proposed the restoration planting of 9.9ha of indigenous forest. The residual effects management plan proposes species to be planted in the restoration planting areas that are generally representative of species that would be found in the ecosystems which are being lost. In addition, the applicant proposes pest control in the areas of indigenous forest and plantings at the site. While that management is primarily aimed at increasing fauna survival within those areas, the provision of control of pest species such as goats in the pest management will increase the regeneration process.

f. Threatened Flora

The applicant has not proposed any management for the threatened plant species affected by the development on-site (i.e., kanuka, manuka, kauri, two rata species (*Metrosideros perforata* and *Metrosideros diffusa*) with the exception of including a large proportion of kanuka and manuka within the restoration plantings. Two regionally rare species kawaka and koromiko will be subject to mitigation management. The applicant proposes that a maximum of 100 seedlings of these species will be relocated to an adjacent area of similar microhabitat. It is not clear how the applicant's ecologists arrived

at that number, or what benefit this will have for each species and their populations at the subject site. Research internationally on threatened flora species relocations has indicated that to achieve approximately 50 seedling survivable a minimum of 500 seedlings would need to be transplanted – to achieve survivorship and second-generation recruitment which ultimately is the key to a successful threatened plant translocation[16]. Therefore, it is considered that for this management action to achieve an appropriate biodiversity outcome, the number of seedlings that are proposed to be translocated should be increased.

g. Riparian Vegetation

The proposal has not been assessed under E15 of riparian vegetation removal. All the riparian restoration proposed is in relation to the instream works and reclamation (AUP: OP E3) effects. Riparian vegetation removal is likely to influence in stream habitat however this is occurring in areas where streams are to be reclaimed – therefore there will be no habitat left to affect. In addition, the fauna management (freshwater fish and frogs) and effects on these are addressed separately.

h. Other - Edge Effects

The applicant's ecologists have proposed to address edge effects primarily during vegetation clearance. In the Ecological Management Plan (Section 7.3 of the Ecological Management Plan), all vegetation immediately adjacent to project footprint will be protected through physical delineation and felling procedures that are designed to minimise unintended damage to vegetation immediately adjacent to the project footprint.

An issue that arises is the lack of consideration on the longer-term edge effects on current indigenous vegetation at the site outside of the proposed planting and covenanted areas. Weed control is proposed for all planting areas, however there is no proposed management for areas of indigenous vegetation that are not to be subject to protection, but will be subjected to increased edge effects through the development (e.g. to the east of the largest portion of the Wayby Wetland complex and indigenous vegetation to the north-east of the western block, and all proposed wetland buffers). When considering cumulative and long-term effects, these areas will be subjected to ongoing edge effects with the provision of future pine forest directly adjacent to the areas and the effects of the planting, pruning, and harvesting activities. The ecological management plan states that all indigenous vegetation at the site will be covenanted which would provide some certainty that these areas will also be subject to ongoing pest plant and animal control. However, in the subsequent section 92 responses, the areas to be defined as covenants are stated as focussing on areas of planting and indigenous vegetation. This has resulted in uncertainty in relation to adverse edge effects on areas of indigenous vegetation at the site which may not be subject to planting or covenant.

Overall, the applicant has not fully addressed adverse edge effects on the areas of indigenous vegetation (including wetland buffers) that are not proposed to be covenanted. The provision of the wetland buffers and their relevance to achieving appropriate offset measures is discussed further in section 3.7.

[16] Silcock, J., Simmons, Monks, Dillon, Reiter, Jusaitis, Coates. (2019). T*hreatened plant translocation in Australia: A review*. Biological Conservation, 236, 211-222 and Commander, Coates, Broadhurst, Offord, Makinson, and Matthes (2018) *Guidelines for the translocation of threatened plants in Australia*. Third Edition. Australian Network for Plant Conservation, Canberra.

3.7 Assessment of the Proposed Effects Management Package - Wetlands

The applicant has proposed 1.37 ha of wetland reclamation, including 0.7 ha of indigenous wetland (categorised as the WL12 (0.58 ha) and WL19 (0.12 ha) ecosystems), 0.64 ha of exotic wetland[17] and 0.03 ha of kahikatea-pukatea forest. To offset the residual adverse effects of the loss of these wetland areas the following enhancement actions have been proposed and are reviewed below.

a. Offset Calculations

Offsetting requires a transparent, explicit measurement and balancing of biodiversity predicted to be lost and gained, resulting in a no net loss (or net gain) outcome[18]. The application has provided an assessment of the ecological values to be lost (at the impact sites) and gained (at the offset sites) to achieve at least a no net loss outcome relating to wetland habitat. This assessment has been provided in the form of the Biodiversity Offset Accounting Model. The Biodiversity Offset Accounting calculations provided as part of the application to support the transparent quantification of offsets to achieve a no net loss of ecological outcome have been reviewed. The application of the Biodiversity Offset Accounting Model has been applied in a limited capacity with respect to the number and nature of attributes used. However, predicted ecological gains are considered by this reviewer to be appropriately conservative.

i. Errors

An error in the wetland pest control calculations is noted where the report states a conservative assumption of 50% - 75% confidence of success has been applied; however, the calculations have confidence set to 75-90%.

ii. Consideration of potential

The application of the Biodiversity Offset Accounting Model has not considered the potential value of the 'exotic wetland' impacted on the subject site. Consideration of the wetlands' potential value is appropriate in considering the effects. This is supported by the AUP: OP policy framework, and existing case law, which highlight the enhancement of degraded freshwater systems (E3.2(2). E3.3(3); B7.2.1(2), B7.3.1(1)). Furthermore, E3.8.1 (matters for discretion) includes consideration of potential ecological value. While, the application is for a non-complying activity, the restricted discretionary matters for discretion provide a reasonable initial framework for undertaking an assessment.

In reviewing the Biodiversity Offset Accounting Model calculations, a colleague undertook independent calculations to assess if the offset actions offered were sufficient to achieve a no net loss outcome relating to wetland habitat if the potential value of the exotic wetland were considered[19]. To achieve this the confidence error noted above was corrected and the value of the exotic wetlands was adjusted to the extremely conservative assumption that the potential value would be equal to that of the benchmark value. The outcome of this assessment is that despite taking an extremely conservative approach to considering wetland potential, the proposed offset measures would achieve a net positive ecological value

[17] Note that categorising these areas as "exotic wetland" incorrectly implies that they are comprised solely of exotic vegetation when substantial indigenous vegetation components are in fact present – Pegrume, K. 2016. Wetland Assessment against Chapter 7 for Qualification to Apply for Subdivision of the property Spring Hill Estate Ltd Wetland M.

[18] Ministry for the Environment (2014) Guidance on Good Practice Biodiversity Offsetting in New Zealand and Maseyk, Ussher, Kessels, Christensen and Brown (2018). Biodiversity Offsetting under the Resource Management Act: A Guidance Document

[19] Lowe, M (2020). Technical Memo LUS60339672 (BUN60339589) – Specialist Unit. Provided to Mark Ross – Planning Consultant (Sentinel Planning), Processing Planner.

outcome with respect to wetland biodiversity within 10 years. Therefore, the review of the Biodiversity Offset Accounting calculations concluded that the model provided appropriate offset actions to address wetland loss.

b. Restoration Planting

Planting of native wetland vegetation within all degraded exotic wetlands on the site that are not affected by the project (4.63 ha) has been proposed. This amounts to an approximate ratio of 1:3 (hectares). While at a first glance this appears to be an appropriate amount to offset for the loss of biodiversity values of the 1.37ha, other values within the wetlands to be lost (form and function, and fauna habitat values) require careful consideration and make the offsetting of these features more complex. In addition, two of the affected wetland types have a regional IUCN status of critically endangered (WL12) and endangered (WL19). The forest type WF8 is also considered critically endangered and has been assessed as a wetland system by the application under the RMA definition of a wetland. In addition, the cumulative loss of wetlands and the loss of wetlands within a wetland complex has not been considered by the applicant's ecologists, and that would increase the value of the wetlands even further, requiring additional offset to achieve no net loss.

In order to demonstrate like for like, the enhancement planting of wetlands at the subject site should be designed to recreate these ecosystems while also taking into account the outcomes of an assessment of the existing wetland hydrology and substrate. This can be provided through a wetland management plan, which would provide more certainty in the relevance of the planting as an offset for permanent loss of these ecosystems.

c. Wetland Buffer Planting

The applicant has proposed 10m wetland margin plantings around SEA wetlands (9.03 ha) and 5m wetland margin plantings around all non-SEA wetlands (6.15 ha) amounting to a total of 15.18 ha). This is in addition to the previously mentioned planting. Buffers are considered significant to the health and ongoing functioning to a wetland system, by providing services such as water quality protection (erosion control and sediment, nutrient, biological and toxics removal), influencing the temperature and microclimate of a water body, and providing organic matter to the wetland. hydrologic event modification, groundwater interaction, aquatic and terrestrial wildlife habitat protection and minimise human impacts. The appropriate size for buffers to provide the minimum functionality to the wetland depends on the functions of the wetland, the wetland's relative sensitivity (as influenced by water retention time), the characteristics of the buffer (i.e. type of vegetative buffer, the fauna habitat it needs to support), the intensity of adjacent land use, and watershed characteristics. Recommended minimum wetland buffer sizes vary from 10m – 20m for rural New Zealand rural situations[20] to over 30m in international literature especially where the function of the proposed buffer includes wildlife habitat in addition to water quality management[21].

The applicant's ecologists have not performed a comprehensive analysis of each wetland in terms of form and function to enable an accurate understanding of appropriate buffer widths, and have instead applied blanket buffer widths of 10m (SEA wetland) and 5m (non-SEA wetland). Rather than rather than designing wetland buffers for positive ecological outcomes and adequate effects management, it

[20] Parkyn, Shaw and Eades (2000). Review of information on riparian buffer widths necessary to support sustainable vegetation and meet aquatic functions. NIWA Client Report: ARC00262.

[21] Emmons and Olivier Resources Inc (2001). Benefits of Wetland Buffers: A Study of Functions, Values and Size Prepared for the Minnehaha Creek Watershed District and Environmental Law Institute (2008). Planner's Guide to Wetland Buffers for Local Governments. ISBN 978-1-58576-137-1, ELI Project No. 0627-01.

appears that the drivers for proposing those buffer widths are maximising area available for plantation forestry on the site, and complying with the absolute minimum wetland setback requirements of the NES-PF.

i. 10m Buffer Proposed (SEA Wetland)

In terms of wetland functioning, the literature generally indicates that 10m buffers will be sufficient to perform functions such as erosion and sedimentation minimisation, and nutrient, biological and toxin removal. On that basis I consider that 10m buffers are appropriate for offsetting the permanent loss of wetland function associated with the proposed wetland loss. However, while 10m buffers are expected to provide the required functions associated with wetlands as described above, it is unlikely that a buffer of that width would be capable of supporting indigenous fauna such as the fernbirds that will be displaced from the proposed wetland reclamation area. The reasons for that conclusion are that the available habitats within the wetland will be occupied by resident avifauna (including highly territorial species), and the impacts of disturbance and habitat damage likely to result from the adjoining plantation forestry management activities[22].

ii. 5m Buffer Proposed (Non-SEA Wetland)

The provision of a 5m buffer around wetlands is not considered sufficient to perform an appropriate level of ecosystem services and is not considered applicable to be considered as an offset concerning the loss of the functioning wetlands at the site. In addition, the ongoing maintenance requirements of buffers of this narrow width would be substantial to provide any meaningful services. Also, in the absence of a management plan that specifies wetland buffer management, it is unclear how these buffers would be managed to provide certainty that the required offset will be achieved. The “future forestry” areas are already required by the NES-PF to have a 5m buffer between non-SEA wetlands and forest plantations therefore it is only the planting of the 5m buffer that is additional to existing wetland protection requirements. Given the importance of wetland enhancement in offsetting the project’s adverse ecological effects, larger buffer widths would be appropriate as plantation forest management activities can have significant adverse ecological effects on adjacent wetland.

iii. Summary on the provision of buffers as an offset

Overall, the provision of a 10m buffer around the SEA wetlands is considered adequate to perform the crucial ecological functions that a wetland buffer should perform, except for avifauna habitat provision. The 5m buffer is not adequate to offset for the loss of either wetland function or wetland avifauna habitat loss. On that basis, there is simply too little certainty around the efficacy of the proposed buffers to accept that the proposed offset for wetland loss is adequate.

d. Protection in Perpetuity

All indigenous wetlands at the site are proposed to be protected by way of covenant and 4.653ha of degraded wetlands is proposed to be planted to offset the loss of form, function, and habitat via

[22] Shepard, J. (1994). Effects of forest management on surface water quality in wetland forests. Wetlands, 14(1), 18-26 and Sun, G., Mcnulty, S., Shepard, J., Amatya, D., Riekerk, H., Comerford, N., Swift, L. (2001). Effects of timber management on the hydrology of wetland forests in the southern United States. Forest Ecology and Management, 143(1-3), 227-236.

permanent wetland loss. Wetland buffers of 5m (non-SEA wetlands) and 10m (SEA wetlands) have been proposed however these buffers appear to have been excluded from the proposed covenanting.

To obtain long-term effectiveness in offsetting through the buffer areas, overland flow must be maintained, vegetation must be kept healthy, and incursions from pests (plant and animal) and human disturbances must be kept to a minimum. The omission of the buffer areas from protection via covenanting limits the adequacy of the buffers as an offset. It is considered that the planting of the buffers alone is insufficient to offset the residual effects of wetland form and functional losses and to account for this deficiency the buffers should also be included in the covenanting footprint. This is especially important given that the adjoining land use to the wetlands will be actively managed plantation pine forest as well as the landfill itself. It is also considered that this issue ties in with the ability for the proposed buffers to be sufficient to address residual adverse effects on wetland birds such as fernbird, Australasian bittern and spotless crake (see section 3.5 (f)(g)(h) of this memo) from displacement and a permanent loss of habitat.

Some protection of wetlands is already provided by the NES-FW which makes wetland reclamation a prohibited activity, and the SEA overlay within the AUP: OP which provides protection from development. However, those provisions do not apply to planted vegetative buffers such as those proposed, and nor do they provide for the enhancement and maintenance of wetlands or protect against incursion or damages potentially arising from adjacent land use activity. The current proposal of the provision of covenants to protect the wetlands provides permanent protection from development but does not provide any assurance that the biodiversity values and functioning of these wetlands will be improved and maintained in the long-term.

Overall, it is unclear how the management and protection of these wetlands and the lack of protection for the associated buffers are going to provide a true example of “like for like “offsetting, a “no net loss“ and an increase in the form and functioning of the wetlands over time, and additional habitat for wetland birds, as no detailed management measures (i.e. specific management plans) have been provided other than an indication of planting, pest plant and animal control.

3.8 Assessment of the Proposed Pest Plant and Animal Control

The applicant has offered pest animal control as the key proposal for the offset and compensation for the majority of the residual effects on avifauna including direct mortality and loss of habitat.

a. Pest plants

The ecological management plan states that the pest plant control within planted areas will occur for five years or until canopy closure. However, it also states that all planted areas will be subject to a covenant. Part of this will be the expectation that pest plant control will continue in perpetuity in these areas.

b. Pest animals

There are discrepancies between the proposed pest animal control (species targeted and RCR/RTI) outlined within the EMP, the offset & compensation framework, and the final Section 92 (terrestrial) responses. Moreover, as no comprehensive pest management plan or baseline pest survey results have been provided, it is difficult to assess the adequacy of the pest control which is proposed as an offset for a wide range of ecological effects. A substantial proportion of the proposed pest control areas are on DOC land that may already be subject to pest control carried out by Auckland Council. Given the reliance on that off-site pest control to achieve adequate offsetting of ecological, evidence is required to

demonstrate that the proposed pest control will achieve sufficient additionality, and that a long-term access agreement to facilitate the pest control will be forthcoming from the landowner. While the applicant's ecologists have indicated that additionality is achievable, and that DOC will grant the necessary approvals, a degree of uncertainty will remain until evidence of such has been provided.

Given the project's predicted high level of adverse effect on Hochstetter's frog, it is particularly important that the proposed pest control achieves sufficient benefits to offset the effects on that species. Even assuming that long-term access for pest control will be secured, uncertainty remains around whether pest control additionality will be achieved and whether frogs will benefit from it. Resolving that issue requires good information on any existing pest control operations and current pest abundance (i.e., baseline pest survey data), as well as information on frog abundance, carrying capacity and habitat availability. Even if it can be demonstrated that the pest control is sufficiently additional, it does not necessarily follow that frogs will benefit from that pest control. For example, if frog abundance is limited by habitat availability, then no amount of pest control will be able to increase carrying capacity to accommodate addition frogs. Furthermore, the frog habitat loss is permanent whereas the pest control is proposed to cease after 35 years.

Pest animal control is proposed within exotic wattle forest and pine plantation areas in the proposed consent conditions. While not considered to make a substantial contribution towards offsetting the project's adverse effects on indigenous fauna, subject to consideration of a comprehensive pest management plan that is yet to be provided, that pest control is likely complement the other pest control on-site and off-site.

The proposed pest animal control is a crucial part of understanding the offset and compensation framework and its effectiveness. Based on the information submitted, it is uncertain whether this will address the residual effects on various fauna and indigenous forest loss.

4. Submissions

The resource consent application was publicly notified, and many submissions were received (>1,000), the vast majority of submissions oppose the application in whole or in part. I have reviewed the submissions relevant to the matters considered in this technical assessment. The submission points relating to aspects of this technical assessment can be broadly grouped into the following themes:

- The presence of wetlands that will be directly impacted by the proposed activity.
- The loss of streams and wetlands and the associated adverse effects on habitat availability, and the downstream receiving environment.
- Inconsistency with policy (including aspects of the RMA, NPS-FW and AUP: OP).
- Concerns with the proposed measures to address residual adverse effects, including a lack of offsetting to achieve a no net loss outcome for ecological function.
- A lack of transparency regarding the consideration of alternative sites for the landfill.
- Concerns with the adequacy of the terrestrial ecological assessment, including wetland mapping and surveys of fauna.
- Inadequate conditions of consent, including conditions that defer finalising actions to address adverse effects to post granting consent, and conditions that lack measurable criteria.

In general, it is considered that these issues raised by submitters are addressed within this technical report.

4.1. Ecological issues identified by submitters:

- Effects on Hoteo River and Kaipara Harbour

A number of submitters (e.g., Michelle Carmichael 9731, Herby Skipper 9883, Haranui Marae Trust Board, Rochelle Rodgers 9727) raised concerns about the downstream ecological effects of leachates and sedimentation on the ecological values of the Hoteo River and Kaipara Harbour.

- Threatened Fauna

The submission from the Auckland Conservation Board (ID 9588) expressed concerned about the potential impact of this construction on a range of nationally 'threatened or 'at risk' native fauna, which the applicant has identified as present at the site' including Hochstetter's frog ('at risk declining'), NZ long-tailed bat (*Chalinolobus tuberculatus*), and Australasian bittern (*Botaurus poiciloptilus*).

- Flora

i) Numerous submissions (e.g., Michelle Carmichael 9731, Herby Skipper 9883, 9884 etc Kathryn Hunter 9913, Christopher Hunter 9918) raise issues with effects on native flora including effects on kauri.
ii) Effects of additional pine forest proposed in close proximity to important wetlands was also a concern raised by Ngati Manuhiri Settlement Trust.
iii) The Conservation Board would like to see the advice provided to the applicant on other sites which were considered and rejected to understand why this site with its significant ecological values has been selected over others.

4.2. Identified key submissions are reviewed in detail below:

Forest and Bird (ID 9920) raises concerns with the adequacy of the ecological assessment and provided mitigation, specifically the following topics:

- A number of threatened and at-risk fauna species have been identified within the project footprint and in adjacent areas which will be adversely impacted by the proposal.
- Effects of proposed future forestry in the western block. There is concern that this would 'supplant the current habitat where NZ pipit have been identified' and have significant impacts on waterbodies and doesn't provide for benefits through planting of indigenous vegetation.
- The level of adverse effects on Hochstetter's frog ('at risk declining'). The submissions note that currently there is '*no known way to create habitat for, or successfully translocate/salvage, this species from existing habitat'* and '*no certainty that suitable habitat will be found, and that the relocation would be successful'*.
- The level of effects on fernbird which have been recorded in indigenous and exotic wetlands within the footprint, and consider that '*the numbers of birds that have been detected in these areas the wetland habitat is likely to be significant*' and that the applicant has not sought to protect these areas in the same way they have for identified SEAs.
- That the proposal has failed to identify appropriate offsetting within the same catchment, and that '*the offset and compensation package does not go far enough to address the significant adverse effects of the landfill activity'*, is inconsistent with the RPS, and does not appropriately have regard to the NPSFM or achieve the purpose of the Act.

Department of Conservation (ID9975) raises concerns around the management of fauna from the development, namely:

- Concerns about the level of adverse effects on Hochstetter's frog ('at risk declining'). The submissions note that currently there is '*no known way to create habitat for, or successfully translocate/salvage, this species from existing habitat'* and '*no certainty that suitable habitat will be found, and that the relocation would be successful'*.
- Concerns about habitat for Nationally Critical long-tailed bat: '*Not all of this habitat is within areas mapped as SEAs in the AUP, and given their high threat status, areas within the site that provide habitat to long-tailed bats should be considered significant habitats under s6(c) RMA'*.

They also raise concerns around wetland delineation and effects:

- '*the mapping of wetland locations, extent and values in the affected area is inadequate to assess significance or effects'*, and that '*given there are few remaining wetlands and there is ongoing wetland loss all remaining wetlands are significant'*. The submission is concerned that '*Small and ephemeral wetlands are likely to be unmapped and even mapped wetlands will be a mosaic of types even if the majority are currently mapped as swamps'*.

And the applicant's provision of offsetting and no net loss:

- *The permanent loss of habitat is not easy to replace, and a precautionary approach needs to be applied when estimating the significance of mitigation, restoration, enhancement and any biodiversity offsets or environmental compensation. Many of the measures proposed to address related adverse effects are either unproven (for example, wetland restoration, frog salvage) or of limited benefit (for example, lizard salvage).*

DOC also consider that there are an overall lack of sufficient considerations to the site selection, and adequate consent conditions where the *'draft conditions place considerable reliance on detailed plans being submitted post any consent approval which means there is a lack of transparency during the public consultation stage of the consent process. Conditions are needed to set out limits and specific measures to give confidence that mitigation measures will be implemented by the applicant. Incorporating such matters into management plans which can be amended after the grant of consent is inappropriate'.*

5. Statutory Considerations

Key Statutory Considerations relating to the matters of this terrestrial technical assessment are summarised below. The AUP: OP 2012, Wildlife Act 1953, The New Zealand Biodiversity Strategy 2000 and the draft National Policy Statement for Indigenous Biodiversity 2019 all contain provisions that are relevant to the avoidance and management of adverse effects on indigenous terrestrial flora, fauna and ecosystems. These documents also provide national direction on the maintenance, enhancement, and protection of indigenous biodiversity values through development.

Overseas Investment Office – Resource Consent Conditions[23]

The applicant has received consent from the Overseas Investment Office (OIO) with regard to the acquisition for the sensitive land at Wayby Valley. Conditions that pertain to the arrangement and are directly relevant to this review include:

Consultation

1. You must consult with the Walking Access Commission ("WAC") and the Department of Conservation ("DOC") on the following:

(a) opportunities to enhance the recreational value of Sunnybrook Scenic Reserve; and

(b) opportunities to create mountain bike tracks on the Land.

You must meet the cost required to undertake this consultation.

Reach agreement

2. Upon consultation with WAC and DOC as outlined above in 1, you must agree to implement all reasonable recommendations made by WAC and DOC including:

(a) Implementation of at least two opportunities identified in 1(a); and

(b) Implementation of at least two opportunities identified in 1(b); and

(c) enter into a Memorandum of Understanding with local mountain biking and cycling groups to establish and manage any mountain biking recreation (if reasonably requested by WAC).

You must meet the costs required to fulfil this condition.

Special condition 4: Protection of significant natural areas

3. You must offer to protect and covenant ALL SNAs on the Land that are not affected by the Landfill and the Forestry Rights Agreements included with this application as part of your resource consent application for the Landfill.

Every covenant that you offer in satisfaction of this condition must be on terms that the covenantee, acting reasonably, approves. You may agree the terms of the covenants with the covenantee prior to making an application for resource consent, during the resource consent process or within a reasonable period of time after resource consent has been granted.

This includes but is not limited to the areas specified in schedule five of the agreement for sale and purchase for the Matariki Land. The extent and terms of the covenants shall also take into account the

[23] Overseas Investment Office (2018). Consent for Overseas Person to Acquire Sensitive New Zealand Land. Consent Conditions.

terms and conditions of your resource consents for the Landfill, as well as the Forestry Rights Agreements with Matariki.

A minimum of 40 ha. shall be protected as part of this covenanted area subject to discussion with the Department of Conservation.

6. To the extent you are felling trees on the Land that might provide habitats for or contain long tailed bats, you must adopt reasonable techniques for avoiding or mitigating effects on the bats.

7. You must adopt the best practicable option as part of your Landfill development and operation to avoid sedimentation entering any streams or waterways on the Land that provide habitats for Hochstetter's frogs.

You must protect water quality and stream habitat (in areas of the Land not affected by the Landfill or the Forestry Rights Agreements) supporting Hochstetter's frogs

8. You must offer to undertake predator control on the Land as part of the resource consent process including securely fencing the Landfill operational area and adopting mitigating solutions to manage any feral cat population or other wild animals that could threaten the SNA on the Land or adversely affect threatened species on neighbouring reserves such as bittern and fernbird.

You must consult with DOC to determine what you can reasonably do to riparian plant and/ fence for the purpose of stock exclusion along the Hoteo river as part of your resource consent process for the Landfill.

If you do not comply with this Special Condition 4, or any part of it, Standard Condition 6 will apply and we may require you to dispose of the Land.

Wildlife Act 1953:

All indigenous bats, birds, lizards, and some invertebrates (including kauri snails) are fully protected under the Wildlife Act 1953. It is an offence to disturb, harm, or remove them without a permit from the Minister of Conservation. This includes the deliberate disturbance of potential habitat even if the presence of native species has not been specifically surveyed.

National Policy Statement: Freshwater Management 2014 (amended 2017) (NPS-FM)[24]

As the application relates to works within and around streams and wetlands, the NPS Freshwater Management is considered relevant to this application. Objectives of the NPS Freshwater Management centre on safeguarding the life supporting capacity, ecosystem processes and indigenous species of water bodies in terms of water quality and quantity.

National Policy Statement: Freshwater Management 2020 (NPS-FM) and National Environmental Standards for Freshwater) Regulations 2020 (NES-FW)

During the processing of the application the new NPS and NES for freshwater management became operative. These includes provisions to safeguard ecological values and maintain or improve water quality, including:

[24] I have undertaken a brief review of the NPS – Freshwater Management and NES - Freshwater published on 3 August 2020, which become effective (in part) on 3 September 2020. The wetland and stream provisions do not alter my comments within this Technical Assessment at the time of writing. However, updates or amendments may be required later upon closer review and direction from Council.

- Freshwater is managed in a way that gives effect to Te Mana o te Wai
- Freshwater is managed through a National Objectives Framework to ensure that the health and well-being of degraded water bodies and freshwater ecosystems is improved, and the health and well-being of all other water bodies and freshwater ecosystems is maintained […]
- There is no further loss of extent of natural inland wetlands, their values are protected, and their restoration is promoted.
- The loss of river extent and values is avoided to the extent practicable.
- The habitats of indigenous freshwater species are protected.

The key components to consider are:

Policy 6 of the NPS: FW: There is no further loss of extent of natural inland wetlands, their values are protected, and their restoration is promoted

And Part Three (53) of the NES: FW:

53 Prohibited activities

(1) Earthworks within a natural wetland is a prohibited activity if it—

(a) results, or is likely to result, in the complete or partial drainage of all or part of a natural wetland; and

(b) does not have another status under any of regulations 38 to 51.

(2) The taking, use, damming, diversion, or discharge of water within a natural wetland is a prohibited activity if it—

(a) results, or is likely to result, in the complete or partial drainage of all or part of a natural wetland; and

(b) does not have another status under any of regulations 38 to 51.

Draft National Policy Statement for Indigenous Biodiversity 2019 (NPS-Bio)[25]

The application proposes activities which will influence indigenous biodiversity, and the NPS Indigenous biodiversity is considered relevant, although it is currently a draft document and has not yet come into effect. The objectives on the NPS Indigenous biodiversity relate to the maintenance, integrated management, restoration and enhancement of indigenous biodiversity and allows for the recognition of the importance of involving community and the principles of the Treaty of Waitangi. Of relevance to this proposed plan change is Policy 2*: "to ensure that local authorities adopt a precautionary approach towards proposed activities with effects on indigenous biodiversity that are uncertain, unknown, or little understood but potentially significant*

National Environmental Standard for Plantation Forestry 2017 (NES-PF)[26]

The National Environmental Standard for Plantation Forestry include environmental protection provisions including afforestation setbacks from wetlands, streams and waterbodies, limits on permitted

[25] Draft National Policy Statement for Indigenous Biodiversity (2019). I have undertaken a brief review of this policy statement in relation to the application, however it is noted that it has not come into effect yet.

[26] Ministry for the Environment (2017). National Environmental Standards for Plantation Forestry 2017. https://www.mfe.govt.nz/publications/rma/national-environmental-standards-plantation-forestry-overview-of-regulations

incidental damage to indigenous forest and riparian vegetation areas, and protection of significant indigenous nesting birds.

Regulation 14 within the NES-PF specifies the following setbacks from wetlands, streams, and waterbodies within which afforestation must not occur:

(a) within 5 m of—

(i) a perennial river with a bankfull channel width of less than 3 m; or

(ii) a wetland larger than 0.25 ha; or

(b) within 10 m of—

(i) a perennial river with a bankfull channel width of 3 m or more; or

(ii) a lake larger than 0.25 ha; or

(iii) an outstanding freshwater body; or

(iv) a water body subject to a water conservation order; or

(v) a significant natural area; or

(c) within 30 m of the coastal marine area.

The following aspects of Regulation 93 of the NES-PF address permitted incidental damage to indigenous vegetation:

(4) Incidental damage is a permitted activity and may occur in an area that is within or adjacent to any plantation forest, including a riparian zone.

(5) In this regulation, incidental damage means—

(a) damage where the ecosystem will recover to a state where, within 36 months of the damage occurring, it will be predominantly of the composition

previously found at that location; or

(b) damage to indigenous vegetation canopy trees that are greater than 15 m in height, where the damage does not exceed—

(i) 30% of the crown of any indigenous vegetation canopy trees and no more than 30% of those trees per 100 m of the indigenous

vegetation perimeter length; or

(ii) 10 m in continuous length per 100 m of a riparian zone length (with the applicable riparian zone width); or

(c) if it occurs in a significant natural area, damage that—

(i) does not significantly affect the values of that significant natural area; and

(ii) allows the ecosystem to recover as specified in paragraph (a).

Regulation 102 of the NES-PF specifies measures which must be undertaken to protect areas classified by councils as significant and indigenous fauna under section 102 (Indigenous Bird Nesting) where:

(1) A plantation forestry activity occurring where nesting of the following indigenous bird species occurs must comply with the procedures required by subclause (2):

(*a) any indigenous bird species with a classification of Nationally Critical, Nationally Endangered, or Nationally Vulnerable in the document referred to in item 8 of Schedule 2 (Conservation status of New Zealand birds); and*

(b) any of the following bird species as described in the document referred to in item 8 of Schedule 2 (Conservation status of New Zealand birds):

(i) Apteryx mantelli, common name: North Island brown kiwi:

(ii) Falco novaeseelandiae novaeseelandiae, common name: Eastern falcon:

(iii) Falco novaeseelandiae ferox, common name: Bush falcon:

(iv) Gallirallus australis greyi, common name: North Island weka.

(d) avoid or mitigate adverse effects on affected nest sites and indigenous bird species.

The NES-PF does not include provisions for the protection of any other significant indigenous fauna such as bats, lizards, frogs, invertebrates, or birds not classified as 'Threatened' in the 2016 Conservation status of New Zealand Birds (published in 2017)[27].

Auckland Council Indigenous Biodiversity Strategy (2012)[28]

The indigenous biodiversity strategy provides direction for Auckland Council to collaborate in the protection and enhancement of indigenous biodiversity in the region. Specifically, the document "supports the development of one of the world's most liveable cities" while also ensuring that "significant indigenous biodiversity is identified and protected from inappropriate use and development". The objectives centre on the conservation of indigenous ecosystems and their sequences, flora and fauna and aims for the long-term recovery of threatened ecology in the region. The objectives also intend to increase and support ecosystem services and manage these in alignment with the protection of indigenous biodiversity.

Auckland Unitary Plan: Operative in part (AUP: OP)

The regional provisions of the AUP: OP include various provisions to maintain and improve indigenous biodiversity, avoid, and manage adverse effects and to manage development that affects terrestrial systems, including (but not limited to): the following.

Chapter B7, Natural Resources and the objectives and policies in section B7.2 seek to ensure that indigenous biodiversity is maintained and degraded habitats enhancement, the loss of indigenous biodiversity is minimised and that any adverse effects are avoided, remedied or mitigated.

[27] Robertson, Baird, Dowding, Elliott, Hitchmough, Miskelly, McArthur, O'Donnell, Sagar, Scofield, and Taylor (2017). Conservation status of New Zealand Birds, 2016. New Zealand Threat Classification Series 19. Department of Conservation, Wellington. 23 p

[28] Auckland Council (2012). Auckland Council Indigenous Biodiversity Strategy.

Chapter E3 seeks to protect Auckland's lakes, rivers, streams, and wetlands with high natural values from degradation and permanent loss. It also provides for the provision that Auckland's lakes, rivers, streams, and wetlands are restored, maintained, or enhanced.

Chapter E15, Indigenous Vegetation Management and Biodiversity seeks to maintain and enhance indigenous biodiversity in areas that are already degraded, and to protect areas of indigenous vegetation when adverse effects are to be expected from new land uses.

Chapter D9 Significant Ecological Areas Overlay seeks to provide for the appropriate management of areas that contain indigenous flora and fauna or habitat for fauna, ensuring that healthy diverse ecosystems are maintained in the Auckland Region. It allows for the protection of these areas from inappropriate development.

6. Summary

6.1. Adequacy of Information

This technical assessment is based on the information submitted as part of the application in relation to terrestrial ecological matters. The information submitted on ecological values, effects, avoidance, mitigation, offsetting, and compensation were all considered. Overall, the information submitted is sufficient to enable the consideration of the above matters on an informed basis because:

a. The level of information provides a reasonable understanding of the nature and scope of the proposed activities as they relate to the AUP: OP

b. The extent and scale of the actual and potential effects of the proposed activities on terrestrial ecology are sufficiently clear to enable them to be assessed

6.2. Summary of Unresolved Terrestrial Ecology Issues

The applicant's ecologists have attempted to address the project's actual and potential effects on terrestrial ecological values logically by proposing a combined package of avoidance, minimisation, mitigation, off-setting, and compensation measures. However, uncertainty and concerns remain as to whether the project's adverse effects on terrestrial ecology will be appropriately managed. The issues fall into two groups, those that may be able to be addressed with further clarification, consent conditions and/or management plans, and those that risk causing unacceptable ecological outcomes without fundamental changes to the application.

a. Issues relating to terrestrial ecology matters that may be able to be resolved with further clarification, consent conditions and management plans (new plans and/or amendments to existing plans):

- Several aspects of the management proposed to mitigate, offset, and compensate the project's effects on Hochstetter's frogs are experimental and unproven. An adaptive management component would need to be added to the frog management plan to ensure appropriate contingency/remedial actions will be implemented if monitoring shows mitigation is not achieving adequate outcomes for frogs.
- A detailed comprehensive pest management plan is required because the proposed pest management represents a substantial component of offsetting and compensation of effects on terrestrial ecological values.

- Wetland buffers should be covenanted, and a wetland and buffer management plan provided to ensure acceptable outcomes are achieved at the site for wetland birds such as fernbird, Australasian bittern, and spotless crake. The proposed buffers widths are narrow (5m or 10m), yet they need to fulfil multiple roles including the provision of habitat for avifauna displaced from impacted wetland habitat (e.g., fernbird), protect wetland functioning, and to buffer the wetlands from the adverse effects of the proposed adjoining plantation forestry operations.
- Edge effects on areas of indigenous vegetation not subject to planting or covenanting have not been addressed, and it is unclear whether all areas of indigenous vegetation at the site are to be covenanted.
- Invertebrate salvaging duration needs to be specified to provide a level of certainty that the project's residual adverse effects on invertebrate populations will be adequately mitigated and offset.
- Discrepancies in the proposed and appropriate salvaging footprint for herpetofauna, bats and invertebrates. The footprint for these should include all areas of suitable habitat for the species concerned. For example, wattle forest was classified as moderate value habitat for lizards therefore salvage efforts should include wattle forest.
- The lighting section of the bat management plan needs to specify which management measures ***will*** be undertaken (instead of ***can*** be undertaken as is currently stated). Additionally, a suitably qualified and experienced bat ecologist will need to be consulted to ensure the design of construction and operational lighting for the project incorporates appropriate measures to avoid/minimise impacts on bats.
- An increase in the number of threatened flora individuals to be translocated is required to ensure successful translocation and to allow for mortality rates.

b. Issues relating to terrestrial ecology that cannot be addressed with further clarification, consent conditions and management plans (new plans and/or amendments to existing plans):

- Unacceptable adverse effects (injury/mortality, habitat loss and severance of habitat connectivity) on Hochstetter's frogs are likely to occur as a result of the proposed installation of a 105m culvert to construct the access road stream crossing in an area occupied by a high density frog population. That aspect of the proposal demonstrates a lack of adequate avoidance of significant adverse ecological effects.
- While the proposed 10m buffers for SEA wetlands may be sufficient to protect crucial elements of wetland functioning (see 3.5c above), the 5m buffers proposed for non-SEA wetlands are unlikely to be wide enough to adequately fulfil that role. Overall, there is substantial uncertainty as to whether the buffer widths will be adequate to achieve the outcomes required to achieve adequate offsetting of effects on wetlands and wetland birds - even if covenanting of buffers and a robust management plan were to be incorporated into the proposal as suggested above.

7. **Recommendations**

Given that the project footprint is dominated by plantation forestry, the site presents a seemingly suitable site for a large-scale landfill from a terrestrial ecological perspective. The majority of the project footprint is currently in plantation forestry with areas of pasture, regenerating native forest, wattle forest, and exotic/degraded wetland also affected. While the subject site's dominant vegetation communities are not among those typically perceived as having high terrestrial ecological value, the applicant's ecologists have identified a range of significant ecological values on-site, some of which will be impacted by the construction and operation of the landfill. The applicant's ecologists have generally applied appropriate assessment methodologies and, despite some inconsistencies, errors, and omissions in their reporting,

I am in general agreement with their conclusions around the significance of the site's terrestrial ecological values. Many of the site's terrestrial ecological values are high, and a comprehensive package of measures to avoid, mitigate, offset, and compensate the predicted adverse ecological effects is required.

However, some of the project's likely residual adverse effects on terrestrial ecology are, in my opinion, 'unacceptable'. In addition to inadequate avoidance of effects on Hochstetter's frog, there are substantial uncertainties associated with the proposed management of the project's adverse effects on that species. The protection of wetland buffers and a robust wetland and buffer management plan would go some way to addressing the uncertainty around the suitability of the proposed buffers for offsetting effects on wetland birds. Ultimately, however, the proposed buffers are likely to be too narrow to provide the offsetting outcomes and wetland buffering required.

I disagree with the applicant's ecologists' argument[29] that the worst-case scenario of the loss of all Hochstetter's frogs from within the project footprint would be acceptable, even when the pest management proposed to manage residual effects is taken into consideration. The presence of a breeding frog population within the footprint with population size estimates noted as being 'in the late hundreds to early thousands' collectively indicate that the population should be considered of high ecological significance at any scale – local, regional, or national.

There are many unknowns associated with the proposed frog management. Examples of important site-specific information on Hochstetter's frogs which is lacking include population size, trend, and carrying capacity. Furthermore, insufficient information has been provided to demonstrate that pest control and experimental habitat enhancement will adequately increase frog carrying capacity at release sites to accommodate translocated frogs. While I agree that pest control has been shown to benefit Hochstetter's frog populations, the loss of frog habitat due to this project will be permanent whereas the benefits of the pest control undertaken by the consent holder as proposed will cease after 35 years. Research on frog translocations is potentially of some value however the inability to distinguish individual frogs will make it impossible to monitor the fate of translocated frogs or detect any adverse effects on existing frogs already resident at release sites (e.g., displacement from preferred habitats by translocated frogs).

An area of high value fernbird habitat at the site will be completely lost, as will habitat and resources for spotless crake and Australasian bittern. The proposed 10m and 5m buffers around SEA and non-SEA wetlands (respectively) at the subject site are relied upon to provide a measure of offsetting for loss of wetland bird habitat. However, in the absence of permanent protection and a management plan for buffers, it is unclear whether and how the provision and management of buffers will provide adequate benefits for those species. Furthermore, there is a risk that the proposed buffers – especially the 5m buffers around non-SEA wetlands – will not provide the outcomes required to adequately offset the permanent loss of wetlands and wetland functioning at the site. The plantation forestry operations proposed to adjoin the wetland buffers may adversely affect the buffers and their avifauna inhabitants (noting that some "incidental damage" from forestry operations would have permitted activity status), and that possibility further increases the risk of unacceptable outcomes.

[29]Communicated by the Applicant's frog expert Dr Matt Baber during a meeting held on 18 August 2020 to discuss s92 responses.

8. Conclusion

The key conclusion of this review is that there are several aspects of the application that give rise to unacceptable levels of uncertainty regarding terrestrial ecology outcomes. The most notable examples include:

- The lack of avoidance of effects on Hochstetter's frogs arising from a proposed 105m culvert along a confirmed frog population hotspot is unacceptable due to the likelihood of frog injury/mortality as well as habitat loss and the severance of habitat connectivity between remaining habitats.
- In addition to the lack of avoidance of adverse effects on Hochstetter's frogs, several aspects of the proposed frog management are experimental therefore there is an unacceptable risk that residual adverse effects on frogs will not be adequately mitigated, offset, or compensated.
- The uncertainties around wetland buffer protection and management mean that the pest control and wetland buffers proposed are unlikely to be sufficient to address residual adverse effects on wetland birds such as fernbird, Australasian bittern and spotless crake, or the permanent loss of wetlands and wetland function.

Based on the information provided to date, I do not support the proposal in its current form due to unacceptably high levels of uncertainty around whether the project's adverse effects on terrestrial ecological values will be adequately avoided, mitigated, offset, or compensated.

9. Recommended Conditions

The application material provides draft conditions of consent (25 August 2020). There is uncertainty in the applicant's approach to rely on management plans and certification through council to address all residual effects on balance of the consent being approved. There are excessive uncertainties and unresolved issues at present with the level of residual effects and the subsequent lack of achieving no net loss. Therefore, while the following section provides a review of the recommended conditions, there needs to be clarity around aspects such as fauna management before these conditions could ensure that the mitigation, offset and compensation offered by the applicant is implemented in full and as anticipated.

These suggested amendments are summarised below with proposed additional text shown as underlined and proposed deletions shown a strike through. Only those conditions relevant to the scope of this Technical Assessment are included below.

It is noted that there are discrepancies in the naming of reports and management plans between the proposed conditions and the actual draft plans provided. This has the potential to cause confusion for the consent holder and should be rectified before/if consent is issued.

Vegetation Covenants

Within one (1) year of Initial Site Construction Works being completed the consent holder shall enter into covenants in favour of Auckland Council. The covenants shall:

- Protect ~~[111.9ha] of~~ all remaining indigenous/native forest at the site ~~and [25.59ha] of wetlands~~ from development;
- Protect and enhance all remaining wetlands and their associated buffers on the site from development [expected ha to be placed here upon receiving the final plans];
- Protect any riparian planting undertaken on the WMNZ landholdings as a requirement of the conditions of this consent that is required to be protected in perpetuity; be drafted and submitted to the council's nominated Solicitor for certification at the consent holder's cost; and

- be registered against the Computer Register(s) (certificate(s) of title) to the affected land by the consent holder at their cost; and
- require the consent holder to:

a. be responsible for all legal fees, disbursements and other expenses incurred by the council in connection with the covenant; and

b. reimburse the council for costs, fees, disbursements and other expenses incurred by the council as a direct or indirect result of the council being a party to this covenant.

A copy of the updated Computer Register (certificate of title) showing that the covenant has been registered shall be provided to the Council Within one (1) year of Initial Site Construction Works being completed. ~~[timing of covenants to be further discussed, where practicable these covenants will be in place prior to the landfill accepting waste].~~

Construction Ecological Management Plan

The consent holder shall develop a Construction Ecological Management Plan (~~FMP~~ CEcoMP), prepared by an appropriately qualified ecologist/s. The ~~FMP~~ CEcoMP shall be submitted to Auckland Council at least three months prior to the construction commencement date. The ~~FMP~~ CEcoMP shall describe the measures to address effects on fauna and their habitat during construction of the project. The ~~FMP~~ CEcoMP shall be comprised of the following sub-sections (described in conditions 52 - 58):

a Bats;

b Avifauna (birds);

c Lizards;

d Hochstetter's frogs;

e Native fish and kōura;

f Invertebrates (peripatus, snails); and

g Vegetation clearance;

By 1 December of each year of the initial construction period, an appropriately qualified ecologist(s) shall certify that fauna relocations have been carried out in accordance with the approved ~~FMP~~ CEcoMP, and shall provide details of any species removed or relocated to the Council's ecologist.

~~Bats~~

~~At least three months prior to the Construction Commencement Date, the consent holder shall provide a Bat Management Plan (BMP) to Auckland Council for certification. The purpose of the BMP is to minimise any potential effects on bats within the vegetation to be cleared.~~

~~The BMP shall be prepared by a suitably qualified and experienced ecologist. The BMP shall include standard best practice tree felling protocol and lighting management.~~

~~Advice Note: The objective of the BMP is to set out the procedures to be implemented by the consent holder to avoid and mitigate the effects on long-tailed bats from the removal of any vegetation and/or trees that are potential bat roost habitat. In particular the BMP shall include measures to be implemented prior to removing the potential bat roost trees identified in Tonkin + Taylor's Assessment of Ecological Effects (2019), which shall include:~~

~~a. A pre-tree felling protocol prepared by a qualified recognised bat ecologist that sets out the monitoring procedures to be implemented for the removal of any vegetation and/or trees that are identified as potential bat roost. This can be achieved through acoustic surveys, direct observation of trees prior to their removal, and by managing the time (month) of removal;~~

~~b. Details of ongoing monitoring and reporting of bat activity where occupied bat roosts are discovered;~~

c. Proposal for minimising disturbance from construction activities near any discovery of active roosts until the bat ecologist confirms they are vacant; and
d. Methods for the replacement of any actual and potential bat roosts that are removed as part of the proposal.

The pre-tree felling protocol set out in the BMP shall be implemented for the removal of any vegetation and/or trees that are identified as potential bat roost by a suitably qualified ecologist.

Avifauna (birds)

8An Avifauna Management Plan (AMP) shall be submitted and certified by Auckland Council at least three months prior to the construction commencement date. The AMP shall be prepared by a suitably qualified and experienced ecologist. The purpose of the plan is to minimise any potential effects on avifauna from the construction works. The Avifauna Management Plan shall provide forest and wetland bird breeding protection including:

a. Seasonal constraints on felling and/or noise disturbance in habitats that are likely to have high bird values to avoid or minimise harm to eggs and chicks;
b. Proposed controls for maintaining a 30 m setback of construction works from the margin of wetlands during peak breeding season (September – December);
c. A process for ensuring no nesting birds are present within vegetation to be cleared if works are required during peak breeding season (September – December).

Lizards

At least three months prior to the construction commencement date, the consent holder shall provide for the certification of Auckland Council a Lizard Management Plan (LizMP) to minimise any potential effects on indigenous skinks and/or geckos within the vegetation. Copies of any Department of Conservation permits shall be attached to the plan. The Lizard Management Plan shall be prepared by a suitably qualified and experienced herpetologist and shall include:

a. Timing of the works;
b. A description of salvaging methodology;
c. A description of relocation methodology, including transfer methods, relocation site(s) selection and habitat enhancement measures (such as deployment of logs and pest control).

Hochstetter's frog

At least three months prior to the construction commencement date, the consent holder shall provide for the certification of Auckland Council a Hochstetter's Frog Management Plan (HFMP) to minimise any potential effects on frogs within streams. Copies of any Department of Conservation permits shall be attached to the plan. The HFMP shall be prepared by a suitably qualified and experienced herpetologist and shall include:

a. Timing of the works;
b. A description of salvaging methodology;
c. A description of relocation methodology, including transfer methods, relocation site(s) selection and habitat enhancement measures (such as deployment of rock refugia and pest control).
d. Proposed monitoring at the relocation site(s) and adaptive management measures and threshold triggers

Invertebrates

At least three months prior to the construction commencement date, the consent holder shall provide for the certification of Auckland Council an Invertebrate Management Plan (IMP). The objective of the IMP is to describe the specific procedures to address potential adverse effects associated with the construction and operation of the Project on peripatus, rhytid snails and kauri snails (if present) through salvage and relocation. The IMP shall be prepared by a suitably qualified ecologist and shall include:

In relation to peripatus:

a. Timing and duration of works;
b. Identification of decaying logs (high quality peripatus habitat) that can be relocated. A minimum of 10 logs or 10% of available and moveable decaying logs shall be relocated; and

c. Relocation methods, including transfer methods and selection of appropriate native forest relocation site(s).

In relation to snails:

a. Timing and duration of the works;
b. A description of salvaging methods; and
c. A description of relocation methods, including transfer methods, relocation site(s) selection and pest control.
d. Copies of ~~any~~ Department of Conservation permits shall be attached to the plan.

~~**Vegetation Clearance Management Plan**~~

~~A Vegetation Clearance Management Plan (VCMP) shall be prepared by an appropriately qualified and experienced ecologist(s). At least two months prior to the construction commencement date, the VMP shall be submitted to Auckland Council. The VMP shall describe the measures to minimise the area of habitat/vegetation impacted by the project construction of the project. The plan shall address native forest and wetland protection measures, including:~~

~~a. Vegetation clearance protocols to protect surrounding habitat and to avoid intrusion of construction works beyond the construction area, such as the physical delineation/protection of areas and individual significant or high value large trees that are close to but outside the project footprint, directional felling of vegetation away from areas which are to be retained and protected, or sediment controls around wetlands;~~
~~b. Timing of removal of indigenous vegetation (of contiguous areas more than 10 m²) to avoid the bird breeding season (September – December inclusive) to the extent practicable;~~
~~c. Proposed measures to stockpile and manage cleared vegetation to avoid or minimise potential adverse effects (e.g. lizards not detected during salvaging or from wood leachate);~~
~~d. Procedures for moving felled logs with a DBH (diameter at breast height) of 60 cm or greater into areas proposed for revegetation. 12 m² of felled logs shall be moved into each hectare of revegetation planting; and~~
~~e. Consideration of bat roosts as required by Condition 84.~~

Biosecurity Kauri Dieback

Where works occur All vegetation, soil, and other material from within a “kauri contamination zone” (defined as 3 x the radius of the canopy dripline of any kauri tree), all vegetation, soil, and other material from that zone must remain on site within the zone or be disposed of within the landfill.

All footwear, clothing, tools, vehicles and equipment used on site within a kauri contamination zone must be cleaned of all soil, vegetation, or other material that has, or may have, come from a “kauri contamination zone” must be thoroughly washed with Sterigene (or other suitable agent) on entry and exit from the site, on every occasion, to avoid the spread of kauri dieback (*Phytophthora agathidicida*).

At least 40 working days prior to the construction commencement date, the consent holder shall submit a Kauri Dieback Management Plan (KDMP) to the Council for certification. The purpose of the KDMP shall be to set out the protocols and monitoring to be used for the works to form the access road to Stockpile 1 and the Clay borrow area, to avoid and minimise the risks of introducing or spreading kauri dieback disease. The KDMP shall be prepared by a suitably qualified expert in biosecurity, plant pathology or similar and shall be prepared in accordance with the Draft KDMP. The KDMP will as a minimum stipulate:

a. How Kauri Contamination Zones (KCZs) in proximity to the stockpile access road will be protected from access, identified and signposted to clearly communicate the delineation and protocols required in relation to the KCZ.
b. The kauri dieback hygiene protocols to be followed by any staff or visitors entering a KCZ.
c. The tree protection protocols to be followed in order to minimise damage or stress to kauri in proximity to the stockpile access road or with rootzones extending into the access road works area.
d. Measures to minimise the need for works within the KCZ, and how works within KCZs will be carried out in a manner that minimises the impact on the kauri and the risk of introducing or spreading P. agathidicida within or between KCZs.

e. Identification of the suitably qualified person who will supervise works within KCZs.
f. Methods used to remove all soil from and decontaminate vehicles, equipment, personnel, footwear etc when entering and exiting KCZs, and how run-off from this activity will be contained and disposed of in a manner that poses minimal risk of spreading P. agathidicida.
g. How drainage, run-off, or other water discharges from the access road will be directed away from kauri and their rootzones.
h. How material from within KCZs will be transported to approved landfill facilities with minimal risk of material loss en route.
i. The KDMP should be reviewed and updated to reflect the most up-to-date best practice for the prevention and treatment of kauri dieback, to ensure that when works commence, the most appropriate controls are in place to manage the spread of kauri dieback disease.

For the avoidance of doubt, the KDMP can be prepared as a standalone plan or as part of the CEMP required by Condition XX above.

Hours of operation
99 Except as otherwise provided for the Landfill Management Plan, the hours of operation shall be:
a. 5.00am to 10.00pm for the working face on all days. Operation of the working face includes all tipping operations and daily opening and closing works that involve the use of landfill machinery, including machinery used to remove or place daily cover, but does not include the bin exchange area.
b. 24 hours a day, 7 days a week for the bin exchange area.
c. 7.00am to 8.00pm Monday to Saturday for stockpiles and borrow areas outside of the landfill valley, with the exception of Stockpile 1 and the clay borrow area, where between September to December works are to occur from one hour after sunrise to one hour before sunset Monday to Saturday. Outside of these months, the hours of operation will be 7.00am to 8.00pm Monday to Saturday.
d. 6.00am to 8.00pm Monday to Sunday for seasonal construction, and up until 10pm during summer for placement of GCL and HDPE liner.
e. 24 hours a day, 7 days a week for maintenance of plant and machinery.

Operational noise

[new line]
<u>During the peak bittern breeding season (September to December inclusive) works associated with construction and operational activities in the Western block (i.e., stockpile 1 and the clay borrow pit) will:</u>

a. <u>Begin at least one hour after sunrise; and</u>
b. <u>Cease at least one hour prior to sunset to avoid peak booming times</u>

Lighting

Prior to any permanent exterior lighting being established within the WMNZ landholding, the consent holder shall provide a finalised lighting design to the satisfaction of Auckland Council in sufficient detail that demonstrates that:
a. The proposed lighting meets the relevant permitted standards in Chapter E24 of the Auckland Unitary Plan.
b. Except in the bin exchange area, all permanent elevated lighting (mounted above ground) is downward facing, with zero upward tilt, emits zero direct upward light and is not located on the ridgelines (unless there is no practicable alternative or it is required for safety reasons), and will have lighting shields (where appropriate)
c. <u>That a suitably qualified bat ecologist has been consulted on the design and its implications for bats</u>

<u>Covenant Ecological Management Plan</u>

<u>A Covenant Ecological Management Plan (CovEMP) shall be prepared and provided to the Council for certification at least three months prior to the construction commencement date. The objectives of the CovEMP is to meet the conditions of this consent, to describe indigenous forest, wetland and wetland margin/buffer maintenance and protection. The focus of the CovEMP is the ongoing enhancement of wetland, buffers and</u>

indigenous forest areas. The CovEMP shall be consistent with and complementary to the Ecological ~~Enhancement~~ Pest Animal Management Plan required by condition XX.

The plan shall include:

a. Protection through covenant of all remaining native terrestrial vegetation within WMNZ landholdings
b. Ongoing maintenance measures to be undertaken that include:
    - Pest plant management
    - Infill planting requirements

c. Ongoing monitoring requirements which include:
    - Change in hydrological integrity
    - Change in physicochemical parameters
    - Change in ecosystem intactness
    - Change in browsing, predation and harvesting regimes
    - Change in the dominance of native plants
    - Fauna monitoring

Ecological and Landscape Enhancement and Restoration Plan

An Ecological and Landscape Enhancement and Restoration Plan (ELERP) shall be prepared and provided to Council for certification at least three months prior to the construction commencement date. The objectives of the ELERP is to meet the conditions of this consent, to describe forest, wetland, and riparian and wetland margin revegetation. The focus of the ELERP is the replacement/replanting of plant species that have been affected by the project and the optimisation of ecological benefits through improving ecological connectivity between habitat types and protecting significant habitat types through buffer/margin plantings. The ELERP shall be consistent with and complementary to the Ecological ~~Enhancement~~ Pest Animal Management Plan required by condition ~~187~~ XX~~.~~

The planting areas shall be in general accordance with those shown in the Ecological Values and Effects Report by Tonkin + Taylor, date May 2019:

a Enhancement and/or protection of 14 km of stream within or as close as practicable to the WMNZ landholdings.

b Planting and protection through covenant of 9.9 ha of native terrestrial vegetation within WMNZ landholdings.

c ~~Long term~~ [specific term] pest control on WMNZ landholdings and Sunnybrook Reserve.

d Protection of ~~111.9 ha~~ all remaining native forest areas within WMNZ landholdings by covenant.

e Planting and protection of 4.63 ha of degraded wetlands within the Western Block that are not affected by the project by covenant

f Planting of wetland buffers of 10 m or 5 m around SEA and non-SEA wetlands within the Western Block, approximately 15.18 ha.

g Protection of all ~~native~~ remaining wetland habitats and associated buffer plantings by covenant, approximately 25.59 ha.

In addition to the above, the planting shall be based on the conceptual layouts of the Mitigation Plans depicted in Appendix 3 of the Boffa Miskell Ltd document entitled “Landscape and Visual Assessment, May 2019” and the ecological management plans outlined in XXXX

Advice Note: Consideration of the conceptual layouts of the Mitigation Plans depicted in Appendix 3 of the Boffa Miskell Ltd document entitled “Landscape and Visual Assessment, May 2019” is to be for the purpose of improving outcomes through coordinated and contiguous enhancements. However,

ecological mitigation and offset shall clearly demonstrate that the actions are additional to those required for landscape mitigation purposes.

The details of this plan shall include:

a Confirmation of the areal extent and spatial configuration of plantings proposed.

b Description of the objectives of the mitigation, offset and compensation planting / landscape treatment, including the ~~mitigation~~ intent of each of the planting areas and how this will be fulfilled over time as the plants develop and age, including details of how the anticipated outcomes used in the SEV calculations and Biodiversity Offset Accounting Model (where relevant) will be achieved;

c Identification of areas of existing vegetation to remain or be removed and the methodology for managing, and supplementing this vegetation where necessary in a timely manner to maintain the ~~mitigation~~ objectives;

d Site preparation ~~(if required),~~ e.g. fencing, weed or animal pest management and habitat enhancement (e.g. deployment of felled logs in revegetation sites).

e Timing of plantings.

f Schedules of planting, including plant species composition, plant sizes, plant densities, measures of stock condition (e.g. health of plant stock) the use of growth enhancement measures where required (e.g. fertiliser tablets or stock guards). ~~Where available, p~~Plants will be eco-sourced native species from the ~~same~~ Rodney ecological district. Planting plans for stream riparian margins and wetland areas shall be in accordance with the Auckland Regional Council Riparian Zone Management Strategy for the Auckland Region, Technical Publication 148, June 2001 (TP148) and Appendix 16 of the Auckland Unitary Plan 'Guideline for native revegetation plantings'.

g Plant maintenance methods for ensuring successful establishment and long-term persistence of plantings, including the duration of maintenance for a period of at least the duration of the landfill operation, methods for ongoing control of weed or animal pests and infill planting.

h Monitoring and reporting requirements, including at a minimum annual reporting to Council for a period of no less than 5 years or until canopy closure is achieved.

i Covenanting/encumbrance details.

j. A site-specific assessment of the risk of stream bank erosion and the likely successful establishment of proposed riparian planting where relevant.

Should the actual area of habitat impacted by the project be reduced through detailed design, the consent holder shall have the ability to demonstrate, using best practice transparent and quantified accounting methods ~~through use of a mitigation/compensation model~~ prepared by a suitably qualified ecologist, that the required area of ecological restoration has been reduced. This is subject to the consent holder providing sufficient evidence of the actual area of clearance and demonstrating to Auckland Council that the area of clearance is less than the consented area. The consent holder shall then submit an updated EERP based on the revised restoration planting area.

All plantings from the Myrtaceae family of species shall be sourced from a nursery that is a signatory to Myrtle Rust Nursery Management Declaration V6, 11 October 2017 that certifies that the plant producer has implemented the New Zealand Plant Producers Incorporated Myrtle Rust Nursery Management Protocol (Myrtle Rust Nursery Management Protocol – V6, 11 October 2017) or the latest version available at the time of planting.

All restoration planting described in the ELERP shall be completed within one (1) year of Initial Site Construction Works being completed ~~three years of the initial construction and enabling works being completed.~~ Written confirmation shall be provided to the Auckland Council within 30 days of the works being completed confirming that all planting and habitat enhancement works have been completed in accordance with the ELERP.

A monitoring and maintenance plan for the duration of the landfill operation shall be developed and implemented to ensure plant densities and 90% survival rate are maintained.

Monitoring shall be undertaken at times that avoid transient conditions, such as flood events. ~~In relation to wetlands,~~ ~~monitoring shall include site photographs to demonstrate that a compliment of facultative wetland species at a density and a~~ planting survival rate of at least 90% that is in accordance with the ~~ELERP referenced in condition XX~~X. All plantings including the wetland areas are to be subject to ongoing monitoring for the duration of the landfill activity (including closure). The consent holder shall provide photographs that demonstrate a minimum 90% survival rate of all planted and restoration areas Any plants that die should be replaced the following planting season. ~~The findings of the monitoring shall be reported to Auckland Council on a two-yearly basis.~~ The findings of the monitoring shall be reported to Auckland Council annually for the first five years after implementation of the planting, then two-yearly after that for the lifetime of the landfill activities.

Ecological ~~Enhancement~~ Pest Animal Management Plan

Advice note: These conditions refer to the pest management programme being offered as compensation for the adverse effects of the project on ecological values. Separate conditions are proposed (Conditions 185-186) to address predators and vermin within the landfill operational areas.

236 An Ecological ~~Enhancement~~ Pest Animal Management Plan (E~~E~~PAMP) shall be prepared by a suitably qualified ~~and experienced~~ ecologist. The EEMP shall be prepared and submitted to Auckland Council for certification three months prior to the construction commencement date. The purpose of the ~~EEPMP~~ EPAMP is to improve the ecological integrity of forest, wetland and riparian ecosystems within areas subject to pest animal control, including the protection and recovery of bats, lizards, Hochstetter's frogs, invertebrates and native forest and wetland plants). The objective of the ~~EEPMP~~EPAMP is to achieve:

a. A long-term reduction in rats, possums, feral cats and mustelids densities

b. A long-term reduction in feral goats and pig densities and

c. the exclusion of farm stock within habitat for native fauna and areas of native vegetation within the WMNZ landholding and the Sunnybrook Reserve.

237 The ~~EEPMP~~ EPAMP shall specify:

a Target pest species and target thresholds to be aimed for to achieve the objectives of the EPAMP ~~EEPMP~~;

b Methods to achieve target species outcomes, with a preference for physical controls over chemical wherever practicable. Methods may include descriptions of spatial configuration of bait lines and baiting and/or trapping details including types of baits/traps and frequency of baiting; and

c A description of monitoring/auditing proposed in accordance with standard accepted practice.

238 Pest control shall commence one month prior to construction works commencing. Pest control shall be undertaken in accordance with the ~~EEPMP~~ EPAMP for a period of 35 years within appropriate and accessible areas in Sunnybrook and WMNZ landholding. The areal extent of pest control operations within Sunnybrook Reserve is to be confirmed following consultation with the Department of Conservation, and may vary over the life of the consent.

239 The scope and frequency of the ecological pest control shall be reviewed by the consent holder at 5 year intervals. Should a change to the scope or frequency be considered appropriate, a report on the effectiveness of the existing pest control programme shall be provided to Auckland Council, along with a description of the proposed changes and an explanation of how the new proposal will achieve the objectives of condition 187.

Kind regards,

Simon Chapman

Principal Ecologist, Ecology New Zealand

HARRISON GRIERSON

17 September 2020

Auckland Council
Level 1, 35 Graham Street
Auckland Central
AUCKLAND 1010

Attention: Warwick Pascoe
warwick.pascoe@aucklandcouncil.govt.nz

Dear Warwick,

WASTE MANAGEMENT NZ LTD – PROPOSED AUCKLAND REGIONAL LANDFILL
APPLICATION NO: BUN60339589
HG REF: 1040-145261-03

Harrison Grierson Consultants Ltd (HG) has been commissioned by Auckland Council (Council) to undertake a peer review of the transport related issues of the Auckland Regional Landfill (ARL) proposed by Waste Management New Zealand Limited (WMNZ).The proposed landfill is located at Wayby Valley, between Warkworth and Wellsford.

The application seeks resource consent for a non-complying activity. The purpose of this memo is to assess the proposal against the requirements specified in the Auckland Unitary Plan Operative in Part (AUP (OP)) and to assess the public submissions against the information provided by the applicant.

All Section 92 Queries have been sufficiently addressed, as per our memo dated 6th March 2020, attached for reference

1.0 INFORMATION PROVIDED

I, Gary, Black, have undertaken a review of the resource consent application on behalf of Auckland Council in relation to transportation effects.

I am a Chartered Professional Engineer with Engineering New Zealand and hold a Bachelor of Engineering degree with Honours in Civil Engineering. I have 30 years' experience in traffic and transportation engineering. This includes providing traffic engineering advice to Auckland Council on the proposed Warkworth to Wellsford Projects and for large commercial and residential sub-divisions for private developer clients.

I confirm I have visited the Redvale Landfill site to observe traffic flows into and out of the site. I have also visited the Dome Valley site to observe existing traffic flows on the State Highway and view the location of the proposed roundabout.

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I would also like to disclose my previous involvement with the project as a geometric design engineer working for TDG (Now Stantec) in 2018. I prepared several design options for a potential access into the Dome Valley site. I also prepared the initial roundabout design presented in the application. My employment with TDG (Now Stantec) ended in November 2018 and the roundabout design has been subsequently developed further by the Applicant's design team and has been reviewed by New Zealand Transport Agency (NZTA).

My review is based on the following documents:

- '*Integrated Transport Assessment*' ('ITA') dated 22 May 2019 prepared by Stantec.
- '*Section 92 Response*' ('S92 Response #1') dated 8th November 2019 prepared by Tonkin and Taylor, including Appendix E – Traffic.
- '*Clause 23(2) RMA Further Information*' dated 24th December 2019 prepared by Auckland Council.
- '*Clause 23 Response*' dated 3rd February 2020 prepared by Tonkin and Taylor, including Appendix B – Traffic.
- '*Section 92 Response – Tranche 5*' dated 20th February 2020 prepared by Tonkin and Taylor, including Appendix E – Traffic.
- '*Public Submissions*' dated July 13th, August 20th and September 2nd 2020 collated by Auckland Council.
- '*Assessment of Environmental Effects*' ('AEE') dated July 2019 prepared by Tonkin and Taylor.

2.0 THE PROPOSAL

The ARL project proposes the establishment and operation of a regional landfill at a site in Wayby Valley approximately 13km north of Warkworth and 6km south of Wellsford. The ARL will be served by a new 2km long access road connecting the landfill area via a new roundabout-controlled access with State Highway 1 (SH1). A bin exchange area will be situated adjacent to the access road and SH1 roundabout.

The general form of the landfill area and the proposed roundabout-controlled access point with SH1 is shown in Figure 1 below.

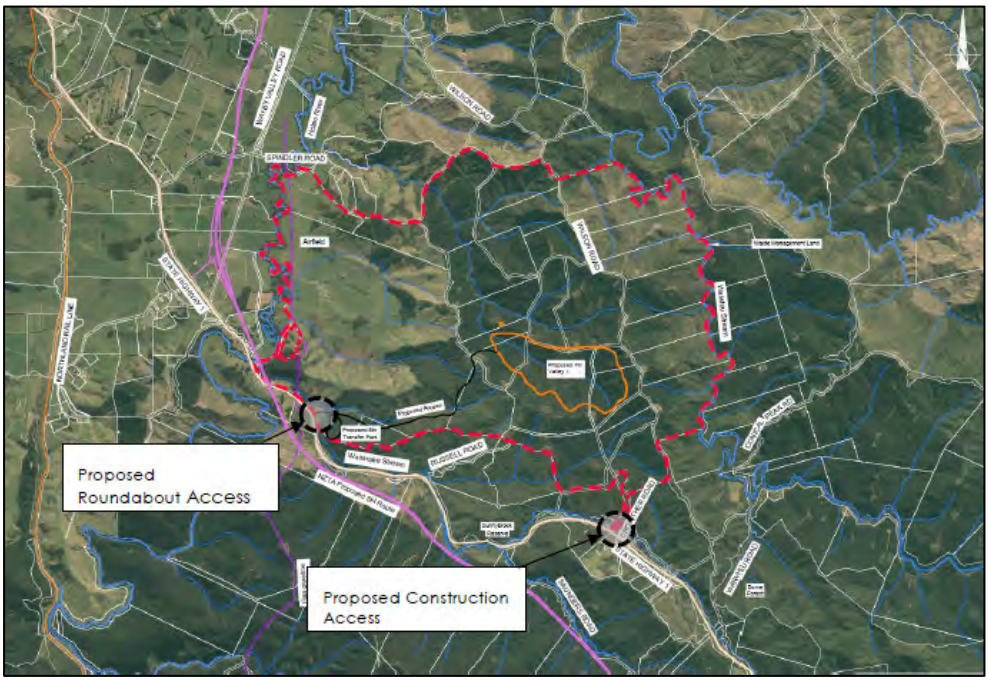

FIGURE 1. AERIAL PHOTO OF PROPOSED ARL SITE

The ARL is anticipated to start construction within the next five years assuming resource consent is approved, with operation expected in 2028.

The highway safety improvements proposed by NZTA along SH1 through Dome Valley have been considered in the design of the access. These improvements are planned to be completed by 2022.

The Puhoi to Warkworth (P2Wk) motorway extension project has also been considered in the resource consent application. Following the completion of the P2Wk project (in late 2021), congestion issues frequent in Warkworth will be mitigated as the through-traffic movements along SH1 are carried by the P2WW extension to the west of Warkworth.

A possible extension of the P2WW project between Warkworth and Wellsford motorway (WW2W) has been considered but due to its early stage of investigation has not formed part of the baseline transport environment used for evaluating the ARL project.

2.1 RESOURCE MANAGEMENT ACT 1991 - CLAUSE 23

Following consultation with Council specialists, it was established that there is a level of overlap between this resource consent application and the private plan change request Waste Management NZ Limited (WMNZ) submitted to Auckland Council.

A clause 23, further information request in respect of the private plan change request was sent to WMNZ on 30 September 2019, which included several traffic related queries. In response to this request, WMNZ has stated that the traffic matters raised would be considered as part of this resource consent application.

3.0 NEW ZEALAND TRANSPORT AGENCY (NZTA) CONSULTATION

Consultation through the preliminary stages of the ARL project has been held with NZTA with emphasis on how to achieve suitable site access off SH1 while also integrating access with the proposed safety improvements on SH1 through Dome Valley. More detail regarding the relationship between the existing SH1 operations and the proposed roundabout access is provided in Section 4.0 of the ITA.

An independent Road Safety Audit (RSA) was undertaken by Traffic Planning Consultants (TPC) for the preliminary design for a roundabout on SH1 at Dome Valley which will facilitate access to a new landfill site.

It was concluded in the RSA that a roundabout is an appropriate intersection form to cater for safe access to/from the proposed landfill site. The location is also considered appropriate to be able to achieve a safe design.

However, safety concerns with recommendations were noted and these are detailed in Appendix A of the ITA.

4.0 OPERATIONAL EFFECTS

4.1 BASELINE TRAFFIC DATA

The baseline traffic volumes used in the ITA (Section 2.1.7) have been used to inform the future baseline SH1 traffic demand and the impact of the additional vehicle trips associated with the ARL. I consider that this is appropriate and acceptable.

4.2 TRIP GENERATION

I have reviewed the trip generation rates in the ITA and the proposed ARL trips are broken down into waste and non-waste related trips. Non-waste vehicles comprise of staff, fuel and oil deliveries, leachate cartage, light deliveries, servicing and maintenance vehicles, and visitors. It is stated in the ITA that:

- *In 2028, it is estimated that there will be a peak of 520 waste truck movements per day (inclusive of inbound and outbound directions of travel) spread over any 24- hour period, and a peak intensity of 110 waste truck movements during the assessed peak hour periods.*
- *In 2028, it is estimated that there will be a peak of 220 non-waste movements per day, and a peak intensity of 25 non-waste vehicle movements during the busiest hour of the peak 4-hour periods around work shift changes.*

I consider the trip rates appear to be appropriate and I would assume these are based on operational data provided by the applicant. However, the source of the trip rates has not been provided with the ITA.

The ITA states the following:

> *'Notably, the non-waste vehicles numbers will reduce to two-thirds of these numbers in winter when construction works have ceased and will reduce further when leachate cartage is replaced by on-site treatment.*

For the purposes of a robust analysis, the peak intensity of waste truck movements with the peak intensity of non-waste traffic (which in reality will not coincide), have been adopted as a co-incident peak period of activity. This is considered to a provide a conservative over-estimate of expected traffic movements and hence worst-case assessment of traffic effects at the proposed access road roundabout.

The traffic generated by the site is only expected to represent approximately 3% of the traffic on SH1 in the morning peak hour and 1% in the evening peak hour.

In 2060, it is estimated that these truck numbers will be factored up by 56% to reflect a 1.4% growth per annum in waste for the period 2028 – 2060 (to a total of 811 waste truck movements per day).'

It is noted that the logging activity is excluded from these volumes. This is because logging related vehicle trips are assumed to already be accounted for on the road network. However, it is noted in the ITA that the exit point onto SH1 for approximately 1000 ha of the Mahurangi Forest harvest will be shifted to the landfill's access road. The relevant next harvest is due in 2030-2034. During the harvest commencing 2030, it is estimated that there will be a peak of 43 logging-related movements per day, and a peak intensity of 20 logging-related return trips over any 4-hour period.

Notably, logging trucks comprise less than half these numbers, the remainder being crew and service vehicles.

I consider the trips associated with the logging activities can be ignored as they are already permitted, and there will be no adverse effect on the proposed roundabout providing access to the site.

4.3 PEAK HOUR TRAFFIC MOVEMENTS

Figure 2 below, extracted from the Stantec ITA, summarises the number of vehicle movements expected to be generated in the peak hours and during the day.

Vehicle Type	AM Peak		PM Peak		Daily	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
Waste Trucks	15	15	15	15	260	260
Non-Waste Vehicles	21	4	4	21	110	110
Total	36	19	19	36	370	370
	55		**55**		**740**	

FIGURE 2. PEAK HOUR VEHICLE MOVEMENTS (EXCLUDING LOGGING)

In the peak hour, all waste trucks are considered to arrive from and depart to the south. For non-waste vehicles, 90% are considered to originate from the south and 10% from the north. This accounts for the fact that some workers may live in the Wellsford area which is the closest urban area to the site access.

I consider the peak hour landfill trips of 55 trips in each of the AM and PM peaks to be appropriate. These equate to 7.5% of daily traffic trips associated with the landfill.

4.4 SIDRA MODELLING

The ITA includes SIDRA modelling for the proposed SH1 roundabout intersection providing access to the ARL site at different stages of ARL operation; 2026 opening, 2028 full operation, and 2060 maximum waste received. For all scenarios, the proposed intersection is anticipated to operate at a level of service (LOS) of A, which indicates free flowing traffic with modest average delays.

It is noted in the ITA that:

> *'Modelling data shows that some queues of slow moving or stationary vehicles are generated on the through movements along the SH1 approaches to the roundabout. Where a notable queue is likely to form northbound on SH1 in both evening peaks of the future years , this can be attributed to the high passing traffic demands on SH1 and the need for these approach movements to Give Way to traffic circulating from the Landfill Access Road . However, vehicles do not experience significant delays (generally average delays in this possible future scenario year are less than only around 6-7 sec/veh for the through movements on SH1) and the queues that form are expected to dissipate quickly (as evidenced by the modest delays predicted by the modelling).'*

This is referring to 95% queue lengths of up to 88.0m and 183.1m predicted on the southern approach to the intersection in 2026 and 2060 respectively. Such queues however correlate to 6-7 second average delay times for through movements in both scenarios.

The ITA states that '*overall, it is considered that the roundabout is readily able to accommodate the traffic volumes generated by the proposed facility and will continue to perform well as background traffic volumes on SH1 increase.*'

I agree with this statement. A LOS of A generally provides free flowing movement of traffic through the roundabout and at a safer speed for all road users.

As stated earlier, longer-term logging activity could generate approximately 14 logging trucks (28 movements) per day during the harvesting cycle. In any particular peak hour during the harvesting period, it is anticipated that a maximum of up to four logging truck movements would be generated through the proposed roundabout.

Considering the LOS of the proposed roundabout intersection discussed above, it is stated in the ITA that, '*the addition of up to an additional four logging truck movements per hour could be readily accommodated without any noticeable adverse effect.*

The level of additional logging truck movement would represent less than 5% additional traffic movements to and from the Landfill Access Road, and as such have less than minor effect on the predicted performances presented above".

Again, I agree with this statement.

4.5 ROAD SAFETY

The ITA details a search of NZTA's Crash Analysis System for all reported crashes for the full five-year period from 2014 to 2018 including all available results from 2018. The search area covered the length of SH1 from Wayby Valley Road in the north to Goatley Road in the south (representing the northern extent of the Warkworth urban area), a distance of approximately 12km. The ITA concludes:

'Between 2014 and 2018, a total of 82 crashes occurred within the study area, of which two resulted in fatalities, 12 resulted in serious injuries, 18 resulted in minor injuries and the remaining only resulted in damage to property. Of all crashes that were reported, 53% were head-on or where the driver lost control, 19% during overtaking, and another 16% during crossing/turning. Poor observation, poor handling and failure to keep left were the three most prevalent contributing factors.'

'While this stretch of road has a notable number of crashes, NZTA and its safety alliance partners are currently undertaking works to specifically address the safety of this section of road and are expected to be completed by 2021. These works include flexible median safety barriers, wider road shoulders, new right turn bays and replacing north and southbound passing lanes with slow vehicle bays.'

The impact of the additional heavy vehicle traffic volumes on the road safety along SH1 south of the proposed ARL site was queried during the Section 92 process. This concern related to the high proportion of head-on, overtaking and turning crashes that had occurred on SH1 along this section and that more heavy vehicle movements may exacerbate this trend. The applicant provided the following response:

'It is noted that this section of SH1 already carries a high heavy vehicle proportion, both during the weekday and on the weekend, with heavy vehicle proportions varying between 8% to 15% in 2019. As discussed previously, the ARL activity is expected to increase heavy vehicle volumes by 12% to 13% in the ARL 2028 operational year, taking the proportion of heavy traffic within the weekend peak four-hour periods to 11% of the total peak traffic volume (i.e. an increase in total heavy vehicles of approximately 1%). It is acknowledged that the increase in heavy vehicles will have some impact on traffic flows and speeds, however, the provision of various passing and slow lanes as currently exist (in part) and as being upgraded within the current NZTA safety improvements through the Dome Valley, will assist in the mitigation of any negative effects additional vehicles may have compared to the existing environment. It is also noted that the projected volumes and proportions of heavy traffic carried along the highway while giving rise to additional traffic flows along the highway are not greatly inconsistent with other periods of heavy traffic movements at other time of the week.'

'The NZTA Dome Valley Safety improvements being undertaken within the Safer Networks Programme will enhance the consistency of lower travel speed expectations and enhance the safety of any overtaking manoeuvres being undertaken'.

'Work involves installing flexible median safety barriers and replacing the northbound and southbound passing lanes at the top of the Dome Valley with a wider shoulder, allowing slow vehicles space to pull over. These improvements are expected to be completed well in advance of the construction of the ARL access roundabout and other works for the ARL project, and are expected to positively address the high proportion of overtaking crashes and provide a more consistent speed environment. It is noted

that all works on SH1 including grades and geometry will be subject to the express approval of NZTA and accordingly, these design matters will be addressed during the consent application.'

The NZTA website includes the following detail on the project:

'The planned safety improvements on SH1 through the Dome Valley include widening the centre line and road side shoulders, adding right hand turn bays and installing flexible road safety barriers.

The project started in early-2019 and is expected to be completed in late-2021. The work is split into five stages along the 15km section of SH1 from Wellsford to north of Warkworth, with two stages currently under construction and due to be completed later this year.

This project is being delivered as part of the Safe Network Programme, a collaborative, prioritised programme of proven safety interventions on high risk routes across New Zealand'[1]

I consider that the proposed additional heavy vehicle trips to and from the subject site along SH1 through Dome Valley, will not exacerbate the existing road safety issues along this section. The heavy vehicle trip generation will be largely mitigated by the ongoing safety improvements to SH1 Dome Valley by NZTA. The impact of the additional heavy vehicle trips on road safety is considered to be not significant. Further assessment of the trip generation is provided in section 4.2 of this report.

It was also queried during the Section 92 process, whether the impact of additional truck traffic to and from the north, would have an effect on the safety of traffic on SH1 through Wellsford, particularly, during peak holiday periods.

It is stated in the S92 Response that:

'Any waste truck movements during the day to and from the north are expected to be modest and would generally be similar to those volumes currently accessing the Redvale Landfill from north of Wellsford and passing along the existing SH1 through Wellsford.'

*'Waste Management NZ(**"WM"**) advises that the waste volumes likely to be generated from the rural areas between Whangarei and ARL would be very low due to the small population and limited levels of activity, and that even if some of this waste was to be transported south via Wellsford to ARL for disposal, the traffic volumes would be insignificant (likely to be no more than two waste truck loads per day).'*

Additional truck movements north of the ARL site through Wellsford are negligible and I therefore consider that they would not exacerbate existing road safety issues.

5.0 CONSTRUCTION EFFECTS

From a transportation assessment perspective, the key aspects of the construction programme over the first four years of construction (expected to

[1] https://www.nzta.govt.nz/projects/sh1-dome-valley/

occur during the summer construction seasons between 2022/23 and 2025/26) include:

- Crowther Road Upgrade
- Ponds and Stock Pile Preparation
- Forestry
- Bridge over Waiteraire Stream
- Roundabout
- Landfill Access Road
- Landfill bulk earthworks and lining
- Fuel for construction machinery
- Staff Movement

In the ITA, the traffic movements associated with the construction/site establishment phase, (excluding the roundabout construction) have been estimated and are shown in Figure 3. These movements are planned to occur at the SH1 / Crowther Road (Forestry Road on Google) intersection.

Year	Daily Return Trips	Daily Movements	Peak Hour Movements
Forestry	14	28	5
Ponds and Stockpile Construction	10	20	4
Bridge over Waiteraire Stream	10	20	4
Fuel	2	4	1
TOTAL	**36**	**72**	**14**

FIGURE 3. CONSTRUCTION PHASE HEAVY VEHICLE VOLUMES (STANTEC ITA)

It is stated in the ITA that:

> *'This therefore equates to a total of 72 heavy vehicle movements per day and 200 light vehicle movements per day visiting the site. During the busiest hour of the day there could be approximately 20% of the daily number of traffic movements representing approximately 14 movements per hour of heavy traffic and approximately 40 movements per hour of light traffic.'*
>
> *'It is considered that 90% of light and heavy vehicle trips generated during construction will originate from south of the ARL site as a result of the location of the primary activity areas in Auckland and the sources of many of the construction-related activities. As is typical for most construction related activities, the majority of vehicle trips are considered to be inbound during the morning peak and the majority of vehicle trips will be outbound in the evening peak.'*
>
> Overall, I agree with this assessment.

5.1 CROWTHER ROAD

Included in the ITA is the anticipated performance of the SH1/Crowther Road intersection during the construction phase, using the movement quantities provided in Figure 4.

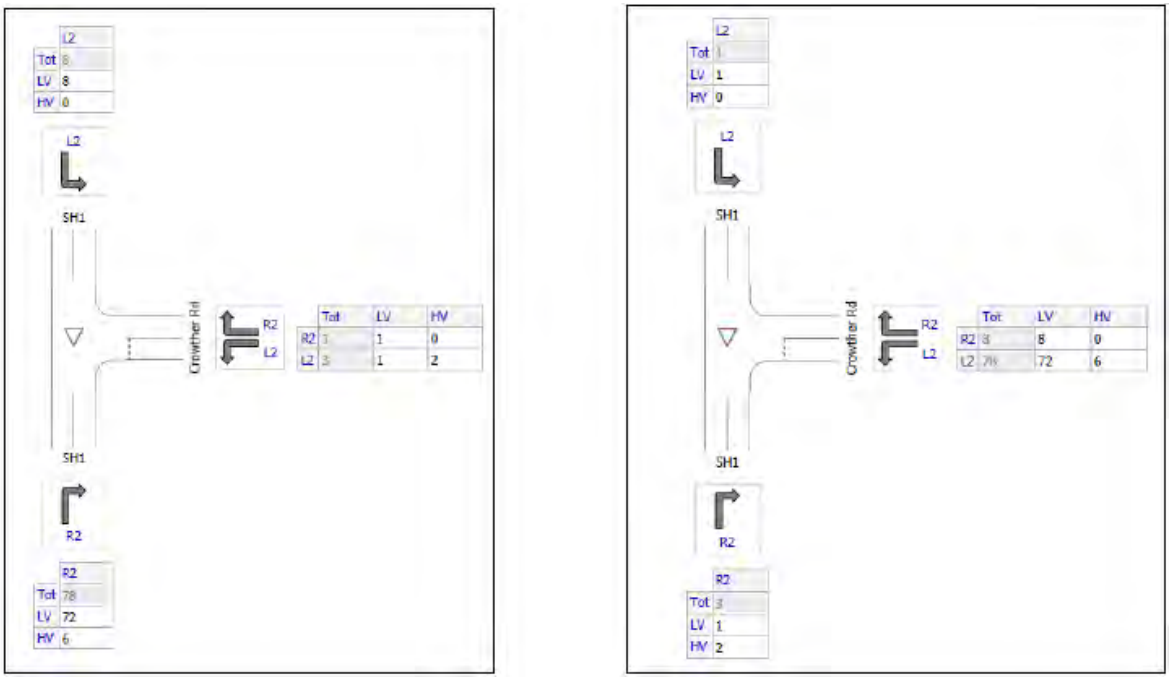

FIGURE 4. ESTIMATED MORNING (LEFT) AND EVENING (RIGHT) PEAK HOUR MOVEMENTS AT CROWTHER ROAD DURING CONSTRUCTION

SIDRA modelling using the above movement quantities, show little to no impact on through movements in each direction on SH1 (0-1.4 second average delay time). However, for vehicles looking to access Crowther Road from the southern approach on SH1, the average wait time is estimated to reach 20 seconds in the evening peak. Right-turn movements out of Crowther Road onto SH1 northbound have a LOS D, with an average wait time of 33 seconds in the evening peak hour.

As a result of the modelling, the ITA states that:

> *'The current layout of the Crowther Road access with SH1 is not proposed to change given that it will only be used for the short duration that the primary site access via Landfill Access Road is being constructed… there are no operational reasons to require an upgrade of this intersection. There is clear sight distance of over 200m on the northbound approach to the intersection which will allow drivers to react to a right turning vehicle within the carriageway. The NZTA safety improvements along SH1 are expected to be completed by 2021 in this area which will further improve the area's road safety. The widened centreline along with the existing wide sealed shoulder allows for a through moving vehicle to pass a vehicle waiting to turn right into the site.'*

It is also stated in the ITA that any right turning vehicles are not expected to be stationary for more than 10 seconds, however the evening peak indicates that

this wait time would be 20 seconds on average (despite only three movements estimated to occur during the evening peak from SH1 into Crowther Road).

It is concluded in the ITA that '*both the safety and efficiency of the access movements would be promoted as well as reflecting and respecting the overall objective for improvements in safety for the SH1 corridor in this location.*'

The safety of such movements at this location is considered to be appropriately managed through the proposed traffic management plan (TMP) as part of the CTMP, which will warn drivers of such potential movements with the option of lowering the posted speed for the subject section of road.

I agree that the efficiency of the road network will be negligibly impacted by the construction traffic accessing Crowther Road. However, I do have concerns around the safety of trucks slowing down from the operating speed along the corridor and if required stopping and waiting to turn right into Crowther Road on the State Highway. This could lead to obstructing through traffic on the State Highway potentially resulting in a rear-end type crash. This has been identified within the draft CTMP discussed below. I also note that the NZTA Dome Valley Safety Improvements allow for wide centreline type treatment, which may address this safety concern if heavy construction traffic can wait within this wide centreline without obstructing through traffic on State Highway 1.

5.2 CONSTRUCTION TRAFFIC MANAGEMENT PLAN (CTMP)

In the ITA it is recommended that prior to commencement of site establishment and construction activities that WMNZ prepare a CTMP to the satisfaction of NZTA. This would be a minimum requirement for NZTA to approve or endorse any development adjacent to the State Highway. Such a CTMP should (as a minimum) include details of:

- *Construction dates and hours of operation including any specific non-working hours for traffic congestion/noise etc;*
- *Nature and frequency of site establishment, forestry and construction traffic movement;*
- *Truck route diagrams between the ARL site and external road network;*
- *Specific measures to be taken when delivering special loads such as earth working machinery to avoid peak periods of activity along SH1 (for example, delivery of these items overnight or early in the morning);*
- *Temporary traffic management signage/details for vehicles and other road users, to manage the interaction of these road users with heavy construction traffic in a safe manner;*
- *Measures to avoid the interaction between site establishment, forestry and construction traffic with school bus attendance at the Forestry Road/Crowther Road location during school term time (make specific provision for major delivery of equipment and supplies to avoid the period between 8.00 and 8.30am, and between 3.15 and 4.00pm during school term time to minimise the risk to school students accessing and egressing these school buses at the Crowther Road location); and*
- *Details of site access/egress over the entire construction period and any limitations on truck movements.*

Stantec provided a draft CTMP dated August 2020 for comment and feedback. I have reviewed the draft CTMP and generally agree with the provisions within the document. I note the following works included within the draft CTMP:

- An upgrade to the existing intersection of SH1 and Crowther Road to include a formalised right turn bay on the State Highway.
- Upgrade of Crowther Road.

Further measures are also included within the draft CTMP to manage the effects of construction traffic, namely:

- The provision of a 'blackout' period for heavy construction traffic using the Crowther Road and its intersection with SH1 during the school pick up and drop of times, when trips would not occur.
- The provision of a 'blackout' period when heavy construction traffic trips would not occur, including during public holidays and the day before public holiday weekends.

I have reviewed these provisions and agree that these are required to manage the safety of construction related traffic at Crowther Road. I believe these can be addressed through the Construction Traffic Management Plan (CTMP) process.

I recommend the CTMP be submitted to Auckland Council (Team Leader Compliance & Monitoring – North) for approval prior to any works commencing and all construction traffic shall be managed in accordance with the approved CTMP.

6.0 SUBMISSIONS

The application was publicly notified on 26th March 2020, with the submissions period closing on 26 May 2020. Over 200 late submissions were also received.

Two Hundred and ninety (290) of the total received submissions raised traffic-related concerns. These concerns and our response to those concerns are provided in TABLE 1 below**.** Concerns raised in the submissions have also been addressed in more detail in Section 4.0 and 5.0 above.

The NZTA and Auckland Transport submissions are discussed separately in Section 6.1 below. NZTA and Auckland Transport also provided submissions to the proposed private plan change for the ARL on 26th May 2020. The matters raised by each organisation are addressed in our review of the plan change (separate to the resource consent review).

6.1 WAKA KOTAHI NEW ZEALAND TRANSPORT AGENCY (NZTA) SUBMISSION

NZTA provided a submission on the notified resource consent for the ARL on 26th May 2020.

Their submission states '*the Transport Agency …is satisfied that the effects on the transportation network have been appropriately addressed to date. The transport Agency requests that the proposed conditions relating to transportation are included in the consents.*'

I consider that there are no outstanding issues relating to the NZTA submission and consultation has been completed and closed out.

6.2 AUCKLAND TRANSPORT SUBMISSION

Auckland Transport provided a submission, dated 26 May 2020, on the notified resource consent and their submission states:

'Auckland Transport acknowledges the need for a new solid waste management and disposal facility to replace the Redvale Landfill once it reaches capacity. It supports the selection of a location proximate to SH1 so that heavy vehicles to not need to use local roads to access the landfill.'

AT submission also states:

'Auckland Transport has an interest in the legal roads which cross, but do not form part of, the applicant's landholding. The legal roads are unformed or partly formed.'; and,

'The applicant has discussed the road stopping process with Auckland Transport, but has not submitted an application to stop the roads. The road stopping is identified in the AEE as a consent or approval required.'

Auckland Transport provided Attached 1 to their submission giving the following feedback:

- Auckland Transport oppose in part *'landfilling in Valley 1 where legal roads are located'* and have requested *'a condition or advice note to any resource consent noting that road stopping needs to be completed and an unconditional agreement to purchase the legal road in place before any landfill operations, including earthwork operations, can commence in Valley 1.'*
- Auckland Transport oppose in part *'activities located outside Valley 1 which may affect legal roads crossing the WMNZ landholding'* and have requested *'Attach a condition or advice note to any resource consent granted noting landfill operations need to avoid occupying legal roads'*. Auckland Transport *'seek additional information from the applicant about the extent of activities outside Valley 1, but otherwise within the applicant's landholding, are expected to occupy or use legal road.'*
- Auckland Transport supports the proposed conditions of consent stating:
  - *'Adopt draft conditions 35 to 37* (Now 63, 64, 66 and 67) *relating to construction traffic'*
  - *'Adopt draft conditions 38 and 39* (Now 68) *relating to finalised SH1 intersection design, or similar conditions to like effect.'*
  - *'Adopt draft condition 65 which states there shall be no queuing of vehicles accessing the site out on to State Highway 1 at any time.'*
  - *'Adopt draft conditions 149, 151, 153 and 154* (Now 212, 213, 214, 215 and 216) *relating to Landfill Management Plan, or similar conditions to the like effect;.'*

I have reviewed the Auckland Transport request for *'landfilling in Valley 1'* and *'activities outside Valley 1'*. I consider that this could be addressed through an Advice Note. The paper roads are owned by Auckland Transport and the applicant would need to purchase this land prior to any landfill activities. This process would also enable the applicant to share information relating to

landfill operations outside Valley 1. Additionally, as the paper roads are not formed, I believe this to be a commercial arrangement between the applicant and Auckland Transport, rather than addressing any traffic related effects.

I consider that there are no outstanding issues relating to the NZTA submission and consultation has been completed and closed out.

HARRISON GRIERSON

TABLE 1. ASSESSMENT OF PUBLIC SUBMISSIONS

TRANSPORT THEME	SUMMARY OF SUBMISSIONS	ITA ASSESSMENT	MY OBSERVATIONS
Traffic Volume/Congestion	*The Wellsford and greater area experience large volumes of trucks such as quarry, logging and cattle trucks, and milk tankers every day which already cause major damage and congestion, and the addition of 300-500 rubbish trucks a day would cause major roading issues.* One submitted claimed that *the addition of about 600 heavy vehicle movements per day on ARL business would increase the heavy vehicle traffic on SH1 by over 40%.* Another submitter claimed that *Outside of peak times there would be one waste truck every four minutes travelling north up Dome Valley. Therefore, other road users would likely encounter a slow waste truck climbing up the Dome Valley incline at about 40 kph 50 % of the time.* *There is a short passing lane on the Dome Valley incline climb, which is 300 m long, i.e. only 20% of the total length of the climb. The topography of the area makes it impractical for that passing lane to be extended.* Overall, increased heavy vehicle traffic volume was a key concern for submitters, and the effect it would have on road safety, congestion and road wear and tear.	Trip generation is assessed in Section 4.2 of this report, based on information provided in the ITA and S92 Responses. It is outlined in the ITA, the ARL would generate 520 waste truck daily movements and 811 waste truck daily movements by 2060. As discussed in Section 4.5 of this report, additional truck movements north of the ARL site through Wellsford are comparatively insignificant compared to those coming from Auckland (south), equating to up to 2 truck movements a day, consistent with current volumes associated with Redvale Landfill.	The anticipated heavy vehicle movements associated with the ARL will increase the heavy vehicle movements on SH1 by approximately 40%. While this is a significant increase of heavy vehicles on SH1, the increase in vehicle movements consists of 3% and 1% in the morning and evening peak hours respectively which is considered an insignificant increase overall. My own calculation is 2.7% and 1.7% in the AM and PM increase associated with truck traffic. With the light and heavy landfill vehicles, I calculated the increase in traffic to be 5% and 3.1% in the AM and PM peak.

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TABLE 1. ASSESSMENT OF PUBLIC SUBMISSIONS

TRANSPORT THEME	SUMMARY OF SUBMISSIONS	ITA ASSESSMENT	MY OBSERVATIONS
			Furthermore, waste truck movements are to be scheduled to occur over 24 hours per day, with the landfill gates open between 05:00 and 22:00 Monday to Saturday and 07:00 to 17:00 Sunday to minimise peak traffic generation effects. Overall, I consider that the increase in trips associated with the landfill are acceptable as I calculated the increase in truck traffic is 2.7% and 1.7% in the AM and PM peak.
Road Safety	Many submitters highlighted the existing crash record on SH1 and the potential for increased heavy vehicle movements to exacerbate safety issues: • *The ITA reports 2 deaths and 12 serious injuries from SH1N crashes in the Dome Valley from 2014 to 2018. The NZTA DSI database reports 4 deaths and 19 serious injuries in the Dome Valley in the years 2016 to 2019. This suggests a*	Section 4.5 of this report discusses the road safety concerns and the responses provided by the client in the ITA and S92 Responses. Overall, it is concluded in the ITA that the NZTA safety improvements will improve	I agree with the conclusions made in the ITA and S92 Responses.

TABLE 1. ASSESSMENT OF PUBLIC SUBMISSIONS

TRANSPORT THEME	SUMMARY OF SUBMISSIONS	ITA ASSESSMENT	MY OBSERVATIONS
	deteriorating safety record for the Dome Valley section of SH1N. • *The frustration resulting from traffic delays on Dome Valley incline would likely cause an increase in dangerous manoeuvres. The short passing-lane section comprises 20% of the Dome Valley incline climb. Dangerous late-overtaking manoeuvres often occur at that passing lane merge point.* • *The proposals see an increase of 44% in the heavy vehicle traffic in the Dome Valley section of SH1 which already has serious safety implications. Refer the current NZTA safety improvements. Safety savings from these improvements is likely to be totally overwhelmed by the increase in heavy traffic.* Some submitters had particular concern with the SH1/Kaipara Flats Road/Goatley Road intersection: *The Stantec January 2020 response notes that the proposed activity is expected to increase heavy vehicle volumes by 12% to 13% in the 2028 operational year. The Goatley Road / Kaipara Flats Road / State Highway 1 intersection is already identified to have safety and functioning issues. The additional traffic arising from the proposed activity will have adverse effects on this intersection that will require avoidance and / or mitigation.*	road safety through the Dome Valley section of SH1, and that because the increase in heavy vehicle trips is insignificant, this will not exacerbate existing safety issues. The ITA nor S92 Responses address the SH1/Kaipara Flats Road/Goatley Road intersection.	
Alternative Transport Methods	Some submitters identified the lack of consideration for alternative transport methods for waste transport:	It is stated briefly in the ITA that *the North Auckland*	I agree that the use of alternative vehicles to

TABLE 1. ASSESSMENT OF PUBLIC SUBMISSIONS

TRANSPORT THEME	SUMMARY OF SUBMISSIONS	ITA ASSESSMENT	MY OBSERVATIONS
	• *Failure to consider the wider transport impacts means that the AEE also fails to adequately assess alternative transport modes and mitigations, as required by the guidelines. There is very little discussion or assessment of alternative transport options.* Submitter ID9826 submission includes a range of alternative transport considerations, with particular detail on 'Waste-by-Rail'.	*Railway Line is located approximately 2.5km west of the site and west of SH1.*	transport waste has not been considered in detail. In my opinion the use of electric vehicles for the movement of waste to the site is not yet technically feasible, however it may be viable at the opening of the landfill in 2028. However, rail may offer an opportunity for alternative modes to transfer waste, considering the main railway line passes close to State Highway 1 to the south of Wellsford, approximately 2.5km west of the site.
Road Maintenance	*Damage to the road surface caused by the increased truck traffic would necessitate more frequent road maintenance. Roadworks in that complex terrain* [Dome Valley] *would be difficult and would cause major delays to traffic.*	It is assumed in the ITA that the road safety upgrades undertaken by NZTA through Dome Valley will suffice for the operational life of the landfill.	NZTA are responsible for maintaining their roads and therefore would undertake any maintenance deemed necessary. Additionally, as heavy commercial vehicles pay additional road user

TABLE 1. ASSESSMENT OF PUBLIC SUBMISSIONS

TRANSPORT THEME	SUMMARY OF SUBMISSIONS	ITA ASSESSMENT	MY OBSERVATIONS
			charges, the cost of additional road maintenance could be offset by the road user charges.
Traffic Modelling	One submitter recommended more comprehensive modelling is undertaken to properly understand the effects on SH1: *modelling using sophisticated and generally accepted rural midblock traffic modelling software, such as TRARR, must be completed before the effects on SH1N… Appendix C of the ITA says, "The typically accepted capacity of a single traffic lane is…15,000 - 20,000 vpd (vehicles per day)." This is not based on a comprehensive analysis that includes the effects of truck numbers, gradients and the inadequate passing opportunities that are a particular feature of SH1N through the Dome Valley.* *NZTA data also reports 9.5% heavy vehicles in that traffic flow, i.e. 1,425 heavy vehicles per day in 2018. The addition of about 600 heavy vehicle movements per day on ARL business would increase the heavy vehicle traffic on SH1 by over 40%.*	The ITA includes SIDRA modelling only for the proposed roundabout access on SH1 for operational use and at the Crowther Road (Forestry Road) intersection with SH1 for the construction period. No midblock or network modelling is provided.	The ITA states that the predicted baseline peak hour traffic volumes for 2060 are as follows: AM Peak: • 529 Northbound, • 711 Southbound. PM Peak: • 1,229 Northbound • 746 Southbound The theoretical capacity of a two-way rural road is 1,500 v/h per lane, as per the Austroads Guide to Traffic Management Part 3: Transport Study and Analysis Methods. The predicted traffic in 2060 is at 82% theoretical link capacity. From a traffic analysis

TABLE 1. ASSESSMENT OF PUBLIC SUBMISSIONS

TRANSPORT THEME	SUMMARY OF SUBMISSIONS	ITA ASSESSMENT	MY OBSERVATIONS
			perspective, I do not consider that a link capacity assessment is required.
Construction	One submitter questioned the safety and practicality of the construction traffic accessing the site via Forestry Road: *The waste management report stated that it would take no more that ten seconds to turn right into Forestry road. I believe this estimation is critically flawed. We can at times wait several minutes to elight from our driveway in a car, the time would be increased with a slow moving large vehicle. In addition, more than one heavy vehicle wishing to turn right onto Forestry road will cause a roadblock outside my front gate with the potential of a serious crash. This part of SH1, isn't wide enough for large vehicles to sit in the middle of the road. This would also cause us unnecessary danger when entering or exiting my drive.* *Heavy vehicles alighting from Forestry road during the winter would bringing muck onto the highway especially after a downpour which could potentially be fatal.* *The school bus turns in the hard shoulder next to the entrance to Forestry road, with the parents dropping off and picking up small children several times a day. This also presents concerns for safety.*	The NZTA safety improvements propose to widen the road carriageway at the Crowther Road intersection, therefore creating additional space available for construction vehicles to wait and undertake turning movements into Crowther Road. The CTMP (proposed in the ITA) includes provision for wheel washing and consideration of school drop off and pick up activity, to ensure the conflicting activities do not overlap.	Detailed plans of the NZTA road safety improvements are not yet available. As part of the CTMP, it is recommended when plans materialise, NZTA and /or Council review them to ensure the safe operation of the Crowther Road/SH1 intersection.
Travel Cost	Some submitters expressed concern with the travel costs associated with waste truck movements to and from the proposed ARL site.	Travel cost has not been covered in the ITA.	I consider travel cost to be a commercial consideration for WMNZ and is not considered to be a traffic

TABLE 1. ASSESSMENT OF PUBLIC SUBMISSIONS

TRANSPORT THEME	SUMMARY OF SUBMISSIONS	ITA ASSESSMENT	MY OBSERVATIONS
			issue, no further commentary is required.

7.0 TRANSPORT RULES OF THE AUCKLAND UNITARY PLAN

The proposed site is situated within the Rural – Rural Production Zone in the Auckland Unitary Plan Operative in Part (AUP).

Landfill activity is defined as a *facility where household, commercial, municipal, industrial and hazardous, or industrial waste is accepted for disposal.*

Landfill activity is a non-complying activity in the '*Rural – Rural Production Zone*'.

Industrial activities in Table JI.3.3 include waste management facilities, refuse transfer stations and recycling facilities.

Because the proposed landfill activity is zoned '*Rural – Rural Production Zone*', the activity is often assessed as an '*all other activity located in rural zone*'.

7.1 AUP (OP) TRANSPORT ASSESSMENT

In this section I have reviewed the compliance (or otherwise) of the proposal against the transport related controls specified in Chapter E27 of the Unitary Plan. These controls are listed below in **TABLE 2** with comments on the compliance of the proposal against each control.

The assessment considers the traffic effects of the proposal and associated plans of the subject site.

TABLE 2: AUP (OP) TRANSPORT ASSESSMENT

RULE	COMPLIANCE	
	Y/N/NA	COMMENT
E27.6.1. Trip Generation	Y	Trip generation is discussed in Section 4.2 of this report. The estimated peak hour trip generation rate does not trigger the threshold in Table E27.6.1.1 of 100 vehicle movements per hour (for any hour).
E27.6.2.4 Number of Parking Spaces	Y	In Table E27.6.2.4 [Parking rates – area 2], no minimum nor maximum parking rate is required for landfill activity located in rural zones. Parking for staff and visitors will be split between the main office (approximately 20 parking bays) and the workshop and staff amenities area (approximately 30 parking bays). Both of these areas are located beside the Landfill Access Road after having passed the weighbridge area.

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TABLE 2: AUP (OP) TRANSPORT ASSESSMENT

RULE	COMPLIANCE	
	Y/N/NA	COMMENT
E27.6.2.5 Required Bicycle Parking Rates	Y	As per Table E27.6.2.5 office activity of at least 300m^2 GFA is required to provide one secure (long stay) bicycle parking space. In the S92 Response #1, it is stated that one cycle parking space will be provided on-site. The exact location of the cycle parking space will be confirmed during detailed design stage.
E27.6.2.6 Required End of Trip Facilities	N/A	End-of-trip-facilities are not required for landfill activity, nor office activity less than 500m^2 GFA. The non-provision of end-of-trip facilities does not contravene the requirements of the AUP (OP).
E27.6.2.7 Minimum Number of Loading Spaces	N/A	As per Table E27.6.2.7 (T113) all other activities located in rural zone are not required to a minimum number of loading space. One loading zone is proposed. It is stated in the S92 Response, '*the visitation of service vehicles (e.g. fuel deliveries, other consumables, etc) will be catered for by the available space dedicated on-site. WM confirms that it is intending to provide a specific loading space adjacent to the main site office catering for such occasional visitors while signing into the site prior to proceeding through access controls to deliver parts etc to the workshops. This bay will also be used for rural postage deliveries which are delivered to the main office.*'
E27.6.2.10 Accessible Parking	Y	In the New Zealand Building Code D1/AS1 New Zealand Standard for Design for Access and Mobility – Buildings and Associated Facilities (NZS: 4121-2001), it is required to provide not less than 2 accessible parking space where 21-50 total parking spaces are provided. For a provision of 50 parking spaces, two mobility spaces are required. Two mobility spaces will be provided on-site, with the exact location and dimensions of these spaces to be confirmed at a later stage. The design of the mobility spaces will satisfy the New Zealand Building Code. Therefore, the proposal complies with this standard.

TABLE 2: AUP (OP) TRANSPORT ASSESSMENT

RULE	COMPLIANCE	
	Y/N/NA	COMMENT
E27.6.3.1 Size and Location of Car Parking Spaces	Y	Table E27.6.3.1.1 determines the minimum dimensions for parking spaces. It is stated in the S92 Response that: *'At this point in time, the exact dimensions and locations of the parking spaces within the weighbridge area have yet to be finalised. However, those parking spaces will be fully compliant with the design standards of the Auckland Unitary Plan (AUP).* *A total of 10 car parking spaces are to be provided within the Bin Exchange Area. These parking spaces will be predominantly used by staff and so the parking layout dimensions are based upon the AUP requirements for regular users. All of the parking spaces are arranged perpendicular to the driveway.* *The AUP requires minimum dimensions of 2.4m width, 4m depth from the kerb and a manoeuvring space of 7.1m. The parking spaces have typical dimensions of 2.4m width and 5m length, with at least 16m of manoeuvring space. These dimensions comply with the minimum dimension requirements of the AUP requirements.'* Therefore, the proposal will comply with this standard.
E27.6.3.2 Size and Location of Loading Spaces	Y	As per Table E27.6.3.2.1, the proposed loading space for the new development would need to have a minimum depth of 8.0 m and width of 3.5 m. It is stated in the S92 Response that, '*an appropriate location and design will made for this loading space at detailed design stage. The location and design of this loading bay will comply with any AUP requirements.'*
E27.6.3.3. Access and Manoeuvring	Y	Plans and vehicle tracking provided indicate and illustrate that all proposed parking spaces have driveways and aisles for entry and exit of vehicles to and from the road, and for vehicle manoeuvring within the site.
E27.6.3.4. Reverse Manoeuvring	Y	Sufficient space is provided onsite, so vehicles do not need to reverse off the site or onto the road.

TABLE 2: AUP (OP) TRANSPORT ASSESSMENT

RULE	COMPLIANCE	
	Y/N/NA	COMMENT
E27.6.3.5. Vertical Clearance	Y	A minimum vertical clearance of 2.5 m is required for non-loading activity and 3.8m for loading and waste related activity. It is stated in the S92 Response, *the detailed design of the parking spaces has yet to be finalised. However, it is confirmed that the parking spaces will not be covered and will satisfy the AUP requirements regarding vertical clearance.*
E27.6.3.6. Formation and Gradient	Y	**Formation** As per the standard, the whole area of parking and loading spaces, and manoeuvring areas and aisles must be formed, drained, provided with an all-weather surface to prevent dust and nuisance, and be marked out or delineated. This must be done before the activity to which those parking and loading spaces relate commences and maintained for as long as that activity is continued. Stantec have confirmed that the form and gradients will comply with the Unitary Plan.
	Y	**Gradient** The gradient of any parking surface must not exceed 1:25 (4%) in any direction for accessible spaces for people with disabilities and 1:20 (5%) in any direction for all other spaces. It is stated in the S92 Response that: *'The gradients of the parking spaces within the weighbridge area will be designed to satisfy the AUP requirements.'* Gradients will therefore comply with the requirements of the Unitary Plan.

TABLE 2: AUP (OP) TRANSPORT ASSESSMENT

RULE	COMPLIANCE	
	Y/N/NA	COMMENT
E27.6.3.7. Lighting	Y	Lighting is required where 10 or more parking spaces are likely to be used during the hours of darkness. It is stated in the ITA that: *'The preliminary lighting design of the roundabout and its connection to the bin exchange area have been developed in a manner consistent with the Australia New Zealand Standard AS/NZS 1158 series of standards for the lighting of roads and public spaces in New Zealand, and the outdoor workplace lighting standard (AS/NZS 1680.5).* *The lighting design and all final details (including scope, design extents, applicable lighting levels and mitigation of obtrusive lighting) will be confirmed during the detailed design stage and is expected to comply with the above standards.'* It will be recommended as a condition of consent that the proposal comply with the Lighting Standards of the AUP (OP).
E27.6.4.1. Vehicle Access Restrictions	N	Vehicle access restriction (VAR) applies and vehicle crossings must not be constructed or used to provide vehicle access across that part of a site boundary which: • 3(b) is subject to Vehicle Access Restriction – Arterial Road. A VAR applies to this proposal as a new vehicle access is proposed on SH1 which is an NZTA state highway and identified as an Arterial Road. Use of a new vehicle crossing where a VAR applies requires assessment under Rule E27.8.2 (10). This is provided throughout Section 3.0 and 4.0 of this report. However, as the proposed access is via the new roundabout on the State highway and NZTA has been consulted on the roundabout and confirmed that it is an appropriate form of roundabout to access the proposed landfill site, this is considered to be not applicable.

TABLE 2: AUP (OP) TRANSPORT ASSESSMENT

RULE	COMPLIANCE	
	Y/N/NA	COMMENT
E27.6.4.2. Number of Vehicle Crossings and Width	N/A	Table E27.6.4.2.1 outlines the maximum number of vehicle crossings and separation distance permitted for any site. As per (T146), maximum number of vehicle crossings is 1 per 25m of frontage or part thereof, with 6m of separation between crossings serving the same site. A minimum separation distance of 2m between vehicle crossings serving adjacent sites. Landfill access will be a private road and therefore is not required to comply with this standard.
E27.6.4.3. Width of Vehicle Access and Queuing Requirements	Y	According to the standard, every on-site parking and loading space must have vehicle access from a road and provide passing bays with suitable distances between the formed accesses. The proposed vehicle accesses comply with this standard. Table E27.6.4.3.2 outlines the minimum and maximum width of the crossings at the site boundary and the minimum formed access width. For rural zones, the minimum crossing width is 3.0m and maximum crossing width of 6.0m, or 9.0m where large heavy vehicles are required to be accommodated. No formed access width is specified. However, vehicle tracking provided shows safe two-way movements at vehicle crossings and formed access.
E27.6.4.4. Gradient of Vehicle Access	Y	Table E27.6.4.4.1 requires a maximum gradient of 1:5 (20%) for a vehicle access serving residential; 1:8 (12.5%) for a vehicle access used by heavy vehicles; and 1:6 (16.7%) for a vehicle access serving all other activities. A minimum 4m long platform with a maximum gradient of 1:20 (5%) is required where the access adjoins the road. Stantec have confirmed that the gradients will comply with the Unitary Plan.

TABLE 2: AUP (OP) TRANSPORT ASSESSMENT

RULE	COMPLIANCE	
	Y/N/NA	COMMENT
E27.6.5. Design and Location of Off-Road Pedestrian and Cycling Facilities	Y	**Pedestrian Facilities** On site pedestrian movement has not been considered at this stage of design / application. However, this level of detail can be included in the detailed design stage. **Cycling Facilities** As stated above, a single bicycle parking space is proposed. No additional cycle infrastructure or facilities are proposed. This is acceptable given the limited demand for bicycle trips to this location and activity.

8.0 CONCLUSION

Overall, it is concluded that:

- The level of vehicle trips generation by the proposed ARL can be accommodated within the road network without significant effects on the road network efficiency. In particular, the increase in vehicle movements consists of 5% and 3.1% in the morning and evening peak hours respectively, with provisions made to ensure vehicle trips are spread throughout the day to avoid the peak periods.
- The crash record on SH1 south of the proposed ARL site shows inherent safety issues where head-on, overtaking and turning crashes are common. The NZTA have identified this stetch of road for safety improvements including centreline widening, shoulder widening and passing bays. The proposed construction work and roundabout construction is planned to occur after these safety improvements have been implemented. The estimated vehicle movements upon operation are not considered to exacerbate existing road safety issues, due to minor increase in trip generation.
- The proposed roundabout access to the new landfill road access is considered acceptable. The proposed intersection is anticipated to operate at a level of service (LOS) of A, which indicates free flowing traffic with modest average delays during peak periods. Stantec has confirmed that '*ongoing consultation*' with NZTA is being held and '*any necessary statutory approvals*' will be sought directly from NZTA.
- The provision of an NZTA and/or Auckland Council approved CTMP is an appropriate mechanism to ensure construction has a minimum impact on the safety and efficiency of the adjacent transport network. This should include improvements to the Crowther Road intersection, if required.
- The proposed landfill activity should comply with the AUP (OP) E27 – Transportation standards if the application is approved. These can be developed as part of the detailed design.

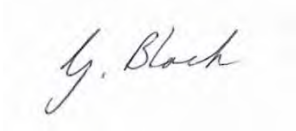
9.0 RECOMMENDATIONS

Based on our review of the information and submissions provided, I support the proposal from a traffic perspective for the following reasons:

- The proposed roundabout on SH1 provides access to the new landfill and would be the safest form of intersection for the development.
- Based on the traffic modelling, I expect the roundabout will operate at free flow traffic conditions for most of the time and the delay to other road users would be limited to slowing down to negotiate the roundabout.
- Occasionally, a queue may form, and the traffic modelling indicates that the average delay would be in the order of 10 seconds.
- The proposed landfill will increase the traffic on SH1 and the increase in waste trucks is predicted to be minor.
- The proposed NZTA Dome Valley Safety improvements should address any safety concerns and delays from laden trucks associated with the landfill.

Yours sincerely
Harrison Grierson

Prepared By:
Gary Black
Principal Transportation Engineer



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memorandum

TO	Warwick Pascoe	FROM	Natalie Webster
	Auckland Council	DATE	17 September 2020
RE	BUN 60339589 - Auckland Regional Landfill, S42A Technical Report; Waste Acceptance and Environmental Risk		

1.0 Introduction

Waste Management NZ Ltd (WMNZ) is seeking to obtain resource consents for the construction and operation of a new regional landfill facility within the Wayby Valley area, between Warkworth and Wellsford. Site address is 1232 SH1, Wayby Valley, Auckland, comprising several land parcels with an approximate total area of 1020 ha. Figure 1 displays the site location and proposed landfill footprint. The area within the red dotted line shown in Figure 1 is henceforth referred to as 'the site'.

WMNZ is proposing to develop the landfill on part of the WMNZ landholdings, which will be known as the Auckland Regional Landfill (ARL). The landfill is proposed to be a Class 1 landfill, as defined by the '*Technical Guidelines for Disposal to Land*' (WasteMINZ, issued in draft August 2018) (referred to hereafter as 'the Landfill Guidelines'), which would accept municipal solid waste, which includes residential and commercial waste. The landfill will also accept construction and demolition waste, some industrial wastes (that meet strict acceptance criteria), and contaminated soils.

The landfill footprint itself is proposed to occupy approximately 60 ha of the WMNZ landholdings, within an area referred to as 'Valley 1' – which comprises an existing WNW orientated valley which is incised ~50 m to >100 m below the adjacent ridgelines.

The landfill is proposed to be fully lined, with either a Type I or Type II liner system, and will include a leachate collection and removal system (above liner); which is to remain functional throughout the entire landfill life and after-care period. A sub-liner drainage system is also proposed (e.g. groundwater drainage beneath the liner).

The particular aspects of this proposal that I have addressed are in relation to waste acceptance procedures and criteria (referred to collectively as 'WAC'), and environmental risk. With respect to 'environmental risk' my assessment has focussed primarily on the potential impacts that the landfill may have on groundwater quality as a result of the placement of waste and / or the operation of ancillary facilities; what the effects may be on surface water quality in the event that groundwater is impacted; and how this may impact ecological receptors and human health. While I have considered the impact of the landfill and ancillary operations on surface water quality as part of my assessment, this contaminant transport pathway has not been my focus, as this area is covered by other experts including Sharon Tang from Auckland Council. Sharon Tang has also been responsible for the specific assessment of the scope and adequacy of the human health risk assessment (HHRA). While my area of review has significant overlap with that of Sharon Tang's, I defer to her review on all matters in relation to the HHRA except for those aspects that I have specifically discussed in this memo. I have not considered effects from landfill

gas emissions or landfill gas combustion, as this area is covered by another expert, Paul Crimmins from Auckland Council.

My qualifications, professional affiliations, and experience are as follows:

- BSc in Geology and MSc (1st class hons) in Environmental Science from Auckland University;
- Member Waste Minimisation Institute of New Zealand (WasteMINZ);
- Member Australian Land and Groundwater Association (ALGA).

I have 16 years of experience as an environmental scientist. The majority of my experience is in the assessment and management of contaminated land, which has included work involving risk assessment and guideline derivation. I have been involved in the review and assessment of numerous resource consent applications on behalf of Auckland Council in relation to soil contamination. I have current experience in relation to landfill management and waste acceptance criteria as part of a project team working to deliver a finalised version of the WasteMINZ ''*Technical Guidelines for Disposal to Land*'.

Key documents I have reviewed (either in whole or in part) in writing this memo are as follows:

1. Auckland Regional Landfill, Assessment of Environmental Effects, Prepared for Waste Management NZ Ltd, Prepared by Tonkin & Taylor Ltd, May 2019
2. Technical Report E – Hydrogeology Assessment Auckland Regional Landfill, Prepared for Waste Management NZ Ltd, Prepared by Tonkin & Taylor Ltd, May 2019
3. Technical Report O – Auckland Regional Landfill Waste Acceptance Criteria, Prepared for Waste Management NZ Ltd, Prepared by Tonkin & Taylor Ltd, May 2019
4. Technical Report S – Auckland Regional Landfill Risk Management Assessment, Prepared for Waste Management NZ Ltd, Prepared by Aecom New Zealand Limited, May 2019
5. Technical Report T – Auckland Regional Landfill Human Health Risk Assessment, Prepared for Waste Management NZ Ltd, Prepared by Tonkin & Taylor Ltd, August 2019
6. Section 92 Questions, Attachment 1 (dated 28 June 2019, "Dome Valley Landfill – s92 Questions") of Sentinel Planning Letter to Andrea Brabant (Tonkin & Taylor Ltd) dated 18 September 2019.
7. Section 92 Response Tranche 1, letter report, Tonkin & Taylor Ltd, 8 November 2019
8. Section 92 Response Tranche 2, letter report, Tonkin & Taylor Ltd, 6 December 2019
9. Section 92 Response Tranche 3, letter report, Tonkin & Taylor Ltd, 20 December 2019
10. Section 92 Response Tranche 4, letter report, Tonkin & Taylor Ltd, 12 February 2019
11. Section 92 Response Tranche 5, letter report, Tonkin & Taylor Ltd, 20 February 2020
12. Appendix A of Section 92 Response Tranche 5, Draft Landfill Management Plan, Prepared by Waste Management NZ Ltd, 30 January 2020
13. Sediment, Stormwater, Waste Acceptance Criteria and Health Risk Assessment Additional Section 92 Responses, letter report, Tonkin & Taylor Ltd, 11 August 2020.

14. Further Stormwater and Health Risk Assessment s92 Responses, letter report, Tonkin and Taylor Ltd, 25 August 2020.

Submissions – Online Submission Report – summary of BUN60339589 submissions, prepared by Auckland Council.

I have also observed the proposed site of the Auckland Regional Landfill (and ancillary features) during a site visit undertaken on 30 July 2020.

2.0 Consents Requested; WAC and Environmental Risk Related

With respect to these aspects, WMNZ are seeking discharge consents under Sections E4, E13, and E33 of the Auckland Unitary Plan (operative in part) (AUP-OP). These consents relate to the placement of waste, the WAC that will be applied to incoming waste, and the discharges that may arise from the placement of waste and the operation of landfill facilities. I consider that the final list of consents collated by Auckland Council dated 25 July 2019 contains all of the consents that are applicable to my areas of assessment.

WMNZ seeks a 35 year term for its regional consents and permanent land-use consents to reflect the long term nature of a landfill development. The proposed works require consent as a noncomplying activity overall under the Auckland Unitary Plan.

2.1 Relevant Policies and Objectives from the AUP OP

The following objectives and policies are relevant to this application and my areas of assessment.

2.1.1 Section E1: Water Quality and Integrated Management

This section is relevant because consents are being sought under Section E4, which refers to the policies and objectives of Section E1.

All of the objectives of Section E1.

Policies 2-6, 8- 10, 26.

2.1.2 Section E13: Cleanfill, managed fills and landfills

All of the objectives of Section E13.

Policies 1, 3-5.

2.1.3 Section E33: Industrial and trade activities

The objective of Section E33.

All policies of Section E33.

3.0 Site Setting and Proposed Landfill Layout Information

The following information has been collated to provide context for the assessment of potential effects from the proposed landfill and ancillary facilities on environmental receptors and human health. The site layout, and points of exposure discussed below are shown in Figures 1 and 2.

The overall landfill project is proposed to include:

- All works associated with the development of an operating landfill on the identified footprint area including:
  - Earthworks to construct the required shape of the basegrade;

  - Construction of a multi-barrier, low permeability lining system to prevent leachate seepage into the surrounding environment;
  - Construction of a leachate collection system above the low permeability lining system;
  - Stormwater control around the constructed landfill and ultimate treatment of stormwater before it leaves the site;
  - A landfill gas (LFG) collection system to collect LFG from the placed waste;
- A leachate management system, including leachate storage, tanker loading facilities and leachate treatment facilities;
- LFG treatment by a LFG to energy plant, with any excess being flared;
- Provision of water supplies for operational (non-potable) and staff (potable) requirements;
- A bin exchange area near the site entrance, adjacent to SH1, where road vehicles will deposit bins for site vehicles to transport them to the landfill tip face;
- An access road from the site entrance to the main site, and all other roads required to access the various parts of the site;
- Operational infrastructure such as weighbridges and vehicle wheel wash;
- Facilities for site staff, including on-site wastewater disposal;
- Maintenance facilities for site plant and equipment.

The site is currently comprised of land which is predominantly in use for forestry or agricultural purposes. Valley 1, where the landfill is proposed to be located, is situated within the current pine forestry block. The Valley 1 landfill footprint is surrounded by ridgelines to the north, east, and south. Valley 1 slopes down topographic gradient to the west northwest. An unnamed stream (a tributary of the Hōteo River) flows down the floor of Valley 1 and exits the valley to the north west.

The unnamed stream that flows through Valley 1 meets and flows in to an unnamed stream that flows down the floor of the valley to the north (being Valley 2, tentatively identified by WMNZ as being a future waste disposal location). This confluence between the Valley 1 and Valley 2 streams is located approximately 430 m (streambed length) downstream from the marked extent of the landfill footprint (i.e. the toe of the landfill). This stream confluence is referred to as 'Point of Exposure 1' ('POE1' in Technical Report T, the Human Health Risk Assessment (HHRA)) (see Figure 2). In terms of the Conceptual Site Model (CSM) for the site, which considers sources of contaminants, potential migration pathways for contaminants, and receptors (people or ecological features / flora / fauna that could be affected by contamination), POE1 has been considered as a potential location where leachate from the landfill could discharge either via surface water flow, or via groundwater. The assessed receptors at POE1 are people eating fish or plants from the stream, people consuming beef or milk from cattle watered using water from the stream. The water quality of the stream itself with respect to how this may impact stream ecology has also been assessed.

It is noted that following construction of the landfill, the unnamed stream which is currently present in Valley 1 will be reclaimed by the landfill itself within the proposed footprint; and downstream of the landfill the stream will be converted in to a series of stormwater retention ponds and a stormwater wetland.

The stream which represents the confluence of the Valley 1 and Valley 2 streams flows in a generally north easterly direction towards the Hōteo River. The total distance between POE1 and the confluence of this unnamed stream with the Hōteo River is approximately 2.7 km (streambed length). The confluence of this stream and the Hōteo River has not been assessed as a point of exposure.

The bin exchange area is located adjacent to the proposed site entrance in the south western corner of the site. The site entrance is proposed to be off State Highway 1, approximately 1.5 km (road length) to the south of Wayby Valley Road. An unnamed stream is located to the north of the bin exchange area, and the Waiteraire Stream is located to the south, both within approximately 100-200 m of the bin exchange area. These streams also flow towards the Hōteo River, which is located approximately 750 m to the north of the bin exchange area. Neither the Waiteraire Stream nor the confluence of the Waiteraire Stream and the Hōteo River have been assessed as points of exposure.

The renewable energy centre is located on a ridge at the southern end of the landfill footprint, to the north of (above) the landfill toe. Facilities that are co-located at the renewable energy centre are: generators, landfill gas flares / evaporators, workshop and facilities, and leachate tanks. This complex is located approximately 100 m from the valley floor within which the stormwater ponds at the toe of the landfill are situated.

Another single workshop is located on a ridge above the southern end of the landfill, to the south of (above) the landfill toe. Another single leachate tank is located at the landfill office / weighbridge complex. This complex is located on a ridge to the southwest of (above) the landfill toe.

The other points of exposure assessed as part of the HHRA are located to the west-north west of Valley 1, within or adjacent to the Hōteo River. These exposure points are located approximately 1.9 km from the north western edge of Valley 1.

POE2 and POE3 are points of exposure within the Hōteo River, assessing the potential impacts from landfill leachate discharging to groundwater on freshwater ecology in the Hōteo River, and recreational users of the Hōteo River respectively.

POE4 and POE5 relate to a groundwater abstraction bore located on a neighbouring farm. The bore is currently utilised by the land owner for irrigation purposes. The depth of the bore is not known. POE4 and POE5 assess the potential impacts from landfill leachate discharging to groundwater on the water quality at the groundwater abstraction bore, under the groundwater usage scenarios of: stock watering (including chickens where the eggs may be consumed by residents, and public consumers of beef and milk from cattle watered with groundwater from the farm bore); irrigation of vegetables to be consumed by residents; drinking water for residents.

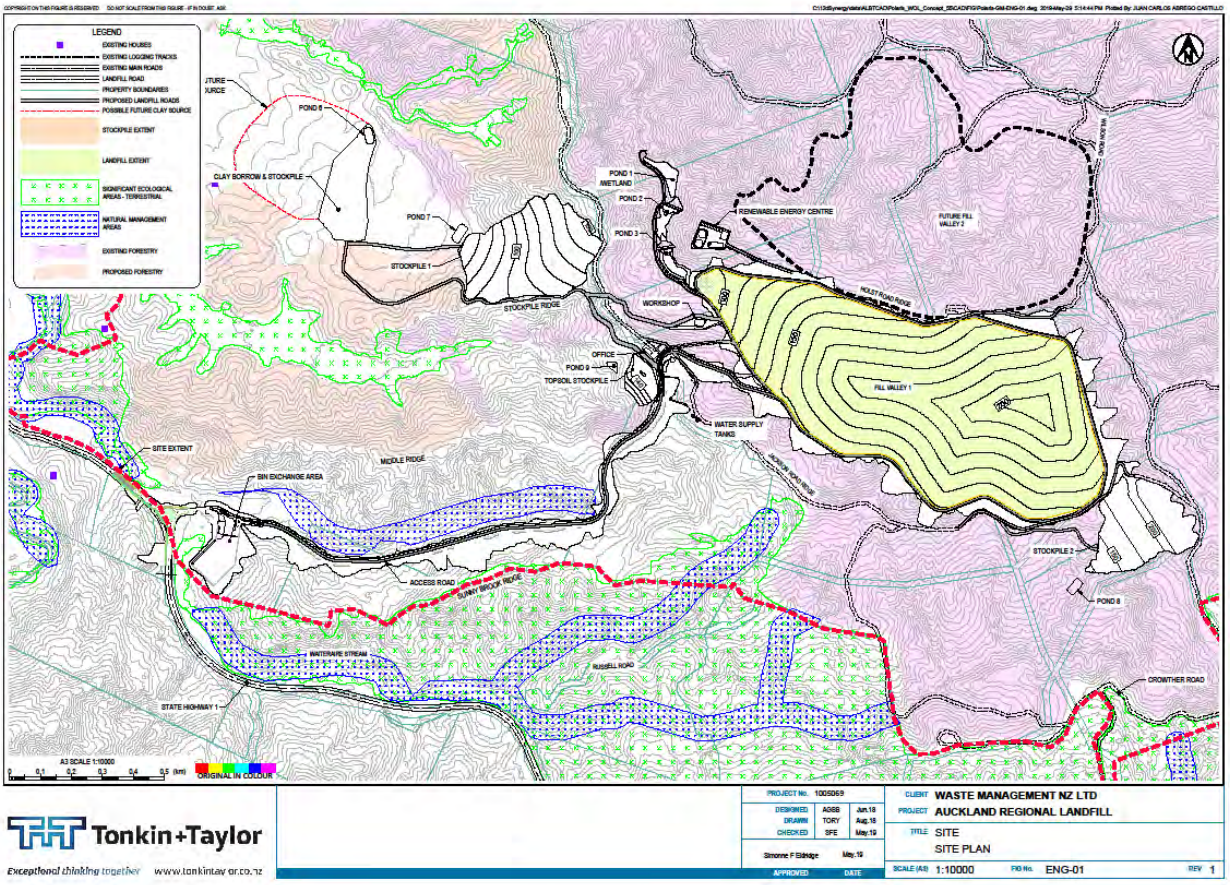

Figure 1: Site Layout Plan

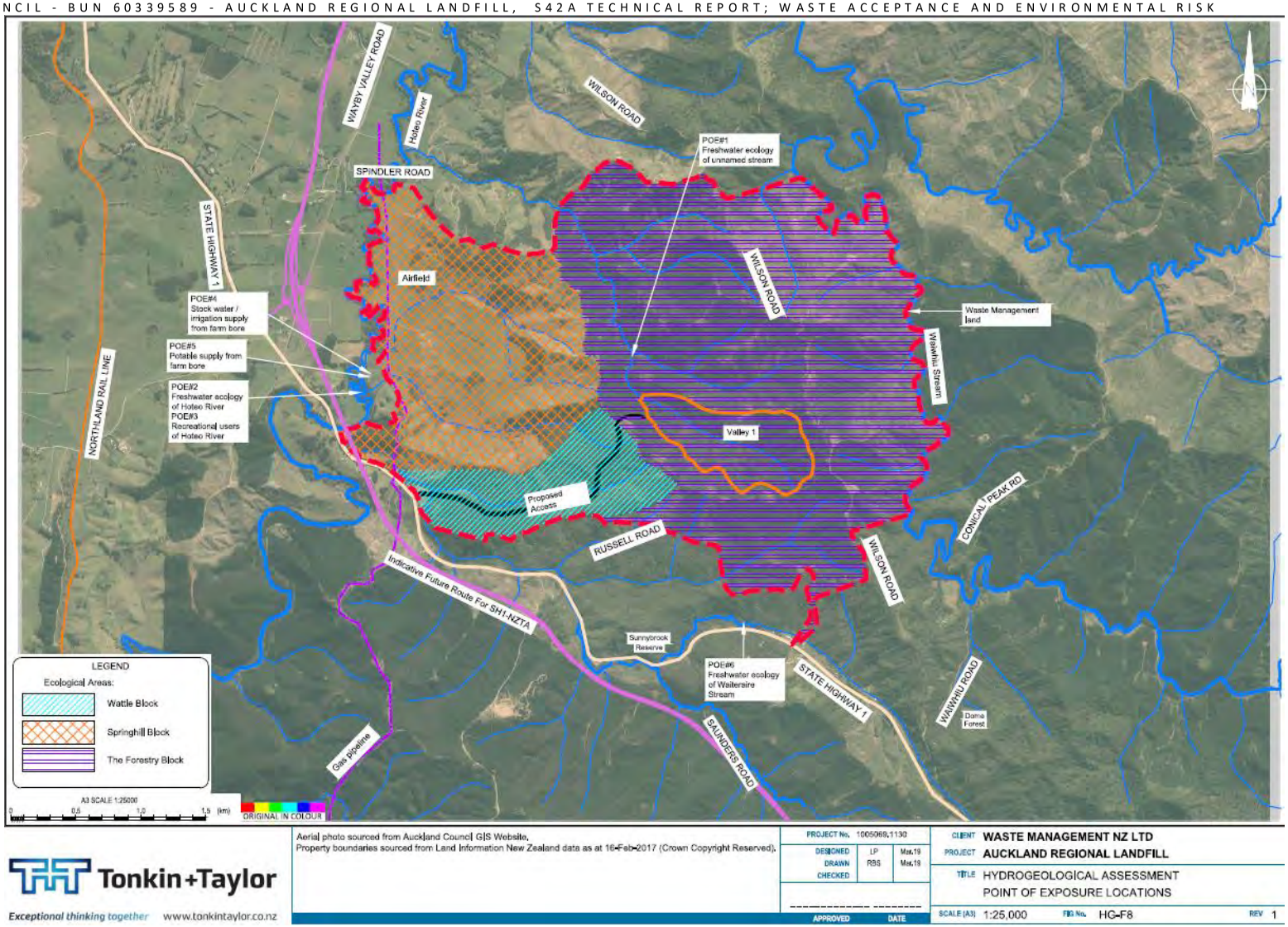

Figure 2: Points of Exposure

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3.1 Geology

The proposed landfill footprint and access road alignment are underlain by Pakiri Formation bedrock consisting of interbedded sedimentary sandstone and siltstone with some conglomeritic layers. The bedrock is overlain by a variable thickness of residual, colluvial and landslide soil. The site soils generally consist of silts and clays with fine sand of variable strength and plasticity.

3.2 Hydrogeology

The groundwater regime at the site is described in Technical Report E, the Hydrogeology Assessment.

Briefly, the groundwater system at the site is described as being comprised of three layers.

Shallow perched groundwater is found in the residual soils above the interface with the highly weathered Pakiri Formation. This water table will be recharged directly from rainfall; groundwater flow direction will generally follow local topography down-topographic gradient towards the nearest surface water receptor, and / or emerge as spring flow at the ground surface.

Perched water tables are found in the higher elevations of the Pakiri Formation. Groundwater flow in the Upper Pakiri Formation is expected to be influenced by the steep terrain, resulting in groundwater levels that are a muted reflection of the topography. The predominant flow regime is expected to be horizontal, with flow controlled and retarded by the low permeability layers within the Pakiri Formation. However there is the ability for these perched layers to migrate vertically down to the deeper regional groundwater aquifer in the Pakiri Formation, with permeability / transmissivity within the rock portion of the relevant geological profile controlled primarily by the presence or absence of water transmitting fractures / joints / discontinuities within the rock mass.

The applicant states that the deeper regional Pakiri Formation groundwater is expected to migrate towards the Hōteo River. Note that in his assessment, Aslan Perwick, who is Auckland Council's hydrogeological specialist and who undertook a review of the hydrogeology-related aspects of the application, states that the regional groundwater flow direction is likely to more towards the south – south west, towards the Waiteraire Stream.

4.0 Key Waste Acceptance and Environmental Risk Issues

Following a review of the application documents and Section 92 questions and responses, and having participated in conferencing meetings with the applicant and their technical specialists, I consider that the key issues related to WAC and environmental risk may be summarised as set out below.

1. **Has the type of waste that will be accepted by the landfill been well understood and defined?**

The information provided in the original application was essentially a recitation of the standard assumptions with respect to the types of waste that may be accepted by a Class 1 landfill (as defined in the Landfill Guidelines). In this way, the applicant was correct in stating that the types of waste that may be accepted, and the proposed approach to waste acceptance, was in line with current industry guidelines / best practice for a Class 1 landfill.

However, because the application contained only a high level, standardised assessment of the type of waste that would (or would not be) accepted in to the ARL, very little detail was provided to support the assumptions. This 'standard approach' resulted in a failure to appropriately quantify the full range of potentially hazardous contaminants that could emanate from the waste received, refer to Question 2 for detail.

Additional information on the types, quantities, and contamination potential of waste that may be received in to the ARL was provided in response to Section 92 questions. Further, additional information has been received with respect to the types of waste that will be prohibited. The sum of the information provided is considered to be sufficient.

2. **Have the contaminants the waste potentially contains (types of contaminants), and the contamination potential of that waste (ability for leachate to be generated, concentration of contaminants in leachate), been well understood and defined?**

The information provided in the application with respect to the type and concentration of contaminants in leachate was substantially based on the monitoring data from the applicant's currently operating Auckland landfill, being Redvale Landfill. It is accepted that this information provides a good indication of what leachate quality may be for ARL, for the suite of contaminants that are analysed for at Redvale; and accordingly, this information appears to have been a key driver for the applicant in determining which contaminants required a numerical WAC (in combination with guidance such as the Landfill Guidelines). However this approach does not provide an adequate assessment of the full range of contaminants that may be present in waste accepted by ARL, in particular new / emerging contaminants; and / or existing contaminants that have not been recognised as toxic, persistent, or bio-acumulative, and / or for which the risk posed to human health and receptors has been poorly understood before now.

The Section 92 process resulted in some progress being made with respect to the recognition by the applicant that a broader range of contaminants may be present in leachate than is currently assessed at Redvale. This in turn resulted in numerical waste acceptance criteria (WAC) (i.e. a concentration limit for a contaminant) being derived for additional contaminants. Refer to Question 3 for further detail about whether it is considered that WAC have been set for an appropriate number / range of contaminants.

In addition, the applicant has acknowledged that certain of the wastes that will be received at ARL will contain environmentally hazardous chemicals, for which a WAC has not been derived. However, it is WMNZs position that such products will represent a small proportion of the waste stream, and that the engineered design, and operation of the landfill (including waste acceptance procedures) represents a sufficiently robust control to prevent discharges that may arise from these wastes causing adverse effects on the environment. In addition, the applicant notes that it is their interpretation of the various international regulations pertaining to the management and disposal of hazardous wastes (e.g. the Stockholm Convention) that the disposal of waste to a specially engineered landfill is an acceptable option, where no other options for recycling or remediation exist.

I consider that the views expressed by the applicant reflect the realities of waste disposal in New Zealand, even if the acceptance of certain wastes, particularly POPs-containing waste, is not currently supported by New Zealand policy[1]. However, and as is discussed further at Question 5, the ability for ARL to operate under these circumstances, in a way that does not cause adverse environmental effects, relies on the implementation of waste acceptance procedures that screen and prevent (to the extent possible) significant quantities of hazardous-chemical-containing wastes from entering the landfill. Further, monitoring of the leachate quality for a sufficiently broad range of contaminants is important to determine what chemicals are being contributed to leachate, and in what quantity, such that ongoing management decisions regarding waste acceptance can be made. Refer to the discussion at Question 5 for further discussion regarding leachate monitoring.

[1] Refer to 'Hazardous Substances (Storage and Disposal of Persistent Organic Pollutants) Notice 2004'.

3. Have numerical WAC (e.g. concentration limits) been set for an appropriate suite of contaminants?

As discussed at Question 2, the suite of contaminants for which a numerical WAC has been derived has been increased as part of the Section 92 process.

However, it is the applicant's opinion that it is unnecessary or not possible to derive numerical WAC for a significantly broader range of contaminants than had been derived already. This is for a range of reasons, including:

- It would create an unnecessarily long list.
- It is not possible to know the full range of emerging contaminants that may be present in waste, because by their nature some of these contaminants are not yet know or recognised as being toxic, persistent and / or bio-accumulative;
- The type of waste that may contain hazardous contaminants, but which cannot be rejected before it is accepted (namely domestic refuse) constitutes a relatively minor fraction of the overall waste stream (data from Redvale to support the composition of the waste stream has been provided);
- The type of waste that is most likely to contain hazardous contaminants is solid waste, including domestic and commercial refuse, and this waste cannot be testing utilising the toxicity characteristic leaching procedure (TCLP) methodology because it cannot be sufficiently broken down to allow the test to be conducted. Therefore, there is no way to generate a TCLP concentration which can be compared to a numerical WAC;
- The mass and concentration of such contaminants in the waste will be minor and therefore their mass / concentration in leachate will be minor and will not therefore result in adverse effects;
- The inability to derive WAC for some emerging contaminants is due to the lack of robust published toxicity data for some of these compounds.

The applicant further considers that the derivation of numerical WAC for a broader range of both existing and emerging contaminants, including additional persistent organic pollutants (POPs) is not necessary to prevent adverse effects occurring as a result of these contaminants because the waste acceptance procedures that will be in place will be robust enough to prevent hazardous wastes from being deposited in ARL.

I am inclined to agree with the applicant that the derivation of numerical WAC for a very broad range of contaminants is not strictly necessary to ensure that the landfill leachate does not become impacted by high concentrations of hazardous chemicals. I accept the applicant's submission that some of the potential emerging contaminants of concern are not yet are supported by robust toxicity data to enable a WAC to be derived. I further consider that it is important to note that a significant quantity of the potentially hazardous-chemical-containing wastes that will enter the landfill will be present in domestic refuse, and commercial waste streams; and this waste cannot be assessed by numerical WAC. On this basis I consider that it is an acceptable approach to assess whether waste can be accepted on a case by case basis but I consider that the points raised above only serve to highlight the critical importance of appropriately screening waste that may be accepted so that waste containing high levels of hazardous chemicals can be rejected.

As such, a high degree of rigor will need to be applied to the waste acceptance process in order for such a 'case by case' approach to be acceptable and to appropriately minimise the potential for adverse effects. WMNZ will need to ensure that they're asking for detailed information about the waste source (type of waste, type of site) to ensure they understand what contaminants might be in the waste; can then ask disposers to test for those contaminants (if possible); and can then determine if the waste can be disposed

of. WAC can also be derived / found for less common contaminants on a case by case basis. Waste materials and / or soils containing (or thought likely to contain) uncommon, or potentially persistent, bio accumulative, or toxic chemicals (including POPs) can be rejected outright. Such processes must be detailed in the Landfill Management Plan (LMP). A revised draft of the relevant sections of the LMP has been provided as part of the Section 92 process, and this is discussed further at Question 5.

This reviewer considers that a key area where issues may arise is where there are contaminants in waste which may be accepted in advance of a robust understanding of their properties (e.g. their toxicity, persistence, and bio accumulative properties; their fate and transport characteristics in the environment); and ahead of the development of environmental standards. Such a situation occurred with PFAS compounds[2]. Therefore, there must be a protocol/process established and described in the LMP on how the understanding of emerging contaminants is tracked, so that intervention decisions can be made early (e.g. the setting of WAC; or the prohibition of some types of waste and / or particular contaminants).

Regular review of the WAC and waste acceptance procedures is necessary to ensure that the waste acceptance procedures are keeping up with advances in industrial chemistry and ongoing scientific research into the toxicity, and environmental fate and transport of chemicals. A WAC review period must be written in to the LMP. It is noted that an appropriate WAC review consent condition has been proposed, and is considered to be acceptable.

4. Have the numerical WAC been set in accordance with best industry practice?

In general the numerical WAC have been set in accordance with the guidance provided in the Landfill Guidelines, and the Ministry for the Environment (MfE) '*Module 2: Hazardous Waste Guidelines Landfill Waste Acceptance Criteira and Landfill Classification*' (MfE, 2004).

Where the process described in these documents has been deviated from, this is on the basis of empirical data collected from Redvale Landfill. Comparison of total concentration / toxicity characteristic leaching procedure (TCLP) data pairs from Redvale has shown that for some contaminants, it is possible to set a higher total concentration limit and still achieve the required TCLP WAC. I consider that this approach is acceptable where there is data to support it (as has been described). In some instances, the applicant has taken a more conservative approach to setting a WAC, by assuming a greater leaching potential than is standard for some persistent contaminants. This approach is also supported.

A process to set new WAC for additional contaminants has been proposed by the applicant as part of the Section 92 process, and is considered to be acceptable.

5. Where a numerical WAC is not proposed, have appropriate waste assessment procedures been proposed that would adequately prevent the acceptance of waste that could result in discharges that would cause adverse effects to receptors?

The information provided in the original application was essentially a recitation of the standard procedures with respect to waste acceptance procedures as described in the Landfill Guidelines. As such, it did not fully appreciate or provide adequate procedures to deal with the acceptance of waste with potentially

[2] Per- and poly-fluoroalkyl substances (PFAS) are a class of man-made chemicals that have been used since the 1950s in the production of a wide range of products that resist heat, stains, grease and water, including furniture protectants, floor wax and specialised firefighting foam. In recent times research has shown that PFAS compounds are highly mobile in the environment, highly persistent, are bio-accumulative in the environment, and are potentially toxic to ecological and human health. However, by the time these discoveries were made, large quantities of PFAS compounds had been (and continue to be) released to the environment, and continue to impact a wide range of receptors primarily via groundwater migration and discharge pathways.

novel or unquantified contaminants (for which there are no numerical WAC), that could be toxic, persistent, or bio-accumulative. Therefore, and particularly given the applicants claim that applications for waste disposal for materials containing novel or emerging contaminants, or contaminants that are in waste which cannot be tested via the TCLP methodology can be dealt with on a case-by-case basis, this reviewer considers that the waste acceptance procedures needed to be more specific and robust.

Via the Section 92 process, the applicant has provided additional information regarding the waste acceptance procedures that they anticipate will be specified in the LMP. The updated procedures are considered to be an improvement, however some additional specific information should be added to ensure they are sufficient. In particular, it is considered that the following should be made specific:

- That no waste will be accepted where it cannot be ascertained that the waste will not result in concentrations of contaminants in leachate that, if discharged from the site, could adversely impact human health or the environment.
- That any application for the disposal of potentially hazardous waste should be accompanied by not only information from the waste generator about the likely physical and chemical characteristics of the waste, but also laboratory analysis results (both total concentrations and TCLP results where possible) for the identified contaminants of concern.
- That the information provided by the waste generator will be assessed by WMNZ to verify whether they agree with the conclusions drawn regarding the contaminants of concern, and whether the correct analysis has been carried out.

It is noted that the ability of WMNZ to perform this kind of critical analysis will be dependent upon having adequately qualified staff to make assessments of incoming waste disposal applications. Such technical knowledge will be required to firstly determine if the waste is able to be considered for acceptance, and not rejected on the basis of being prohibited waste; and then to determine if the assessment of the properties of the waste material done by the waste generator is adequate. Only then can the determination of whether the waste is able to be accepted be made, as per the proposed LMP procedure.

In addition, as part of the Section 92 process, the applicant was requested to provide further and more detailed information regarding waste that was prohibited. This is because the original application contained only a high level summary of the characteristics of prohibited waste, as per the Landfill Guidelines, with no further detail provided regarding the nature of the waste that could fall into the prohibited categories . A draft version of the LMP that was provided as part of the Section 92 process did not contain any further description of the types of products and wastes that fall in to the prohibited categories as per the Landfill Guidelines. A full description of prohibited waste types and characteristics (as per USEPA Subtitle C [US Code of Federal Regulations Title 40 Volume 18 Parts 260 to 295 and in particular Part 261 - Identification and Listing of Hazardous Waste) is considered necessary for the LMP to be practically understood and implemented by those WMNZ personnel who are responsible for screening waste disposal applications. It is noted that a consent condition has been proposed which specifies the types of waste that are prohibited; and this consent condition is considered to be acceptable.

It is further noted that continued improvements to the management process are anticipated as part of the LMP drafting and Council review process. None of the assessments undertaken by this reviewer, or my acceptance of the information provided to date by the applicant, should prejudice Auckland Council's ability to require that additional information is included in the LMP, if Council deems this appropriate in order to protect ecological receptors or human health.

With respect to leachate monitoring, it is noted that the applicant acknowledges that some hazardous-chemical-containing products will be accepted in to the landfill, however the suite of analytes proposed for leachate monitoring is limited. As an example, the proposed leachate monitoring suite does not include any POPs compounds. This omission is important because POPs are:

a. Particularly hazardous to ecological receptors and human health;

b. Present in a range of consumer products that are likely to be disposed of into the landfill as solid waste e.g. the casing / housings for electrical products, circuit boards, cables, plugs, fuses, building insulation, building panels (with heat/flame retardant properties), upholstered furniture, carpets, and curtains; among other things;

c. Subject to restrictions with respect to where they are able to be disposed of, as per the Stockholm Convention, but more pertinent to New Zealand, the Hazardous Substances and New Organisms Act (HSNO), which strictly speaking does not allow disposal of POPs waste in New Zealand.

If it is not possible to set a WAC for the particular POPs that are present in these products (because as noted, these materials are solid waste and therefore cannot be assessed via the TCLP methodology), the landfill is therefore relying on waste acceptance procedures to either exclude such products or accept only limited quantities, such that elevated concentrations of hazardous chemicals are not present in leachate. It is this reviewer's opinion the only way it can be determined that this approach is working is to test the leachate. This rationale also applies to other known or emerging contaminants that have been identified in the Stockholm Convention as being of particular concern, and which are likely to be in waste accepted to ARL as solid waste, including (but not limited to) compounds associated with fire retardant products, lubricating products, in rubbers and soft plastics, furniture upholstery, insulating products, wood preservatives, dyes, personal care products, and many more.

It is therefore recommended that the leachate monitoring analytical suite is expanded to include (as a minimum) POPs compounds associated with fire retardant products. This monitoring should be done on an annual basis. Other compounds may need to be added to the leachate analysis suite depending on the findings of the regular review of the LMP and WAC which is to be undertaken, where it is determined that additional contaminants of concern must be addressed.

6. With respect to the assessment of risk to ecological receptors and human health:

a. Has the assessment of risk to these receptors been appropriately carried out?

The exposure assumptions that underpin the risk assessment, and the methodology, is accepted as being appropriate.

b. Have the appropriate receptors been identified?

It is considered that the range of receptors has been appropriately identified. Such receptors include (but are not limited to): surface water bodies into which groundwater (containing leachate) may discharge; domestic groundwater users; residents consuming produce grown with the use of groundwater; etc. However, unless the hydrogeological assessment that has been undertaken by the applicant is sound, there can be no assurance that the receptors that have been assessed are situated in an appropriate location to determine if they will be impacted; or whether all specific receptors that should have been assessed have been included. Aslan Perwick discusses this in detail in his specialist hydrogeological assessment memo; and refer to the response at Question 7 for further detail.

c. Have the potential migration and exposure pathways by which contaminants could impact receptors been appropriately identified?

As above, the range of migration and exposure pathways that the applicant has identified is considered to be sufficient; however, also as above, unless the hydrogeological assessment that has been undertaken by

the applicant is sound there can be no assurance that the conclusions reached by the applicant with respect to the direction and end point of contaminants via the identified migration pathways is correct. Refer to the response at Question 7 for further detail.

d. On the basis of the proposed WAC does the risk assessment show that the risk to receptors is acceptably low, or not?

The risk assessment was based on contaminant transport modelling, using the Redvale (or Kate Valley) leachate quality data as the concentration at source; or where data from Redvale or Kate Valley was not available for a particular contaminant, leachate quality data from international literature. In terms of the linkage back to the WAC, the assumption is that setting the WAC at the proposed levels will not result in concentrations of contaminant in leachate that are higher than those observed at Redvale or Kate Valley, or which are recorded in the literature. As the proposed WAC are very similar (if not identical) to the Redvale WAC this is considered to be an acceptable assumption.

The risk assessment concludes that the risk to ecological receptors and human health is acceptably low. Further information regarding the sources of contamination that had been included in the risk assessment was provided as part of the Section 92 process, with the applicant clarifying that all potential on-site sources of contamination had been considered (e.g. landfill leachate and stormwater runoff emanating from other activity areas). In addition, various revisions of the risk assessment were carried out to include an assessment of cumulative risk (e.g. considering receptor exposure from both the landfill and other potential sources, as well as background exposure), and to assess the risk of exposure via additional pathways (e.g. the use of surface water for vegetable garden irrigation).

The sum of the information provided indicates that the risk to ecological receptors and human health from discharges from the landfill and ancillary features is acceptably low. That is to say, the modelled concentrations of contaminants at the identified exposure points do not exceed the applicable human health or environmental guidelines.

However, questions have been raised via the Section 92 process by other experts, including Alan Pattle (landfill engineering), and Aslan Perwick (hydrogeology) about the input data and migration pathway assumptions utilised in the contaminant transport model. Most notably in regard to the assumed quantity of leachate that may leak from the landfill to groundwater, and the assumed groundwater flow regime that will result in the transport of any leaked leachate. These matters are discussed further at Question 7 below.

7. Is the risk assessment based on appropriate assumptions with respect to leachate discharge potential, and a sound geological / hydrogeological conceptual model?

The contaminant transport modelling undertaken by the applicant is based on an assumed leachate leakage rate of 3 m^3/ year, which is the equivalent of 8.2 L/day. The applicant notes that this rate is considered to be conservative, because the proposed landfill liner system will largely prevent discharges of leachate from occurring. At this rate, and using the hydrogeological assumptions entered into the model, the modelled concentrations of contaminants at the nominated exposure points were assessed as being below applicable human health and environmental guidelines.

Via the Section 92 process, questions have been raised by other experts, primarily Alan Pattle and Aslan Perwick, as to whether the assumed leachate leakage rate was appropriate; and whether the hydrogeological assumptions utilised in the contaminant transport modelling were sound. In response, the applicant has carried out a revision of the model using a different set of hydrogeological assumptions,

and an altered approach to applying the 3 m^3/yr leachate leakage rate. Some of these assumptions, namely surface water dilution factors, have been increased e.g. made less conservative.

The revised modelling showed that there may be higher concentrations of contaminants at one of the points of exposure, being a farm bore used for domestic purposes (POE4 and POE5). It is noted that higher modelled concentrations at other points of exposure, in surface water receptors, were mitigated in the modelling by the application of higher dilution rates (which were obtained from a third-party regional scale computer model, rather than physical flow gauging). With respect to the impact of these results on human health (for users of the water from the farm bore), the applicant has provided calculations showing there is no change to the assessed risk to human health as a result of exposure to contaminants associated with the landfill, with the assessed risk remaining as low. For some contaminants, the revised concentration levels were found to exceed the applicable environmental guidelines for the protection of ecological receptors (the ANZECC, 2018 water quality guidelines). However, it is noted that the comparison of groundwater to these guidelines is a conservative approach, as the guidelines were derived to assess the risk from contaminants in the receiving environment, after reasonable mixing. The ultimate conclusion made by the applicant is therefore that the revised modelling shows that the risk to ecological receptors and human health from leachate discharges from the landfill is acceptably low.

However, I understand that fundamental questions about the adequacy of the hydrogeological assessment completed by the applicant remain. I defer to Aslan Perwick on this matter but share what I understand are his concerns with respect to:

- The adequacy of the assessment of the potential effects the landfill may have on the groundwater flow regime;
- The impacts that any changes to the groundwater flow regime caused by the establishment of the landfill may have on the migration of leachate discharges from the landfill. This is particularly relevant with respect to groundwater flow and contaminant transport in the shallower, Upper Pakiri aquifer. The specific concerns in relation to the shallow aquifer are that the establishment of the landfill and the under-liner drains, particularly the central under-liner drain at the base of Valley 1, will result in an altered groundwater flow regime within the landfill footprint. The shallow groundwater flow within Valley 1 will likely predominantly be drawn towards the centre of the valley and into the under-liner drain. However, beyond the influence of the under-liner drain, and (generally) nearer to the edges of the proposed Landfill footprint, downwards migration of groundwater is considered more likely to occur, e.g. migration from the shallow to the deep aquifer. This would result in any leachate seeps and leaks which migrate to shallow groundwater in the central area of Valley 1 being drawn towards (and into) the under-liner drain; whilst leachate leaks/seeps that occur more towards the footprint extremity may migrate downwards and ultimately into the deeper regional aquifer zone;
- The migration direction of the deep, regional aquifer has likely been misinterpreted. Rather than a north westerly flow direction, a south westerly flow direction, towards the Waiteraire Stream is considered more likely;
- Whether any changes in the migration direction of leachate discharges from the landfill will result in changes to the assessment of whether the appropriate receptors have been identified (and therefore whether the risks to those receptors have been adequately assessed);
- Whether the proposed monitoring locations (for both the assessment of baseline conditions, and ongoing potential effects detection) remain appropriate if the groundwater flow regime and discharge migration direction have been inadequately or inaccurately assessed.

With respect to bullet #2 above, if the groundwater flow regime associated with Valley 1 is changed such that downwards migration of groundwater from the shallow to the deep aquifer at the edges of Valley 1

becomes more likely, there is a greater chance that regional groundwater may be impacted by any leachate leaks or seeps that occur near the Valley 1 ridgelines. Contaminants transported to the deeper regional aquifer via this pathway can then migrate towards receptors (which may not have been appropriately assessed) with regional groundwater flow, as discussed further below.

I understand that the under-liner drain is to discharge to the stormwater retention system at the toe of the landfill. Therefore, leachate leaks or seeps through the liner across the majority of the landfill footprint, which migrate into the shallow groundwater system, will be transported with groundwater flow to the under-liner drain; and will subsequently be discharged in to the stormwater ponds. I do not consider that this is a contaminant transport pathway that has been well assessed by the applicant, particularly in the HHRA which does not consider the potential effect of the under-liner drain on leachate migration; and which therefore does not consider the potential impacts on stormwater quality, or on the stream receptor at POE1. It is understood that monitoring of the stormwater ponds for the presence of leachate is a requirement of the LMP, and that the applicant has stated that leachate migrating into the stormwater ponds via any pathway (including the under-liner drains) will not result in concentrations of contaminants that are elevated above applicable guideline values; and will be able to be appropriately managed. However, I consider that additional human health and ecological risk assessments should be undertake for POE1 that explicitly consider the potential contaminant inputs from the under-liner drain.

With respect to bullet #3 above, if the regional groundwater flow direction is more south-west from the landfill such that migration is towards the Waiteraire Stream, then it is considered that potential receptors to the south through west south-west of the landfill footprint should be assessed as these are the most likely to be affected by any leachate release. This includes the proposed potable water abstraction bore for the landfill facility, TB01.

In addition, it is the opinion of this reviewer that further assessment of the potential effects on receptors at higher assumed leachate leakage rates would be useful (provided that such an assessment is made utilising appropriate hydrogeological assumptions). Such an assessment would better allow support for the conclusion of the applicant that the effects of discharges from the landfill will be acceptably low, if the modelling demonstrates this to be the case. It would also allow a more rigorous assessment of the potential risks to receptors in the case of a more substantial liner failure (a circumstance that the applicant has assessed as having a moderate residual risk, and has therefore not modelled).

5.0 Assessment of Submissions

The submissions received by Auckland Council with respect to the WAC and environmental risk aspects of this application have been reviewed. The following is a summary of the key issues highlighted by submitters; and whether these issues have been addressed in the application, or via responses to Section 92 requests for further information.

Submission Theme		Comment
1	The placement of waste that may result in adverse impacts to the Hōteo River	Largely addressed in the application materials and via information provided as part of the Section 92 process. It is noted however that the Hōteo River may not be the only / most significant surface water receptor that may be impacted by discharges (refer commentary in Section 4, Question 7); and that the potential for the Waiteraire Stream to be impacted by discharges from the landfill has not been assessed to date.

2	The placement of waste that may result in adverse impacts to the Kaipara Harbour	Addressed in the application materials.
3	The placement of waste that may result in adverse effects to groundwater quality	Largely addressed in the application materials although refer to Aslan Perwick's memo which indicates that groundwater quality to the south-south west of the landfill may be affected, which has not been assessed to date.
4	The adequacy of the monitoring regime to prevent discharges to receptors; and of the contingency measures that are implemented to respond to any leachate breakout events.	Largely addressed in the application materials although as per responses to Points 1 and 3, and as discussed in Section 4, Question 7, if groundwater migration changes to a south-south westerly direction as a result of the establishment of the landfill there is inadequate monitoring proposed in this direction.
5	The proposal conflicts with the purpose and principals of the RMA	Largely addressed in the application materials.
6	The potential for leachate discharges to occur during high rain fall events causing surface flooding	Largely addressed via information provided during the Section 92 process.
7	The proposal conflicts with the Auckland Unitary Plan	Largely addressed in the application materials and via information provided during the Section 92 process.
8	The placement of wate that may result in adverse effects to soil quality.	Largely addressed in the application materials and via information provided during the Section 92 process.
9	The likelihood that discharges to the environment (soil, groundwater, surface water) will occur in the event of liner failure.	Somewhat addressed in the application materials although a quantitative assessment of this scenario has not been undertaken.

6.0 Assessment of Environmental Effects

The key environmental effects that may arise from the operation of the landfill, as it relates to my areas of assessment are:

- Contamination of groundwater as a result of leachate discharge through the liner (either incrementally as seepage or via a breach in the liner caused by an engineering failure);
- Contamination of surface water as a result of leachate discharge from the surface of the landfill (either as seeps or due to substantial failure of a landfill structure);
- Contamination of groundwater or surface water as a result of ancillary facility operations;
- Impacts to the health of groundwater or surface water users, and / or to ecological receptors, as a result of discharges.

The prevention of potential environmental effects as it relates to waste acceptance and environmental risk will be substantially achieved by two means:

1. Ensuring that waste deposited in the landfill complies with the WAC (both numerical criteria and waste acceptance procedures). This means that the waste: is not prohibited waste; does not

contain concentrations of contaminants that exceed the WAC; does not have properties that could impact leachate production or quality (e.g. elevated pH) and is not otherwise hazardous; and does not contain concentrations of toxic, persistent, or bio-accumulative contaminants that would results in elevated concentrations of contaminants in leachate, thereby posing a risk to the environment should leachate discharge to surface water or groundwater. (Note that the acceptance of unsuitable waste also increases the likelihood of discharges of unacceptable levels of contaminants to air, and / or the increased potential to cause landfill fires, as discussed by Paul Crimmins.)

2. The prevention (to the degree possible), or minimisation of potential discharges from the landfill via appropriate engineering and operation of the facility.

As noted in Section 4 this mainly comes down to detailed and competent assessment and management of the incoming waste; and the competent design, construction, management, and maintenance of the landfill structures.

In addition monitoring of leachate and receiving environments, at an appropriate frequency, in suitable locations, and for an appropriate range of contaminants, will assist with determining whether discharges which could result in adverse impacts to the environment are being prevented. The leachate monitoring programme must include a broad enough range of contaminants that it can be determined that the waste management procedures are appropriately excluding or minimising acceptance of hazardous materials; and that the leachate that is generated by the waste does not contain elevated concentrations of hazardous chemicals that could result in adverse effects to human health or ecological receptors if released to the environment.

The water quality monitoring programme must be comprehensive enough that contamination of the regional aquifer is detected, if this should occur. The Groundwater Monitoring and Management Plan should outline the management and remediation measures that may be implemented in the event that contamination of the aquifer occurs. Such measures may include, but not be limited to, active remediation measures such as the installation of groundwater interception structures, removal of groundwater via pumping for treatment or disposal, or the in-situ treatment of groundwater via the introduction of air, reagents, or encouraging biological activity. Reactive measures may also include the introduction of controls on, or the prohibition of water takes and / or the collection of food from potentially affected receptors. Passive measures may include the ongoing monitoring of groundwater and surface water to assess the degree to which impacts on quality have occurred; and the analysis of food items (e.g. cress, fish, milk, eggs) that may have been affected by the presence / use of impacted water.

6.1 Waste Deposition in Accordance with the WAC

The applicant has demonstrated that they have knowledge of the appropriate management of waste, and the measures that are required to prevent the acceptance of unsuitable waste that could result in elevated concentrations of contaminants in leachate. The numerical WAC that have been proposed are assessed as being appropriate for a Class 1 landfill.

However it is this reviewers opinion that it is not what is know about the waste that is a cause for concern, but rather what is not known, or not adequately appreciated; particularly in terms of the presence and concentration of toxic, persistent, or bio-accumulative contaminants that may hot have historically been assessed, or are only now emerging as a cause for concern, or have not yet been identified as a cause for concern. As noted in Section 4, the successful management of this issue, and the prevention of unsuitable material being disposed of to the landfill, will be achieved by the creation of a robust LMP, and the rigorous implementation of that LMP.

This is particularly true given the applicant's submission that they are able to manage the assessment of waste containing uncommon or emerging contaminants, for which there is no numerical WAC, on a case-by-case basis.

As such, the LMP is a critical document; and the rigorous implementation of the LMP by WMNZ, particularly as it pertains to the assessment of incoming special waste, is vitally important. It is expected that regular auditing of waste acceptance practices, and Council review and approval of the LMP at intervals throughout the life of the consent, but particularly following any updates to the LMP, will occur.

In addition, monitoring of leachate for a range of contaminants that will appropriately assess whether concentrations of hazardous chemicals are accumulating in leachate is an essential component of the landfill management system. This is particularly true for hazardous chemicals such as POPs, which are unlikely to be able to be excluded entirely from the landfill due to their ubiquitous presence in a range of consumer products that will be disposed of to the landfill as solid waste.

6.2 Landfill Engineering

With respect to the engineering aspects, I defer to Alan Pattle who has reviewed the applicant's Landfill Engineering assessment on behalf of Council.

6.3 Assessment of Risk to Receptors

As noted in Section 4, the methodology and results of the HHRA are generally accepted. The HHRA shows that the risk to the identified receptors at the nominated points of exposure are low. However, my key concern is that the groundwater flow regime post-landfill construction may not have been properly determined. Accordingly, the risk assessment may not have considered the most applicable contaminant migration pathways and directions, exposure points, and receptors; and / or may not have accurately assessed the potential effects at the points of exposure.

Further assessment is recommended, both pre- and post-construction of the landfill, to ensure that the groundwater flow regime is well understood. This is also necessary to ensure that monitoring is undertaken in the right locations to accurately assess any discharges from the landfill. Accepting the opinion of Aslan Perwick that the regional groundwater aquifer is likely to migrate in a south westerly (as opposed to the north westerly direction presumed by the applicant); and that the establishment of the landfill is likely to result in a greater ability for vertical migration of groundwater from the shallow to the deep aquifer, I consider that additional receptors/points of exposure to the south west should be assessed including but not limited to the planned potable water supply for the landfill (TB01), and the Waiteraire Stream (both ecological receptors and human health). I also consider that further assessment should be made in the HHRA regarding the contaminant transport pathway represented by the under-liner drain, and the potential effect this pathway may have on water quality at POE1.

6.4 Regulatory Control

With respect to the key matters outlined above, the main points with recommendations for regulatory control as appropriate are outlined below.

Aspect	Risk Event	Preventative Response	Regulatory Control
Waste acceptance	Deposition of prohibited, toxic, persistent, bio-accumulative, or otherwise hazardous waste at concentrations	Setting of numerical WAC which cannot be exceeded	Condition, LMP, LMCP GMMP
		Implementation of waste acceptance	Condition, LMP, LMCP, GMMP

Aspect	Risk Event	Preventative Response	Regulatory Control
	which could adversely impact leachate quality	procedures that screen for and prevent the acceptance of unacceptable / unsuitable waste	
	Presence of novel contaminants for which no WAC exist and about which current knowledge is lacking	Regular review of relevant information sources to ensure knowledge of emerging contaminants	Condition, LMP*
		Addition to WAC, update to procedures based on review	Condition, LMP*
Leachate or other contaminant discharge to groundwater	Incomplete understanding of the range of hazardous chemicals accumulating in leachate as a result of waste accepted to landfill	Broaden the range of contaminants included in annual leachate monitoring suite	Condition, LMP
	Inappropriately assessed groundwater flow regime resulting in mis-identified contaminant migration pathways, direction	Update groundwater assessment	Condition, HA
		Update HHRA with additional points of exposure	Condition, HHRA
		Installation and monitoring of groundwater monitoring wells in suitable locations to assess groundwater flow regime and contaminant migration (if any)	Condition, GMMP
	Contamination of the aquifer via leachate discharge	Installation and monitoring of groundwater monitoring wells in suitable locations to assess contaminant migration, and to inform management decisions	Conditions, GMMP

Aspect	Risk Event	Preventative Response	Regulatory Control
		Surface water monitoring at appropriate locations to determine if receptors have been impacted, and to inform management decisions	
		Testing of food items to determine effects as a result of impacted water.	
		Determination and implementation of appropriate remediation measures.	

LMP: Landfill Management Plan

GMMP: Groundwater Monitoring and Management Plan

LMCP: Leachate Monitoring and Contingency Plan

HA: Hydrogeology Assessment

HHRA: Human Health Risk Assessment

* indicates that an update of the LMP and Council review and approval are anticipated

7.0 Conclusions and Recommendations

The criteria and procedures relating to waste acceptance that have been provided by the applicant are in line with current industry guidance in New Zealand. However, due to the evolving nature of industrial chemistry, and the novel chemicals that are utilised in products that will eventually become waste; and the use / mis-use of chemical compounds in the environment which may impact soils which become waste, it is the opinion of this reviewer that reliance on current best practice is insufficient to ensure that ARL does not result in adverse impacts on the environment as a result of discharges.

As a result of the Section 92 process, the applicant has made updates to proposed WAC and waste acceptance procedures that have strengthened the application. The key controlling document in relation to waste acceptance is the LMP. It is critical that this document is industry-leading, and that it is implemented with the utmost rigor. Further improvements to the currently proposed LMP are anticipated as part of the consenting process.

The HHRA shows that as currently assessed, the risk to the identified receptors at the nominated points of exposure are low. However questions remain about the appropriateness / completeness of the Hydrogeological Assessment, particularly with respect to groundwater flow direction; and with respect to the modelled leachate leakage rate. This reviewer recommends that additional hydrogeological assessment and monitoring are undertaken to ensure that the effects of the landfill on the groundwater flow regime are well understood, particularly as it pertains to the potential transport of contaminants away from the landfill via groundwater. Such information is vital to ensure that long term groundwater

and surface water monitoring, designed to detect discharges from the landfill, is undertaken at locations that will provide accurate information. Further, such information is necessary to ensure that the correct points of exposure and receptors have been assessed, such that the conclusion that discharges from the landfill pose a low risk to receptors can be fully supported.

Monitoring of leachate for a sufficiently broad range of contaminants is required to assess the ultimate consequences of the waste acceptance procedures. Appropriate groundwater monitoring will also ensure that any leachate discharges to the aquifer are detected such that suitable remediation and / or management decisions can be made.

8.0 Limitation

This memorandum has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by the applicant Waste Mangement NZ Ltd, and others (not directly contracted by PDP for the work), including Auckland Council. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the memorandum. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

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

Prepared by

Natalie Webster

Technical Director – Contaminated Land

ATTACHMENT 3

LIST OF SUBMISSIONS

The full submissions have not been re-produced in this agenda. They can be found at

https://www.aucklandcouncil.govt.nz/have-your-say/hearings/find-hearing/Pages/resource-consent-hearing-documents.aspx?HearingId=299

ID	Submitter	Organisation Name	Submission Options
9846	Aaron Apihai Mathew Pihema		opposes the application in whole or in part
9885	Abigail Meagher		opposes the application in whole or in part
9134	Adam Minoprio		opposes the application in whole or in part
EPL216	Adrian Phillip Noda		opposes the application in whole or in part
10045	Aileen Berry		opposes the application in whole or in part
9540	Aimee Higgs-Healy		opposes the application in whole or in part
9285	Aimee Kruger		opposes the application in whole or in part
9912	Aimee Packer		opposes the application in whole or in part
9768	Alan Gilbert von Tunzelman	Warkworth Country House	opposes the application in whole or in part
9287	Alan Johnson		opposes the application in whole or in part
EPL226	Alan Riwaka		opposes the application in whole or in part
8139	Alan William Preston		opposes the application in whole or in part
9907	Alastair Brickell	Stargazers B&B and Astronomy Tours	opposes the application in whole or in part
7931	Albert Terence Kidd		opposes the application in whole or in part
EPL001	Alex Natiso		opposes the application in whole or in part
9919	Alex Schenz		opposes the application in whole or in part
EPL002	Alex van Dam		opposes the application in whole or in part
EPL191	Alice Davis		opposes the application in whole or in part
8040	Alisja Ann Skelling		opposes the application in whole or in part
EPL194	Alison Anna Third		opposes the application in whole or in part
8146	Alison Baird		opposes the application in whole or in part
9921	Alison Michelle Enticott		opposes the application in whole or in part
10081	Alistair de Joux		opposes the application in whole or in part
10032	Allan Mark Dudley		opposes the application in whole or in part
9622	Allan Stuart Wetherall		opposes the application in whole or in part
EPL003	Allen and Dorothy Dove		opposes the application in whole or in part
EPL200	Alton Crisp & Susan Speedy (more petition signatories. Refer online submission 9423)	No Mega Landfill	opposes the application in whole or in part
9423	Alton Crisp & Susan Speedy [refer also to EPL200 which has more signatures on petition]		opposes the application in whole or in part
9890	Amanda Jackson		opposes the application in whole or in part
9289	Amanda Jane Hebben		opposes the application in whole or in part
EPL004	Amiria Hemana		opposes the application in whole or in part
EPL005	Amisha and Tony O'Brien		opposes the application in whole or in part
9887	Amy Griffiths		opposes the application in whole or in part
EPL006	Ana Miria Kidwell		opposes the application in whole or in part
9694	Anataia Ngapiu Murphy-Pirini		opposes the application in whole or in part
7922	Andre Brayne		opposes the application in whole or in part
EPL206	Andrea Vujnovich		opposes the application in whole or in part
8885	Andrew David Botica		opposes the application in whole or in part
9889	Andrew Griffiths		opposes the application in whole or in part
EPL210	Andrew John South		opposes the application in whole or in part
9359	Andrew Lambert		opposes the application in whole or in part
9276	Andrew Robert Scott		opposes the application in whole or in part
10043	Andrew Scott		opposes the application in whole or in part
EPL204	Andrew Short		opposes the application in whole or in part
9993	Andrew Wallace		opposes the application in whole or in part
9483	Andrey Drobotun		opposes the application in whole or in part
EP04	Angela Cora Clinton Buckton		opposes the application in whole or in part
9647	Angela Newton		opposes the application in whole or in part
EPL007	Angela Pauline Perawiti		opposes the application in whole or in part
EPL008	Angela Susan Dickson		opposes the application in whole or in part
9274	Anika Rahm		opposes the application in whole or in part
9023	Anita Thompson		opposes the application in whole or in part
9297	Anita Walker		opposes the application in whole or in part
9673	Anna Harriet Pendred		opposes the application in whole or in part
9425	Anna Ingham		opposes the application in whole or in part
9835	Anna Steedman		opposes the application in whole or in part
EPL009	Annabelle Rose Porter		opposes the application in whole or in part
9874	Annalisa Wong		opposes the application in whole or in part
9909	Anne Richards		opposes the application in whole or in part
9924	Anne Smith		opposes the application in whole or in part
9999	Anne Taylor		opposes the application in whole or in part
9272	Annette Mary Dark		opposes the application in whole or in part
10064	Anthony Ivan Vujnovich		supports the application in whole or in part
10071	Anton Matthew John Carter		opposes the application in whole or in part
EP32	Antony Pai		opposes the application in whole or in part
EPL010	April Jan Ashton		opposes the application in whole or in part
9656	Ariana Kahui		opposes the application in whole or in part
9333	Arina Bosch		opposes the application in whole or in part
9952	Arlette Farland		opposes the application in whole or in part
9625	Arnold Robert Tupe		opposes the application in whole or in part
9696	Aroha Gray		opposes the application in whole or in part
9318	Arrum Stones		opposes the application in whole or in part
EPL011	Arthur Geoffrey Pickstone		opposes the application in whole or in part
9747	Arthur Price		opposes the application in whole or in part
8965	Ashley Nicole Blair		opposes the application in whole or in part
EPL230	Auckland Conservation Board		opposes the application in whole or in part
9588	Auckland Conservation Board c/o DoC		opposes the application in whole or in part
EP14	Auckland Transport		opposes & supports in part

9678	Barbara Joan Hamilton		opposes the application in whole or in part
9635	Barbara Just		opposes the application in whole or in part
9307	Barbara Sdhephear		opposes the application in whole or in part
EPL012	Barbara Te Pou Hemana		opposes the application in whole or in part
9906	Barry George and Rosemond May Rose		opposes the application in whole or in part
9576	Ben Moir	Kaipara Marine	opposes the application in whole or in part
9022	Ben Thatcher		opposes the application in whole or in part
10015	Beneace Steffens		opposes the application in whole or in part
EPL013	Bernette Rosalie Malizia		opposes the application in whole or in part
EPL014	Bethany Thurston		opposes the application in whole or in part
9025	Betsy Tipping		opposes the application in whole or in part
9868	Bianca Howlett		opposes the application in whole or in part
9003	Birgit Rahm		opposes the application in whole or in part
9989	Bonnie Ellen Cohen		opposes the application in whole or in part
9417	Boyd Jones		opposes the application in whole or in part
9378	Brandon Barclay		opposes the application in whole or in part
EPL015	Breda and Ron Matthews		opposes the application in whole or in part
9572	brendan Reid		opposes the application in whole or in part
9670	Brendda Salt		opposes the application in whole or in part
9397	BRENT NATHAN PARKER		opposes the application in whole or in part
9270	Brent Pascoe		opposes the application in whole or in part
7988	Brett a'Court		opposes the application in whole or in part
9817	Brett Stansfield	Environmental Impact Assessments Ltd	opposes the application in whole or in part
9009	Brian Smith		opposes the application in whole or in part
10014	Brian Wetherall		opposes the application in whole or in part
9344	Briar Gimblett		opposes the application in whole or in part
9549	Bridget Moir		opposes the application in whole or in part
9998	Bridgit Bretherton-Jones [combined with 9620]	Waterfall farm (Whaiwhiu) Limited	opposes the application in whole or in part
9620	Bridgit Bretherton-Jones [combined with 9998]		opposes the application in whole or in part
9459	Brigitte Hagemann		opposes the application in whole or in part
9566	Bronson Moors		opposes the application in whole or in part
9485	Bruce Levien	Yakka Contracting	supports the application in whole or in part
EP35	Bruce Parris		opposes the application in whole or in part
9442	Bruce Snowsill		is neutral regarding the application in whole or in part
9271	C Elizabeth Holsted		opposes the application in whole or in part
10005	Callan Neylon		opposes the application in whole or in part
EPL016	Campbell Tapurau		opposes the application in whole or in part
8979	Caren Davis		opposes the application in whole or in part
8593	Caren Virginnia Murphy		opposes the application in whole or in part
9695	Carlin Shaw		opposes the application in whole or in part
EPL017	Carmel Theresa Rata		opposes the application in whole or in part
9949	Carol Dawn Weaver		opposes the application in whole or in part
9878	Caroline Milner		opposes the application in whole or in part
9974	Carolynn Harris		opposes the application in whole or in part
9869	Casey Wikiriwhi-Heta		opposes the application in whole or in part
EPL018	Cassandra Kingi - Waru		opposes the application in whole or in part
9823	Catherine Braham		opposes the application in whole or in part
EPL019	Catherine Ann Rameka		opposes the application in whole or in part
9774	Catherine Eliot-Cotton		opposes the application in whole or in part
EP03	Cathryn J Downes		opposes the application in whole or in part
9830	Celia attwood		opposes the application in whole or in part
10009	Charlotte King		opposes the application in whole or in part
EPL020	Charlotte Rudolph		opposes the application in whole or in part
9769	Charlotte-rose Fasitaue Rudolph		opposes the application in whole or in part
9589	Chase Hann		opposes the application in whole or in part
9574	Chaslyn Still		opposes the application in whole or in part
9292	Cherie Gwilliam		opposes the application in whole or in part
9677	Cheryl Prendergast		opposes the application in whole or in part
10017	chris Dermott		opposes the application in whole or in part
EP21	Chris Jensen		opposes the application in whole or in part
EPL021	Chris Leitch	Social Credit	opposes the application in whole or in part
9946	Chris Newman	First Nation Association of New Zealand	opposes the application in whole or in part
8052	Chris Scherrer		opposes the application in whole or in part
9004	Chrissy Longworth		opposes the application in whole or in part
9365	Christal Monk nee Manukau		opposes the application in whole or in part
EPL022	Christiane Anania		opposes the application in whole or in part
9294	Christine Anne Rogan		opposes the application in whole or in part
9918	Christopher Hunter		opposes the application in whole or in part
EPL023	Christopher James Fulop		opposes the application in whole or in part
7929	Cindy Kapea		opposes the application in whole or in part
10020	Clair mcentegart		opposes the application in whole or in part
9749	Claire Anstett		opposes the application in whole or in part
9714	Claire Forno		opposes the application in whole or in part
10076	Claire Hamilton		opposes the application in whole or in part
7940	Claire N Wolfgramm [combined with 9490]		opposes the application in whole or in part
9490	Claire Nina Wolfgramm [combined with 7940]	Te Runanga o Ngāti Whātua	opposes the application in whole or in part
10022	Claire Wirth		opposes the application in whole or in part
10059	Clare Gregory		opposes the application in whole or in part
EPL217	Clarence Foreman		opposes the application in whole or in part

9859	Clay Hoani Hawke		opposes the application in whole or in part
EPL183	Cliff Taylor		opposes the application in whole or in part
9607	Colin Graham Minton		opposes the application in whole or in part
9523	Colin Gregory Smith		opposes the application in whole or in part
EPL024	Colin Lindsay Phillips and Sheryl Isobel Pilkington		opposes the application in whole or in part
9579	Colinda Rowe		is neutral regarding the application in whole or in part
9648	Connell Sean Mackay		opposes the application in whole or in part
EPL025	Connie Povey		opposes the application in whole or in part
9726	Corene Humphreys		opposes the application in whole or in part
9323	Corey Randall Haimona Rangi Todd		opposes the application in whole or in part
9370	Corina Alipate [repeated submission 9371 deleted]		opposes the application in whole or in part
10047	Courtenay Hunt		opposes the application in whole or in part
EPL188	Craig Joiner		opposes the application in whole or in part
9426	Craig Purvis [combined with 10038]		opposes the application in whole or in part
10038	Craig Purvis [combined with 9426]		opposes the application in whole or in part
EPL219	Craig William MacPherson		opposes the application in whole or in part
EPL026	Cray De Boer		opposes the application in whole or in part
9812	Crystal Rowe		opposes the application in whole or in part
9664	Cushla Salt		opposes the application in whole or in part
EPL027	Dallas Taylor		opposes the application in whole or in part
9599	Dane Batts		opposes the application in whole or in part
9336	Danelle Brown		opposes the application in whole or in part
9111	Daniel Hawee	Small kine ding repairs	opposes the application in whole or in part
9428	Daniel Mohr		opposes the application in whole or in part
EPL179	Daniel Robert Donovan		opposes the application in whole or in part
9595	Daniel Tohill		opposes the application in whole or in part
EPL028	Daniel Vladimir Fulop		opposes the application in whole or in part
9902	Danielle Kennedy		opposes the application in whole or in part
9851	Danny Morgan	Te Uri O Hau	opposes the application in whole or in part
EPL029	Darlene Anne Clark		opposes the application in whole or in part
EPL030	Darren Povey		opposes the application in whole or in part
EPL031	Darryn Ray Holloway		opposes the application in whole or in part
10028	David Adams		opposes the application in whole or in part
9363	David Aird Torrance		opposes the application in whole or in part
EPL032	David Allan Beattie		opposes the application in whole or in part
EP18	David and Ann Harley		opposes the application in whole or in part
EPL033	David and Marietta Van Dam		opposes the application in whole or in part
9863	David Bruce Mason		is neutral regarding the application in whole or in part
9782	David Cunningham		opposes the application in whole or in part
9381	David Henry		opposes the application in whole or in part
9657	David Ieuan Thomas Sawyer		opposes the application in whole or in part
EPL207	David Ingram		opposes the application in whole or in part
9762	David McCarthy		opposes the application in whole or in part
10044	David Parker	Kotare Research & Education for Social Change in Aotearoa Charitable Trus	opposes the application in whole or in part
9558	David Smith		opposes the application in whole or in part
9301	David Wilmot		opposes the application in whole or in part
9763	Dawn Clayden		opposes the application in whole or in part
9633	Dawn Fay Isabella Judge		opposes the application in whole or in part
EPL227	DC Webster		opposes the application in whole or in part
9943	Dean Gerrard		opposes the application in whole or in part
9712	Dean Watson		opposes the application in whole or in part
9386	Dean Williams		opposes the application in whole or in part
9688	Dean Yarndley		opposes the application in whole or in part
9888	debbie anderson	Tauraroa Area School Northland	opposes the application in whole or in part
9792	Debbie Aperehama		opposes the application in whole or in part
EP13	Debbie Sarney		opposes the application in whole or in part
9304	Debby Norris		opposes the application in whole or in part
EPL034	Deborah Anne Pickstone		opposes the application in whole or in part
9867	Deborah Hart		opposes the application in whole or in part
9547	Debra Searchfield		opposes the application in whole or in part
9893	Dedrie Trnjanin		opposes the application in whole or in part
9757	Dee Littlejohn		opposes the application in whole or in part
9814	Denis Bourke		opposes the application in whole or in part
9746	Denise Bijoux	Catalyse Network	opposes the application in whole or in part
9898	Denise Stuart		opposes the application in whole or in part
EPL181	Dennis Winston Shepherd		opposes the application in whole or in part
9975	Department of Conservation		opposes the application in whole or in part
EP22	Department of Conservation		opposes the application in whole or in part
9567	Derek Moors		opposes the application in whole or in part
9498	Derek Russell Smith		opposes the application in whole or in part
9629	Des Watson	Kiwis clean aotearoa	opposes the application in whole or in part
EPL035	Deveraux Nachyes Christian Tangaroa-preex		opposes the application in whole or in part
9971	Devon Taylor		opposes the application in whole or in part
9954	Diana Russek	Russek Family	opposes the application in whole or in part
10058	Diana Winter		opposes the application in whole or in part
7938	Diane Greenwood		opposes the application in whole or in part
EPL036	Diane Sheryl Clark		opposes the application in whole or in part
9849	Dianne Civil		opposes the application in whole or in part
7919	Dianne Drew		opposes the application in whole or in part
EPL037	Dianne Kidd		opposes the application in whole or in part

8141	Dion Pilmer		opposes the application in whole or in part
EPL038	Don Urquhart		opposes the application in whole or in part
10024	Donald George Scandrett		opposes the application in whole or in part
9369	Donald Lawson		opposes the application in whole or in part
EPL039	Donna Marie Tapurau		opposes the application in whole or in part
9342	Doreen Kemp		opposes the application in whole or in part
EPL186	Dory Reeves		opposes the application in whole or in part
9455	Dr Jason Smith [replaced by official submission 9487]	Kaipara District Council	opposes the application in whole or in part
9934	Dr Joshua Salter		opposes the application in whole or in part
9710	Eddie Tiepa Bluegum		opposes the application in whole or in part
EPL042	Edith Samson		opposes the application in whole or in part
EPL043	Eileen Taogaga		opposes the application in whole or in part
8890	Eilish West		opposes the application in whole or in part
9269	Elena MacDonald		opposes the application in whole or in part
9394	Elinore Martel		opposes the application in whole or in part
9402	Elizabeth Ann Foster		opposes the application in whole or in part
8519	Elizabeth Ashton		opposes the application in whole or in part
EPL044	Elizabeth Grace Dempster Tree & Michael John Tree		opposes the application in whole or in part
8992	Elizabeth Gregory		opposes the application in whole or in part
EP17	Elizabeth Joan Dowling		opposes the application in whole or in part
9350	Elizabeth Saua		opposes the application in whole or in part
9979	Ella Rickit		opposes the application in whole or in part
9758	Ellanor Maihi-Rupapera		opposes the application in whole or in part
9801	Elsie-May Dowling	Fight the Tip	opposes the application in whole or in part
9283	Emma Grieve		opposes the application in whole or in part
9316	Emma Mallock		opposes the application in whole or in part
9990	Emma Stretch		opposes the application in whole or in part
8085	Emma wright		opposes the application in whole or in part
EP26	Environs Holdings Ltd		opposes the application in whole or in part
10080	Eric Jonathan Boyd		opposes the application in whole or in part
9384	Erin Edinborough		opposes the application in whole or in part
8307	Errol Adams		opposes the application in whole or in part
EPL045	Eruera Manu Emery Berg- MacKinven		opposes the application in whole or in part
EPL046	Eugene Robert Nathan		opposes the application in whole or in part
8083	Eve Bornhauser		opposes the application in whole or in part
EP08	Faye and James Sherwan		opposes the application in whole or in part
EP24	Federated Farmers of New Zealand		opposes the application in whole or in part
9987	Federated Farmers of NZ (Auckland Province) Inc		opposes the application in whole or in part
10057	Fiona Moselen		opposes the application in whole or in part
9575	Fire & Emergency NZ	Beca Limited	is neutral regarding the application in whole or in part
9833	First Gas Limited		is neutral regarding the application in whole or in part
EPL229	Fisheries NZ, Ministry Primary Industries		Neutral
9779	Fletcher Building		supports the application in whole or in part
10050	Fleur Tomlinson		opposes the application in whole or in part
9671	Florian Juergen Rolf Primbs		opposes the application in whole or in part
9926	Forest and Bird-Warkworth		opposes the application in whole or in part
9750	Francois Keen		opposes the application in whole or in part
EPL047	Fraser Gordon Brown		opposes the application in whole or in part
EPL048	Fraserina Panui		opposes the application in whole or in part
EPL049	Gail Lesley Van Reemst		opposes the application in whole or in part
9339	Gail Williams		opposes the application in whole or in part
9848	Gareth Davis		opposes the application in whole or in part
9994	gareth moon		opposes the application in whole or in part
9807	Garry James Lambert		opposes the application in whole or in part
9619	Garth Mackay		opposes the application in whole or in part
9400	Gavin John Brough		opposes the application in whole or in part
9840	Gaylene Gaffney		opposes the application in whole or in part
9571	Geoff Still		opposes the application in whole or in part
9692	Geoffrey Wati Piringi Kora		opposes the application in whole or in part
EPL051	George Samson		opposes the application in whole or in part
EPL050	Gerald Clyde Panui		opposes the application in whole or in part
EPL052	Gessie Moki Rice		opposes the application in whole or in part
9616	Glen Inger	PG & JA Inger & M Carey	opposes the application in whole or in part
EPL053	Glendith Mercia Samson		opposes the application in whole or in part
EPL054	Glenn Clark		opposes the application in whole or in part
EP11	Goatley Holdings Limited		opposes the application in whole or in part
9983	Grace Vujnovich		opposes the application in whole or in part
EPL199	Graeme Dingle & Jo-anne Wilkinson (Lady Dingle)		opposes the application in whole or in part
EPL223	Graeme Stuart McLeod		opposes the application in whole or in part
EPL055	Graham Brian Patrick Dawson		opposes the application in whole or in part
9741	Graham Chan & Susan Perry		opposes the application in whole or in part
9443	Graham Conroy Harris		opposes the application in whole or in part
EPL056	Graham Gough		opposes the application in whole or in part
9649	Graham Tipene	Te Wheke Moko Design Studio	opposes the application in whole or in part
EP09	Grahame Powell		opposes the application in whole or in part
9279	Grainne Taylor		opposes the application in whole or in part
9605	Grant Agnew		opposes the application in whole or in part
EPL057	Grant Barry Hope		opposes the application in whole or in part
10075	Grant Crawford Cowie		opposes the application in whole or in part
EPL058	Grant McCarthy		opposes the application in whole or in part
9667	Greg Doherty	HQH Fitness	opposes the application in whole or in part
9610	Greg Martin	Lemon Tree Bay Partnership	opposes the application in whole or in part

EP01	Gwenda Hungerford		opposes the application in whole or in part
9615	Haimona Rameka-Tupe		opposes the application in whole or in part
9964	Hamish Stewart		opposes the application in whole or in part
10035	Hanna Kloosterboer		opposes the application in whole or in part
9352	Hannah Horrell-Morrison		opposes the application in whole or in part
9291	Hannah Taylor-Rose		opposes the application in whole or in part
EPL059	Hanuere Nicholls		opposes the application in whole or in part
9325	Heather Bryant		opposes the application in whole or in part
9448	Heather Mackay		opposes the application in whole or in part
9986	Heidi Burchett		opposes the application in whole or in part
9968	Helen Jamieson		opposes the application in whole or in part
EP05	Helen Margaret Howard		opposes the application in whole or in part
EPL060	Helen Smith		opposes the application in whole or in part
9930	Helena Cullen		opposes the application in whole or in part
EPL061	Hemi Tapurau		opposes the application in whole or in part
EP30	Henrietta Maria Young		opposes the application in whole or in part
EPL062	Henry Benjamin Rameka		opposes the application in whole or in part
9883	Herby Skipper [combined with 9884 - deleted]	Fight the tip. Save the Dome	opposes the application in whole or in part
9864	Herewaina Tumahai		opposes the application in whole or in part
9963	Heritage New Zealand Pouhere Taonga		opposes the application in whole or in part
9458	Hermann Kall		opposes the application in whole or in part
EPL063	Hoani Neri Porter		opposes the application in whole or in part
9895	Hoki Edmonds		opposes the application in whole or in part
9724	Holger Zipfel		opposes the application in whole or in part
9877	Holly Kestra		opposes the application in whole or in part
EPL182	Holly Southernwood		opposes the application in whole or in part
EPL064	Hone Simons		opposes the application in whole or in part
EPL065	Horowai Hereora		opposes the application in whole or in part
9808	Hugh Hutchinson		opposes the application in whole or in part
EPL066	Hugh Wilson		opposes the application in whole or in part
9785	Hugo Primbs		opposes the application in whole or in part
9970	Huhana Lyndon	Ngati Rango, Ngati Rongo, Ngati Whatua, Te Uri o Hau, Te Kawerau a Maki	opposes the application in whole or in part
EP23	Ian Civil and Denise Civil		opposes the application in whole or in part
9284	Ian Redpath		opposes the application in whole or in part
EP06	Ian Sarney		opposes the application in whole or in part
9362	Ineke van der linden - Smith		opposes the application in whole or in part
9282	Inez MacDonald		opposes the application in whole or in part
9315	Inger Mortensen		opposes the application in whole or in part
EPL067	Irena Roulston		opposes the application in whole or in part
EPL068	Irene Hogan		opposes the application in whole or in part
9759	Irene Gubb		opposes the application in whole or in part
EPL069	Isaac Samson		opposes the application in whole or in part
9354	Isabella Alipate-Roberts		opposes the application in whole or in part
8265	Ivan Wagstaff		opposes the application in whole or in part
EPL070	Izaac Povey		opposes the application in whole or in part
9773	J V Wildermoth		opposes the application in whole or in part
9377	Jackie Fanning		opposes the application in whole or in part
EPL071	Jacquelene Rahera Tibbits		opposes the application in whole or in part
9573	Jacqueline Patton		opposes the application in whole or in part
9959	Jacqueline Stevens		opposes the application in whole or in part
7999	Jacquie Stokes	Stop the tip, save the dome	opposes the application in whole or in part
9984	Jaden Parkes		opposes the application in whole or in part
9329	Jahkodii Morunga		opposes the application in whole or in part
9955	Jaime-Lyn		opposes the application in whole or in part
9341	Jaimelyn Chalmers		opposes the application in whole or in part
9577	Jame Isaacs		opposes the application in whole or in part
EPL177	James Alexander Newman		opposes the application in whole or in part
10040	James Donald McGill		opposes the application in whole or in part
9708	James George		opposes the application in whole or in part
9861	James Graeme Chicken		opposes the application in whole or in part
EPL072	James Iti & Nate Tapurau		opposes the application in whole or in part
9892	Jamie McDell		opposes the application in whole or in part
9828	Jamie Rewiri	Ngati Whatua	opposes the application in whole or in part
9506	Jamii-Lee Smith		opposes the application in whole or in part
EPL073	Janaya Stephens		opposes the application in whole or in part
9591	Jane Banfield		opposes the application in whole or in part
9886	Jane Hotere	Mahurangi aho	opposes the application in whole or in part
9900	Jane Jackson		opposes the application in whole or in part
9950	Jane Pashley		opposes the application in whole or in part
9882	Janet Margaret Hooper		opposes the application in whole or in part
EPL074	Janice Gardner		opposes the application in whole or in part
EPL075	Janice Rae Porter		opposes the application in whole or in part
7932	Janis Buchanan		opposes the application in whole or in part
9407	Janne Radtke		opposes the application in whole or in part
9364	Jarrod McKelvie		opposes the application in whole or in part
EPL076	Jeanette Forde		opposes the application in whole or in part
EPL077	Jeanette Nathan		opposes the application in whole or in part
EPL078	Jeanine Ngaoma Davis		opposes the application in whole or in part
9942	Jemima Briggs		opposes the application in whole or in part
9029	Jenna Vaughn		opposes the application in whole or in part

9594	Jenner Manfred Heinz Zimmermann		opposes the application in whole or in part
9836	Jennifer Barnes		opposes the application in whole or in part
9503	Jennifer Lynn Driskel		opposes the application in whole or in part
7998	Jennifer Margaret Salt		opposes the application in whole or in part
9937	Jennifer Roth Bartlett		opposes the application in whole or in part
8189	Jennifer Saunders		opposes the application in whole or in part
9320	Jenny Neel		opposes the application in whole or in part
EPL079	Jeremy Clark		opposes the application in whole or in part
EPL080	Jeremy JosephFulop		opposes the application in whole or in part
EPL184	Jesse Williams		opposes the application in whole or in part
9777	Jessica connors		opposes the application in whole or in part
EPL197	Jessica Jane Donovan		opposes the application in whole or in part
9309	Jessica Martin		opposes the application in whole or in part
9739	Jessica Stewart		opposes the application in whole or in part
10027	Jessica Wirth		opposes the application in whole or in part
7928	Jill Jackson		opposes the application in whole or in part
10037	Jim Sonerson		opposes the application in whole or in part
9821	Jo Gallagher		opposes the application in whole or in part
8943	Jo Hendren		opposes the application in whole or in part
9385	Jo Wyman-Macer		opposes the application in whole or in part
9416	Joan Helen Brown		opposes the application in whole or in part
9991	Joanne Luijpers		opposes the application in whole or in part
9860	Joanne Macdonald		opposes the application in whole or in part
EPL081	Joanne Montague		opposes the application in whole or in part
9933	Joanne Mqry O'Sullivan		opposes the application in whole or in part
9745	Jodi Ellis		opposes the application in whole or in part
9546	Jodine Treadwell		opposes the application in whole or in part
EPL082	Joe Warren Timoti		opposes the application in whole or in part
EPL202	Joesephine Nathan		neutral regarding application
9838	John Barnes		opposes the application in whole or in part
8084	John Bornhauser		opposes the application in whole or in part
9760	John Clendon Malloy		opposes the application in whole or in part
9420	John Fredrick & Mary Jane Appleby		opposes the application in whole or in part
10053	John Murray Green	Wild West Kayaking	opposes the application in whole or in part
9682	John Raymond Wiltshire		opposes the application in whole or in part
9728	John Taylor		opposes the application in whole or in part
EP19	John Tiernan	Lifecare Constructions Ltd	opposes the application in whole or in part
9743	Jon Claude Walker		opposes the application in whole or in part
9642	Jonathan Stuart Drucker		opposes the application in whole or in part
9167	Jordan King		opposes the application in whole or in part
9689	Joseph Henare Kapa Pihema		opposes the application in whole or in part
9822	Joseph Kapea		opposes the application in whole or in part
9730	Joshua Don [combined with 9732 & 9734 - deleted]		opposes the application in whole or in part
9693	Joshua Moana Hoani Paraone Wikiriwhi-Heta		opposes the application in whole or in part
9894	Joshua Potae		opposes the application in whole or in part
EPL083	Joshua Taitimu-Moore		opposes the application in whole or in part
9015	Joshua Thomas		opposes the application in whole or in part
8872	Josie Gritten		opposes the application in whole or in part
EPL084	Josie Porter		opposes the application in whole or in part
EPL178	Judith Anne Newman		opposes the application in whole or in part
9617	Judith Downer		opposes the application in whole or in part
EP34	Judith Marie Wood		opposes the application in whole or in part
EPL085	Judith Mary Standing		opposes the application in whole or in part
9663	Judy Hindman		opposes the application in whole or in part
EPL086	Judy Kennedy		opposes the application in whole or in part
9904	Julia Carr		opposes the application in whole or in part
9879	Julia Newland		opposes the application in whole or in part
EPL087	Julia Ruth Nevill		opposes the application in whole or in part
9721	Julia Steenson		opposes the application in whole or in part
EPL088	Julie Ann Urquhart		opposes the application in whole or in part
9982	Julie Blanchard		opposes the application in whole or in part
9604	Julie Cook		opposes the application in whole or in part
EPL089	June Taipeti		opposes the application in whole or in part
9659	Jung Hee Kwak		opposes the application in whole or in part
EPL213	Junsu Kim		opposes the application in whole or in part
9953	justin sands		opposes the application in whole or in part
9852	Justine Rockel		opposes the application in whole or in part
EPL090	Justus Lanigan		opposes the application in whole or in part
9624	Kaewa Cassidy		opposes the application in whole or in part
9487	Kaipara District Council [replaces 9455]	Mayor Dr Jason Smith	opposes the application in whole or in part
9776	Kamira henderson		opposes the application in whole or in part
EPL091	Kapo Wairua Komene		opposes the application in whole or in part
9311	Kara Stones		opposes the application in whole or in part
EPL224	Kare Rata & Anthony Sindair		opposes the application in whole or in part
9353	Karen Alipate		opposes the application in whole or in part
EPL092	Karen Ann Ward		opposes the application in whole or in part
9372	Karen Anne King		opposes the application in whole or in part
9772	karen pegrume		opposes the application in whole or in part
EPL196	Karina Haru Donovan		opposes the application in whole or in part
9331	Karla Matua		opposes the application in whole or in part
9374	Karly Harris		opposes the application in whole or in part
EPL190	Karne Harmon		opposes the application in whole or in part

9702	Kataraina davis		opposes the application in whole or in part
EPL093	Kate Blenkinsopp		opposes the application in whole or in part
9978	Kate Ellingham		opposes the application in whole or in part
9652	Kate Leslie		opposes the application in whole or in part
9876	Kate Waldrom		opposes the application in whole or in part
9302	Katherine Jackson	Mangawhai Massage Therapy	opposes the application in whole or in part
10023	Katherine Norman		opposes the application in whole or in part
10049	Kathleen Buck		opposes the application in whole or in part
EPL094	Kathleen Helen Phillips		opposes the application in whole or in part
9661	kathleen smith		opposes the application in whole or in part
10019	Kathleen Tolman		opposes the application in whole or in part
9662	Kathryn Elizabeth Evans		opposes the application in whole or in part
9913	Kathryn Hunter		opposes the application in whole or in part
EPL095	Kathryn Joy Fulop		opposes the application in whole or in part
EPL211	Kathy and Alby Rean		opposes the application in whole or in part
9414	Kathy Mcelroy		opposes the application in whole or in part
9280	Katie Alana Mills		opposes the application in whole or in part
9718	Katie Forno		opposes the application in whole or in part
9810	Katie shaw		opposes the application in whole or in part
9413	Kauri Te Ahu		opposes the application in whole or in part
10069	Kaye Maree Dunn	Making Everything Achievable Ltd	opposes the application in whole or in part
EPL096	Keith Wood		opposes the application in whole or in part
9298	Kelly Francis		opposes the application in whole or in part
EPL097	Kelly Retimana		opposes the application in whole or in part
EPL098	Kelly Taipeti		opposes the application in whole or in part
9324	Kelsey Orford		opposes the application in whole or in part
9839	Ken Jordan		opposes the application in whole or in part
9862	Ken Kerehoma	Ngāti Whatua Orakei	opposes the application in whole or in part
9786	ken marment		opposes the application in whole or in part
9606	Kenneth William Harcombe		opposes the application in whole or in part
9944	Keren Hurt		opposes the application in whole or in part
9698	Kerry		opposes the application in whole or in part
9432	Kerry Allen		opposes the application in whole or in part
EP31	Kerry Lynne Thomas Gore		opposes the application in whole or in part
EPL099	Keverne Vaughan Clark		opposes the application in whole or in part
7937	Kevin Tutt		opposes the application in whole or in part
EPL100	Kevin Ward		opposes the application in whole or in part
8145	Keziah Gallagher		opposes the application in whole or in part
9988	Kim Lewin		opposes the application in whole or in part
9997	Kirstin Lawson		opposes the application in whole or in part
9660	Kirsty Ann Sawyer		opposes the application in whole or in part
EPL187	Kirsty Joiner		opposes the application in whole or in part
9609	Koha Kahui-McConnell	Para Kore Ki Tamaki	opposes the application in whole or in part
9061	Kristal Cole		opposes the application in whole or in part
9778	Kristeen Prangley		opposes the application in whole or in part
EPL101	Kura Jane Geeoe-Watson		opposes the application in whole or in part
9628	Kylee Matthews		opposes the application in whole or in part
8466	Laine Hill		opposes the application in whole or in part
10033	Laura Wild		opposes the application in whole or in part
EPL102	Lavina Komene		opposes the application in whole or in part
8904	Leah Routen		opposes the application in whole or in part
9701	Leah Warbrick	Ngat whatua Orakei	opposes the application in whole or in part
9563	Leane Barry [combined with 9562]		opposes the application in whole or in part
9562	Leane Barry [combined with 9563]		opposes the application in whole or in part
9948	Leane Makey		opposes the application in whole or in part
9733	Leanne Gray		opposes the application in whole or in part
9278	Lee Dobson		opposes the application in whole or in part
9857	Lee Laughton		opposes the application in whole or in part
10010	Leigh Mason		opposes the application in whole or in part
9415	Leihia Wilson		opposes the application in whole or in part
EPL103	Lena Tapurau		opposes the application in whole or in part
9666	Leon Salt		opposes the application in whole or in part
EPL104	Lesile King Noda		opposes the application in whole or in part
10007	Lesley Munro		opposes the application in whole or in part
EPL105	Linda Gail Wichman		opposes the application in whole or in part
9945	Linda Gilbert		opposes the application in whole or in part
9368	Linda Judith Allan		opposes the application in whole or in part
8946	Linda Kendall		opposes the application in whole or in part
9870	Linda M Clapham		opposes the application in whole or in part
EPL106	Linsey Smith		opposes the application in whole or in part
9825	Lionel Anderson		opposes the application in whole or in part
9881	Lionel Don [combined with 7925]		opposes the application in whole or in part
7925	Lionel Don [combined with 9881]		supports the application in whole or in part
9645	Lionel Foster [combined with 9643 & 9644]		opposes the application in whole or in part
9644	Lionel Foster [combined with 9643 & 9645]		opposes the application in whole or in part
9643	Lionel Foster [combined with 9644 & 9645]		opposes the application in whole or in part
10011	Lisa Foden		opposes the application in whole or in part
9980	Lisa Knight		opposes the application in whole or in part
9653	Lisa Outwin		opposes the application in whole or in part
10063	Lisa Treadwell		opposes the application in whole or in part
9005	Lisa Weber		opposes the application in whole or in part
9766	Liza Fairburn	Te uri o hau	opposes the application in whole or in part

10070	Logan Holt	Engco	opposes the application in whole or in part
10008	Lorna Stevenson		opposes the application in whole or in part
9923	Lorraine Brien		opposes the application in whole or in part
EPL107	Louis Nathan		opposes the application in whole or in part
9705	Louisa Currie		opposes the application in whole or in part
EPL108	Louise Ann Porter		opposes the application in whole or in part
EPL109	Lovinia Te Aroha Hatley		opposes the application in whole or in part
EPL110	Luka May Staveley		opposes the application in whole or in part
9723	Lukas Leinweber		opposes the application in whole or in part
EPL111	Lydia Jane Nathan		opposes the application in whole or in part
EPL112	Lyn Cayne -Ward		opposes the application in whole or in part
9590	Lyn Hume		opposes the application in whole or in part
9411	Lyn Morrison		opposes the application in whole or in part
9373	Lyn Pairama		opposes the application in whole or in part
9293	Lynda Warrington		opposes the application in whole or in part
EPL113	Lynette Chapman		opposes the application in whole or in part
9290	Lynn Davey		opposes the application in whole or in part
9403	Mahera Mererina Wirihana-Rawhiti		opposes the application in whole or in part
9424	Mahurangi East Residents and Ratepayers Assoc		opposes the application in whole or in part
EPL114	Mahurangi Wastebusters		opposes the application in whole or in part
9775	malcolm lea		supports the application in whole or in part
9928	Mallcom Smith		opposes the application in whole or in part
9973	Mandy Flood		opposes the application in whole or in part
9474	Mansoor Achim Valkoun		opposes the application in whole or in part
EPL115	Maraea Rameka		opposes the application in whole or in part
EPL116	Marama Pairania		opposes the application in whole or in part
9855	Marc Stammbach	HZI Australia Pty Ltd	opposes the application in whole or in part
9308	Maria Lambert		opposes the application in whole or in part
EPL208	Maria Louisa Henare (aka Mina Henare) Toka	Kaitiaki Tinopai Resource Management Unit	opposes the application in whole or in part
9824	Maria Valkenburg		opposes the application in whole or in part
9969	Marian Jones		opposes the application in whole or in part
9764	Marian Watkins		opposes the application in whole or in part
9927	Marie Alpe		opposes the application in whole or in part
9565	Marijana Moors		opposes the application in whole or in part
9634	Marijke Lindgreen		opposes the application in whole or in part
10034	Mario De Mendoza		opposes the application in whole or in part
9903	Marissa Bale		opposes the application in whole or in part
9713	Mark Christopher Keane		opposes the application in whole or in part
9512	Mark Croft		opposes the application in whole or in part
9966	Mark Nicholas Donaldson		opposes the application in whole or in part
9865	Mark Oliver		opposes the application in whole or in part
9539	Mark Smith	Rubbish Direct	supports the application in whole or in part
EPL117	Martika Panui		opposes the application in whole or in part
9716	Martin Bridson	Yogawave	opposes the application in whole or in part
9391	Martin Edinborough		opposes the application in whole or in part
8242	Martina Johanna Tschirky		opposes the application in whole or in part
EPL201	Matakana Coast Trail Trust		opposes the application in whole or in part
9602	Matt Lomas [also refer to EP20 on RC & PC42]		opposes the application in whole or in part
8959	Matt Railey		opposes the application in whole or in part
9548	Matt Thompson		opposes the application in whole or in part
10052	matthew crisp		opposes the application in whole or in part
EP20	Matthew John Lomas [also refer to 9602]		opposes the application in whole or in part
9340	MATTHEW Rua		opposes the application in whole or in part
EPL118	Maurie Hooper		supports the application in whole or in part
EPL119	Max Purdy		opposes the application in whole or in part
EPL120	McCaela Panui		opposes the application in whole or in part
9300	Megs Kendall		opposes the application in whole or in part
9421	Mélanie Duplain		opposes the application in whole or in part
9720	Melanie Marnet		opposes the application in whole or in part
9674	Melanie Scott		opposes the application in whole or in part
8985	Melanie Torkington	Te Waka Youth	opposes the application in whole or in part
9691	Melanie Williams		opposes the application in whole or in part
9296	Melissa Hambly	Mangawhai Nature Education	opposes the application in whole or in part
9299	Melissa Parker		opposes the application in whole or in part
9977	Merata Kawharu		opposes the application in whole or in part
EPL041	Mere Kepa		opposes the application in whole or in part
8966	Meriana Hare		opposes the application in whole or in part
9711	Meryl Elizabeth Bacon		opposes the application in whole or in part
EPL212	Micaiah Samson		opposes the application in whole or in part
9518	Michael Gerard Sweetman		opposes the application in whole or in part
EPL121	Michael Waru		opposes the application in whole or in part
9508	Michele Dana Smith		opposes the application in whole or in part
9872	Michelle Boler		opposes the application in whole or in part
9916	Michelle Bow		opposes the application in whole or in part
9731	Michelle Carmichael [combined with 9684]		opposes the application in whole or in part
9684	Michelle Carmichael [combined with 9731]	Fight the Tip Tiaki Te Whenua Inc	opposes the application in whole or in part
9141	Michelle Fogarty		opposes the application in whole or in part
9880	Michelle Nahi		opposes the application in whole or in part
9976	Michelle Roberts		opposes the application in whole or in part
9951	Michelle Worth		opposes the application in whole or in part
9410	Mikaera Miru	Waiaotea Marae	opposes the application in whole or in part

EPL209	Mikaere Tapurau		opposes the application in whole or in part
9581	Mikayla Sherwin on behalf of Ben Moir	James Dunlop Textiles	opposes the application in whole or in part
9866	Mike Forbes		opposes the application in whole or in part
9908	Miles Stratford		opposes the application in whole or in part
EPL122	Miriam Claire Connor		opposes the application in whole or in part
EPL123	Moana Beazley		opposes the application in whole or in part
9312	Moana Phillips		opposes the application in whole or in part
9761	Moi Becroft		opposes the application in whole or in part
9427	Mr Richard Brown		opposes the application in whole or in part
EPL218	Mrs Kura Foreman		opposes the application in whole or in part
9182	Murdoch Rutherford		opposes the application in whole or in part
9938	Myles Williams		opposes the application in whole or in part
EPL124	Nadine Lisa Armiger		opposes the application in whole or in part
9715	Naomi Walker		opposes the application in whole or in part
9791	Nastazia Turner		opposes the application in whole or in part
9334	Natalie Connelly-Richards		opposes the application in whole or in part
9583	Natasha Burrett		opposes the application in whole or in part
9809	Natasha Jennings		opposes the application in whole or in part
7918	Nathaniel Everett		opposes the application in whole or in part
9630	Neil McGarvey		opposes the application in whole or in part
10029	Nell Husband		opposes the application in whole or in part
10003	New Zealand Native River Wood		opposes the application in whole or in part
EP10	New Zealand Transport Agency		Neutral
EP27	Ngā Māunga Whakahii o Kaipara Devel Trust		opposes the application in whole or in part
10073	Ngadia Jones		opposes the application in whole or in part
9752	Ngaroimata pane morgan [combined with 9361]		opposes the application in whole or in part
9361	Ngaroimata Pane Morgan [combined with 9752]		opposes the application in whole or in part
EP15	Ngāti Manuhiri Settlement Trust		opposes the application in whole or in part
9956	Ngati Whatua Orakei		opposes the application in whole or in part
9351	Nicholas Carré		opposes the application in whole or in part
9797	Nick Merwood		opposes the application in whole or in part
7917	Nick Webster		opposes the application in whole or in part
9844	Nicola		opposes the application in whole or in part
EPL189	Nicola Rogers-Pirini		opposes the application in whole or in part
9669	nicolas Herren		opposes the application in whole or in part
9992	Nicolas Mulder		opposes the application in whole or in part
9640	Nicole Redman		opposes the application in whole or in part
9613	Nigel Muir	Bluemoon Ltd	opposes the application in whole or in part
EPL125	Nikau Nicholls		opposes the application in whole or in part
9596	Nikki Amiss		opposes the application in whole or in part
9002	Nina Carre		opposes the application in whole or in part
EPL126	Noelene Florence Cowper		opposes the application in whole or in part
9834	NZ Refining Co Ltd		is neutral regarding the application in whole or in part
9841	NZ Walking Access Commission Ara Hikoi		is neutral regarding the application in whole or in part
EPL127	Obe Simeon Porter		opposes the application in whole or in part
10067	Olivia Collier		opposes the application in whole or in part
10072	Olivia Morgan		opposes the application in whole or in part
9675	Oskar Henry Primbs		opposes the application in whole or in part
9891	Otakanini Haranui Marae Trust Board		opposes the application in whole or in part
EP28	Otakanini Haranui Marae Trust Board		opposes the application in whole or in part
EPL128	Otere Tapurau		opposes the application in whole or in part
9798	Oxana Haque		opposes the application in whole or in part
EPL203	Paenui Tapurau		opposes the application in whole or in part
9875	Pallas Martin		opposes the application in whole or in part
EPL129	Pamela Beattie		opposes the application in whole or in part
9717	Pania Roberts		opposes the application in whole or in part
10041	Paora John Tohiteururangi Tapsell		opposes the application in whole or in part
10068	Paratene Tane	Te Potiki National Trust	opposes the application in whole or in part
EPL130	Patricia Mary Curtis		opposes the application in whole or in part
9740	Patrick Joseph Wildermoth		opposes the application in whole or in part
9277	Patti Line		opposes the application in whole or in part
9014	Paul Coombes	Re Gen	opposes the application in whole or in part
EPL131	Paul Shephard		opposes the application in whole or in part
9853	Paul Surman		opposes the application in whole or in part
9480	Paul Wheeler	BTR Holdings Ltd T/- Earthtec Projects	supports the application in whole or in part
9995	Paulene Bond		opposes the application in whole or in part
9286	Pauline Patrick		opposes the application in whole or in part
9330	Peggy Bobby	Poutu and Otamatea Marae	opposes the application in whole or in part
9306	Penelope Arthur		opposes the application in whole or in part
9780	Penelope Jane Smith		opposes the application in whole or in part
EPL222	Penne-ann Huston		opposes the application in whole or in part
EPL192	Perenka James Alexander Rogers		opposes the application in whole or in part
7990	Peter Andrew Buxton		opposes the application in whole or in part
9273	Peter Anthony Baker	Mangawhai Board Riders	opposes the application in whole or in part
EP33	Peter Buckton		opposes the application in whole or in part
9639	Peter Georgetti		opposes the application in whole or in part
9722	peter gould		opposes the application in whole or in part
9729	Peter Humphreys		opposes the application in whole or in part
9564	Peter Robert Henderson		opposes the application in whole or in part
9996	Peter Schwartz		opposes the application in whole or in part
9430	Peter Seers	MoneyScience Limited	opposes the application in whole or in part

9597	Petrina Madsen-Fisk		opposes the application in whole or in part
9799	Philip Braddick [combined with 9795]		opposes the application in whole or in part
9795	Philip Braddick [combined with 9799]		opposes the application in whole or in part
9910	Philippa Kingsford		opposes the application in whole or in part
9725	Philippa muller [combined with 9024]		opposes the application in whole or in part
9024	Philippa Muller [combined with 9725]		opposes the application in whole or in part
9784	Phillip James Hill	Hill Farms	opposes the application in whole or in part
9637	Phillip William Tomlinson		opposes the application in whole or in part
7942	Phoebe Sullivan		opposes the application in whole or in part
9654	Pianina Kahui-McConnell	Para kore ki Tāmaki	opposes the application in whole or in part
10056	Piere Tapsell		opposes the application in whole or in part
9636	Pirihira Karaitiana		opposes the application in whole or in part
9802	Piripi Menary		opposes the application in whole or in part
9704	Precious Clark		opposes the application in whole or in part
EPL132	Puatahi Marae & Cherie Dawn Povey		opposes the application in whole or in part
EPL133	Pute Kidwell		opposes the application in whole or in part
9676	Quentin Jukes		opposes the application in whole or in part
9748	Quentin Mehana	Quentin Mehana	opposes the application in whole or in part
EPL134	Quentin Povey		opposes the application in whole or in part
9326	Rachael Williams		opposes the application in whole or in part
10048	Rachel Beere		opposes the application in whole or in part
10074	Rachel Cowie		opposes the application in whole or in part
9683	Rachel Honey		opposes the application in whole or in part
EPL135	Rachel Jan Stirling		opposes the application in whole or in part
9681	Rachel Stansfield		opposes the application in whole or in part
EPL221	Raewyn Anita Huston		opposes the application in whole or in part
9911	Raj Maharjan	iSolutions Consultants	opposes the application in whole or in part
9197	Raju Kesha		opposes the application in whole or in part
10066	Randa Kassem		opposes the application in whole or in part
9348	Rangi Michelle Aroha Witika		opposes the application in whole or in part
9754	Rarihi bennett		opposes the application in whole or in part
EPL198	Rebecca Collins		opposes the application in whole or in part
9770	Rebecca Fletcher		opposes the application in whole or in part
EPL136	Rebecca Inwood-Mole		opposes the application in whole or in part
9783	Rebecca Ward		opposes the application in whole or in part
EPL040	REMOVED - not a submission for this proposal		
EP07	REMOVED [correspondence only, refer to online submission 9807]		
EP25	REMOVED [identical to EP26]		
8999	Rene Micklewright		opposes the application in whole or in part
9816	Renee Grey		opposes the application in whole or in part
8023	Renee Hanley		opposes the application in whole or in part
9322	Reno Skipper		opposes the application in whole or in part
EPL225	Renoir Tapurau		opposes the application in whole or in part
9321	Rhiannon Morris		opposes the application in whole or in part
9680	Rhonda Faye Whitehead		opposes the application in whole or in part
9965	Rhys Davies	Global Olivine NZ Ltd.	opposes the application in whole or in part
9067	Riana Waenga		opposes the application in whole or in part
10077	Richard Clive Sisley		opposes the application in whole or in part
9406	Richard Griffiths		opposes the application in whole or in part
9429	Richard Holt	Bins R Us	supports the application in whole or in part
9796	Richard Kidd	Whenuanui Farm	opposes the application in whole or in part
EPL137	Ripeka Nahi		opposes the application in whole or in part
9627	Riria Rameka		opposes the application in whole or in part
9744	Rita Carol Donovan		opposes the application in whole or in part
EPL138	Rita Lorraine Olsen		opposes the application in whole or in part
9873	Ritia Kilkelly		opposes the application in whole or in part
9915	Robbie Douglas		opposes the application in whole or in part
EPL139	Robert Bradley Sutcliffe		opposes the application in whole or in part
9431	Robert David Millar		opposes the application in whole or in part
9593	Robert Ernest Dennis Street		opposes the application in whole or in part
EPL140	Robert Kelly Hautawaho Rameka		opposes the application in whole or in part
9631	Robert Malcolm Hall		opposes the application in whole or in part
9917	Robert Pinder		opposes the application in whole or in part
9310	Robyn Lorraine Brown		opposes the application in whole or in part
9332	Robyn Patricia Manukau		opposes the application in whole or in part
9305	Robyn Williams		opposes the application in whole or in part
9736	Rochelle Don [combined with 9737 - deleted]		opposes the application in whole or in part
9727	Rochelle Rodgers		opposes the application in whole or in part
9941	Rodney Macdonald		opposes the application in whole or in part
9026	Roger Bull		opposes the application in whole or in part
9382	Roger Parkinson		opposes the application in whole or in part
9650	Rohan Arlidge		opposes the application in whole or in part
9679	Ronald Kenneth Taylor		opposes the application in whole or in part
EPL141	Ronald Robert Cowper		opposes the application in whole or in part
9793	Rosana hiki pou ferguson	Manuel Pou Family Whanau Trust	opposes the application in whole or in part
9742	Rosanna Donovan		opposes the application in whole or in part
10061	Rosiland Stancich		opposes the application in whole or in part
EPL220	Rosilyn Ruby Gelderman		opposes the application in whole or in part
10013	Ross Flahive		opposes the application in whole or in part
9905	Roxanne Edmonds-Aperehama		opposes the application in whole or in part
9920	Royal Forest & Bird Protection Society of NZ Inc		opposes the application in whole or in part

9163	Royce Noble		opposes the application in whole or in part
EPL142	Rozanne Mii Pamela Ward (Edwards)		opposes the application in whole or in part
EPL143	RT Mercer Family Trust		opposes the application in whole or in part
9569	Rupert Mather		opposes the application in whole or in part
10062	Russell Haywood		opposes the application in whole or in part
9608	Ruth Lois Minton		opposes the application in whole or in part
10030	Ruth Morrow		opposes the application in whole or in part
8312	Ruth Wagstaff		opposes the application in whole or in part
EP02	Ryan		opposes the application in whole or in part
EPL144	Ryan Breen		opposes the application in whole or in part
9313	Ryan Vujcich		opposes the application in whole or in part
10051	S Harris		opposes the application in whole or in part
10054	Sabine Drueckler-Hiepe		opposes the application in whole or in part
9317	Sabrina Fiorenza Peacocke		opposes the application in whole or in part
EPL146	Sam Nathan-Bailey [combined with EPL145]		opposes the application in whole or in part
EPL145	Sam Nathan-Bailey [combined with EPL146]		opposes the application in whole or in part
10039	Sammy Eric Dean Williams		opposes the application in whole or in part
9568	Sandra Mather		opposes the application in whole or in part
9387	Sandra Williams		opposes the application in whole or in part
8469	Sara Hill		opposes the application in whole or in part
9366	Sarah		opposes the application in whole or in part
EPL228	Sarah Blenkinsopp		opposes the application in whole or in part
9738	Sarah Bray		opposes the application in whole or in part
9295	Sarah Holmes		opposes the application in whole or in part
9856	Sarah Kinred		opposes the application in whole or in part
9755	Sarah Lindsay		opposes the application in whole or in part
9699	Sarah mcpherson		opposes the application in whole or in part
EPL214	Sarah Samson		opposes the application in whole or in part
10021	Sarah Waller		opposes the application in whole or in part
EPL147	Satya Donna Foster		opposes the application in whole or in part
9347	Savea Benjamin Davies-Saua		opposes the application in whole or in part
9854	Sean Doughty		opposes the application in whole or in part
9981	Seonaid Grimmett		opposes the application in whole or in part
8991	Shana Valente		opposes the application in whole or in part
9899	Shannon Greenwood - Ryan		opposes the application in whole or in part
9936	Shannon Paikea [combined with 9355]		opposes the application in whole or in part
9355	Shannon Paikea [combined with 9936]		opposes the application in whole or in part
EPL148	Shannon Povey		opposes the application in whole or in part
EPL149	Shari Jara Kinikini		opposes the application in whole or in part
9668	Sharley Haddon		opposes the application in whole or in part
9925	Sharna Sutherland		opposes the application in whole or in part
10046	Sharon Amelia Williams	Taumata B Maori Block Pakiri	opposes the application in whole or in part
9901	Sharon Kemp		opposes the application in whole or in part
EPL150	Sharon L Roberston		opposes the application in whole or in part
9756	Shekainah Melany Tautari		opposes the application in whole or in part
9288	Shelley Ann Lambert		opposes the application in whole or in part
EPL185	Shelley Pulham		opposes the application in whole or in part
10055	Sherilyn Byron		opposes the application in whole or in part
10078	Sherryll Burke		opposes the application in whole or in part
9646	Sheryl Gay Ball		opposes the application in whole or in part
9947	Shirley Anne Evans		opposes the application in whole or in part
9842	Shirley Merlene JENKINS		opposes the application in whole or in part
EPL151	Shirley Welsby & Margaret Welsby		opposes the application in whole or in part
10012	Shona Oliver		opposes the application in whole or in part
EPL152	Simon Perawiti		opposes the application in whole or in part
EP12	Skywork Helicopters Limited		opposes the application in whole or in part
9357	Sonia Te Kepa Rata		opposes the application in whole or in part
9751	Sonny Ashby		opposes the application in whole or in part
9843	Sophie Bretherton-Jones		opposes the application in whole or in part
9967	Sophie Tweddle		opposes the application in whole or in part
10016	star gossage		opposes the application in whole or in part
9832	Stella Clyde		opposes the application in whole or in part
9598	Stephanie Ann Batts	S & D Consultants	opposes the application in whole or in part
9719	Stephanie Gibson		opposes the application in whole or in part
9346	Stephen Gillespie		opposes the application in whole or in part
9303	Stephen Mackay	Stephen Mackay Ltd	opposes the application in whole or in part
9813	Stephen patrick Ryan		opposes the application in whole or in part
EPL205	Steve Goldthorpe		opposes the application in whole or in part
8087	Steven Law		opposes the application in whole or in part
9545	Steven Pigott		opposes the application in whole or in part
10001	Steven Taylor		opposes the application in whole or in part
9281	Stevie OConnor		opposes the application in whole or in part
10060	Stewart		opposes the application in whole or in part
9655	stuart kidd		opposes the application in whole or in part
EPL153	Sue Lewis		opposes the application in whole or in part
10031	Sue Monk	-	opposes the application in whole or in part
9392	Sue Phillips [combined with 9064]		opposes the application in whole or in part
9064	Sue Phillips [combined with 9392]		opposes the application in whole or in part
9707	Summer Wharekawa		opposes the application in whole or in part
9422	Susan Barbara Henry		opposes the application in whole or in part
9765	Susan bretherton		opposes the application in whole or in part
10004	Susan Crockett		opposes the application in whole or in part

9399	Susan Debra Thorne Speedy [combined with 9398]		opposes the application in whole or in part
9398	Susan Debra Thorne Speedy [combined with 9399]		opposes the application in whole or in part
10079	Susan Elizabeth Stevens		opposes the application in whole or in part
8143	Susan Rowbotham		opposes the application in whole or in part
10000	Susan Tomlinson		opposes the application in whole or in part
10065	Susan Trinh		opposes the application in whole or in part
9826	Sustainable Energy Forum		is neutral regarding the application in whole or in part
EPL154	Suzanne Clarke-Taipeti		opposes the application in whole or in part
10042	Sylvia Irene Adams		opposes the application in whole or in part
9706	Tahu Kena		opposes the application in whole or in part
9337	Taiawhio Wati		opposes the application in whole or in part
8467	Taina Hill		opposes the application in whole or in part
9831	Tangi Walker		unknown
9788	Tania Ashby		opposes the application in whole or in part
9383	Tania Saffron Burrows		opposes the application in whole or in part
9626	Tara Moala		opposes the application in whole or in part
9767	Tarumai Kerehoma	NgatiWahtua Orakei / Kaipara member	opposes the application in whole or in part
9358	Tauhia Te Kepa Rata		opposes the application in whole or in part
9871	Te Aroha Pā Marae		opposes the application in whole or in part
EPL157	Te Arohanui Hatley		opposes the application in whole or in part
EPL155	Te Inu Muru		opposes the application in whole or in part
EPL156	Te Kahui-iti Ote Haahi Ratana Morehu		opposes the application in whole or in part
9804	Te Korito kapea		opposes the application in whole or in part
EPL163	Te Rongopai Ote-Haahi-Ratana Morehu		opposes the application in whole or in part
EP16	Te Rūnanga o Ngāti Whātua		opposes the application in whole or in part
9794	Te Uri o Ngati Rango Kaitiaki		opposes the application in whole or in part
9703	Te Waiora		opposes the application in whole or in part
9735	Tearoha Sharon Phillips		opposes the application in whole or in part
EPL158	Teihana Wiremu Rameka		opposes the application in whole or in part
EPL159	Temiringa Sherman		opposes the application in whole or in part
EPL160	Teresa karena		opposes the application in whole or in part
EPL161	Teresa Rose Wilson		opposes the application in whole or in part
9360	Teresa Turner		opposes the application in whole or in part
9697	Teri Miriama Davis [combined with 9338]		opposes the application in whole or in part
9338	Teri Miriama Davis [combined with 9697]		opposes the application in whole or in part
9897	Teri Wilson		opposes the application in whole or in part
9349	Terina Hawke		opposes the application in whole or in part
EPL162	Terina Rapana Hemana		opposes the application in whole or in part
9820	thea simays		opposes the application in whole or in part
9623	Theodorus Marinus Rodink		opposes the application in whole or in part
EPL164	Therese Van Dan		opposes the application in whole or in part
9600	Thomas & Maggie Errington		opposes the application in whole or in part
EPL195	Thomas David Donovan		opposes the application in whole or in part
9845	Thomas Gregory Parsons		opposes the application in whole or in part
10006	Thomas O'Neill		opposes the application in whole or in part
9958	Thomas Wallace		opposes the application in whole or in part
9685	Thomaseena Paul		opposes the application in whole or in part
7941	Tia Panapa		opposes the application in whole or in part
9632	Till Schlimme		opposes the application in whole or in part
9753	Tim Holdgate		opposes the application in whole or in part
9343	Tina Pihema	Aotearoa Resettled Community Coalition	opposes the application in whole or in part
EP29	Tinopai Resource Management Unit		opposes the application in whole or in part
9914	Tinopai RMU Limited - Tinopai Resource Management Unit		opposes the application in whole or in part
9612	Titanya Snow-Pere		opposes the application in whole or in part
EPL165	Toko Retimana		opposes the application in whole or in part
9709	Toni Marie Rewiri [combined with 9356]		opposes the application in whole or in part
9356	Toni Marie Rewiri [combined with 9709]		opposes the application in whole or in part
10002	Toni Oldfield		opposes the application in whole or in part
9985	Tony Vujnovich		opposes the application in whole or in part
EPL166	Topeora Penetana		opposes the application in whole or in part
9314	Tracey Stimpson		opposes the application in whole or in part
9929	Tracy Belinda Wood	Trustee, T B Ross-Wood Family Trust	opposes the application in whole or in part
9960	Tracy William Davis	Ngati Whatua o Kaipara	opposes the application in whole or in part
9806	Trish Whyte		opposes the application in whole or in part
EPL215	Tui Mehana		opposes the application in whole or in part
9275	Tui Peters		opposes the application in whole or in part
9367	Turu Maipi		opposes the application in whole or in part
10026	Uma Te Kani		opposes the application in whole or in part
EPL167	Valeria Maw		opposes the application in whole or in part
9672	Valerie Janet Hay		opposes the application in whole or in part
EPL180	Valerie Shepherd		opposes the application in whole or in part
9687	Valese Webster		opposes the application in whole or in part
10036	Vanessa Fulton		opposes the application in whole or in part
8086	Vanessa Steffener		opposes the application in whole or in part
9962	Varga Gyuri		opposes the application in whole or in part
9961	Vera Lin		opposes the application in whole or in part
9335	Verena Frances Roberts		opposes the application in whole or in part
9957	Vicki Lowther		opposes the application in whole or in part

9345	Vicky Gillespie		opposes the application in whole or in part
9544	Victoria del la Varis-Woodcock	Love Kaipara Ltd	opposes the application in whole or in part
9328	Victoria Kurupo		opposes the application in whole or in part
EPL168	Virginia Wati		opposes the application in whole or in part
9621	Vivienne Helen Munro		opposes the application in whole or in part
EPL169	Wade Alan Cornish		opposes the application in whole or in part
9614	Waiata Rameka-Tupe		opposes the application in whole or in part
EPL170	Waimarie Povey- Nicholls		opposes the application in whole or in part
9858	Waimarie Ratu		opposes the application in whole or in part
9580	Waimirirangi Howell		opposes the application in whole or in part
EPL193	Wakaiti Rebecca Kowhai Dalton		opposes the application in whole or in part
EPL171	Waratah Hinerangi Eruera		opposes the application in whole or in part
9686	Waratah Taogaga		opposes the application in whole or in part
EPL172	Waratah Taogaga		opposes the application in whole or in part
7935	Warren Burnand		opposes the application in whole or in part
EPL173	Warren Burnard & Janie Nahi		opposes the application in whole or in part
9922	Watercare Services Limited		is neutral regarding the application in whole or in part
EPL174	Wayne Rhodes		opposes the application in whole or in part
EPL175	Wayne Ryder		opposes the application in whole or in part
9690	Wayne Webster		opposes the application in whole or in part
9554	Wendy Carr [combined with 9553]	Warkworth Surveyors Limited	opposes the application in whole or in part
9550	Wendy Carr [combined with 9554]		opposes the application in whole or in part
9932	Wendy Joy Crow-Jones	Northfork Farms Ltd	opposes the application in whole or in part
9419	Wendy Sheffield [combined with 9418]		opposes the application in whole or in part
9418	Wendy Sheffield [combined with 9419]		opposes the application in whole or in part
9380	Whetumarama Thomas	Nikezeal consultant unlimited	opposes the application in whole or in part
9658	William & Diana Rea		opposes the application in whole or in part
9561	William Foster		opposes the application in whole or in part
9771	William Graham O'Meara		opposes the application in whole or in part
9939	William Patrick Kirby		opposes the application in whole or in part
9517	Willie Wolfgramm		opposes the application in whole or in part
9537	Yatra Southward		opposes the application in whole or in part
9412	Yvette Urlich		opposes the application in whole or in part
9935	Yvonne Reid		opposes the application in whole or in part
9264	Yvonne Zboyd		opposes the application in whole or in part
9327	Zane Tekawau Phillips	Te uri o hau,ngati whatua	opposes the application in whole or in part
9582	Zero Waste Network		opposes the application in whole or in part
EPL176	Zoe Duffy		opposes the application in whole or in part

ATTACHMENT 4

WRITTEN APPROVALS

Written approval of affected persons

PART A (to be completed by applicant)

PART A – APPLICATION

Applicant(s) name: (*please write all names in full*): Waste Management NZ Ltd

Address of proposed activity: As per application and set out in table 1.1 of the AEE

Consent number if known: BUN60339589

Brief description of proposed activity:

Construction and operation of a new regional landfill facility within the Waybe Valley Area, including all associated works as described in the application and the AEE

Plan references (including title, author and date):

Auckland Regional Landfill: Drawings prepared by Tonkin and Taylor Ltd, dated 27 May 2019

Resource consent(s) being sought for (describe area(s) of non-compliance):

As set out in section 1.3 and table 1.2 of the AEE

PART B (to be completed by persons and/or organisations providing written approval)

PART B – AFFECTED PERSON(S)

		Tick if Owner	Tick if Occupier
Full name: (*in print*)	Matariki Forests	✔	✔
Full name: (*in print*)			
Full name: (*in print*)			

Address of affected property: 1232 State Highway 1, Wayby Valley Postcode: 0972

Phone: 09 302 2988 Mobile: 0274 872 565

PART B – AFFECTED PERSON(S) *(continued)*

I have authority to sign on behalf of all the other: (*tick one*)

☑ OWNER(S) ☐ OCCUPIER(S)

of the property. Please provide documentation proving this authority.

Please note: the approval of all the legal owners and the occupiers of the affected property may be necessary.

PART C (to be completed by persons and/or organisations providing written approval)

PART C – DECLARATION

☑ I/We have been given details of the proposal and plans to which I/we are giving written approval.

☐ I/We have signed each page of the plans in respect of this proposal. These need to accompany this form.

☑ I/We understand that by giving my/our written approval, the Council when considering the application cannot take account of any actual or potential effects of the activity on my/our property.

☑ Further, I/we understand that at any time before the determination of the application, I/we may give notice in writing to the Council that this approval is withdrawn.

Note: You should only sign below if you fully understand the proposal. If you require the resource consent process to be explained you can contact the Customer Service Team at the Council who can provide you with information.

Signature(s):	PR Spencer	Date:	9 June 2020
Signature(s):		Date:	
Signature(s):		Date:	

PRIVACY INFORMATION

The council requires the information you have provided on this form to process your application under the RMA and to collect statistics. The council will hold and store the information, including all associated reports and attachments, on a public register. The details may also be made available to the public on the council's website. These details are collected to inform the general public and community groups about all consents which have been processed or issued through the council. If you would like to request access to, or correction of any details, please contact the council.

ATTACHMENT 5

LOCAL BOARD COMMENTS

Local Board Feedback on Publicly Notified Application: 1232 State Highway 1, Wayby Valley

Date:	29 April 2020
Attention:	Mark Ross Sentinel Planning
Form to be sent to:	mark@sentinelplanning.co.nz warwick.pascoe@aucklandcouncil.govt.nz
Application reference:	BUN60339589
Location:	1232 State Highway 1, Wayby Valley
Applicant:	Waste Management New Zealand

Brief summary of the proposal:

The construction and operation of a new regional landfill facility within the Wayby Valley area, between Warkworth and Wellsford. The landfill will be a Class 1 landfill, being one that accepts municipal solid waste, which includes residential and commercial waste, construction and demolition waste, some industrial wastes (that meet strict acceptance criteria) and contaminated soils. The landfill would not accept loads of hazardous waste.

The council has also received a Private Plan Change request in respect of the proposed landfill. This Private Plan Change request has been jointly notified with the above resource consent.

Local Board Feedback:

The Rodney Local Board provides the following feedback in relation to the notified resource consent for 1232 State Highway 1, Wayby Valley:

1. While it is recognised that there has been a spike in the volume of waste going to landfill in the last 5 years, more work needs to be done on waste minimisation and recycling of demolition waste. We understand that this is not the sole responsibility of the applicant, however the application states that the Redvale Landfill will be closing early due to reaching

capacity ahead of schedule. We then believe that the applicant does have some responsibility in the generation of waste, to ensure that this landfill does not fill ahead of projections, and that all material that can be recycled, is.

2. The Rodney Local Board (RLB) would like to see a clearer programme of recycling prior to waste entering this site, at an existing site already owned or managed by the applicant, so that **only pre-sorted waste** is brought to this site and has clearly been identified as only suitable for landfill. This recycling transfer station shall remove most of its waste from its waste stream such as:
    a. Set up a concrete crushing plant and provide material back to the community for use in construction and roading
    b. Set up a soft plastics recycling plant as detailed below
    c. Set up a composting plant or transfer all organic waste to an existing composting facility already established in Auckland
    d. Set up a treated timber mulching or shredding plant and provide this material for alternative uses than landfilling and work with the NZ Wood Industry to look for alternative uses for this by-product

3. The applicant states that the amount of plastics heading to its landfills has increased from the domestic market, and we can assume this is due to the lack of NZ resources to recycle plastics within NZ. The RLB would like to see the applicant set up a soft plastics recycling programme, in conjunction with local councils and other plastic recycling providers, to remove soft plastics from the waste stream to this landfill and provide an alternative way of managing the waste.

4. The RLB would like to see all organic waste composted through a facility owned or operated by the applicant, or at existing large composting plants elsewhere in Auckland.

5. The RLB would like to see all treated timber separated from the waste stream and put through a shredder/ mulcher and the by-product used in other uses and not sent to landfill.

6. There are three groundwater systems under the application site, with one being shallow perched. Landfill impermeable clay liners can fail, and this can then lead to contaminated leachate entering groundwater systems. If this happens, the failure point is not visible and can remain undetected for some time. We support the development and implementation of a Groundwater Quality and Quantity Management Plan that will consider but not be limited to:
    a. regularly monitoring the water quality levels of all three groundwater systems on an ongoing and continual timeframe, with live updates provided to Auckland Council Regulatory and Compliance Team. Any changes in the quality of any of the three groundwater systems will be able to be determined to be attributable to the landfill practices and may indicate a failure in the impermeable liner.
    b. regularly monitoring the water quantity levels of the three groundwater systems on an ongoing and continual timeframe, with live updates provided to Auckland Council Regulatory and Compliance Team
    c. acknowledgement that the Auckland Council Regulatory and Compliance Team may require remedial action from the consent holder to remedy any adverse environmental effects on groundwater systems from the activities of operating the landfill which may involve removal of buried fill and rectification of the site.

7. Auckland Council has provided ongoing and long-term monitoring of the water quality of the Hoteo River as this is a major contributor of sediment to the Kaipara Harbour[1]. Reports have identified that stream bank erosion are a key source of sediment to the river and increasing the occurrence of the 34.5mm [2] rain event on the Hoteo riverbanks will exacerbate stream bank erosion. As the landfill area is developed, there will be an increase in the surface runoff from the development area, which will increase water quantity discharges to surface water catchments. If this runoff is not mitigated and managed to pre-development levels, we will see an increase in periodic runoff volumes from the project area into the Hoteo River, hence an increase in the incidence of 34.5mm runoff levels.

8. We support the development and implementation of a Surface Water Quality and Quantity Management Plan that will consider but not be limited to:
    a. regularly monitoring the water quality levels of all surface water systems, including where any affected tributaries meet the Hoteo River, on an ongoing and continual timeframe, with live updates provided to Auckland Council Regulatory and Compliance Team. Water quality must include Total Suspended Solids (TSS) as well as expected contaminants from a landfill activity and regulatory compliance must ensure that TSS levels within all watercourses does not exceed pre-development levels.
    b. regularly monitoring the water quantity levels of surface water systems, including where any affected tributaries meet the Hoteo River on an ongoing and continual timeframe, with live updates provided to Auckland Council Regulatory and Compliance Team.
    c. Acknowledgement that the Auckland Council Regulatory and Compliance Team may require remedial action from the consent holder to remedy any adverse environmental effects on surface water systems from the activities of operating the landfill which may involve removal of buried fill and rectification of the site.

9. We support the development and implementation of legal protection of all wetlands on site in perpetuity to ensure that they cannot be lost or detrimentally affected by the landfill activity.

10. We support the development and implementation of a wheel wash facility at the exit of the site, that is constructed at least 500m from a road entrance, and which is fully sealed. This wheel wash facility must be designed to fully remove all fine clay particles from truck tyres and not allow any fine particles to be tracked onto local roads. Evidence from the management of Redvale Landfill demonstrates that the wheel wash is not operating to a high enough standard, and this wash facility does not remove all clay from truck tyres all the time. This material is then tracked for up to 500m further down the local roads until all material has come off the tyres. This then creates a significant issue on wet days where vehicles driving along local roads lift this fine clay off the road and throw it behind them onto trailing vehicle windscreens. Local roads around the Redvale Landfill are known as the dirtiest in Rodney for this reason.

11. We support the development and implementation of a Noise Management Plan that enables all noise from the site, including that of entering and existing trucks, to be no higher than allowed for in the Unitary Plan at site boundaries.

[1] Kamarinas, Ioannis & Julian, Jason & Hughes, Andrew & Owsley, Braden & de Beurs, Kirsten. (2016). Nonlinear Changes in Land Cover and Sediment Runoff in a New Zealand Catchment Dominated by Plantation Forestry and Livestock Grazing. Water. 8. 436. 10.3390/w8100436.

[2]The significance of the 34.5mm rainfall event is documented in Technical Publication 10, Stormwater Management Devices Guideline Manual 2003, Auckland Regional Council

12. We support the development and implementation of a Dust Management Plan on site to ensure no dust is generated through the site activities that can extend beyond the boundary of the site, and which does not affect the water quality and TSS of any surface water systems.

13. We support the development and implementation of a Leachate Management Plan that will ensure there are less than minor adverse environmental effects on the environment from leachate.

14. We support the development and implementation of a Waste Minimisation Plan that will address all recommendations outlined in Comments 1-5 as a minimum, but not be limited to these waste types. The intentions behind these recommendations are that the landfill life term be able to be extended, and overall waste recycled or repurposed as much as possible to reduce the requirement of further landfills in the region.

15. We support the development and implementation of a Landfill Gas Management Plan that will ensure there are less than minor adverse environmental effects on the environment from landfill gases.

16. We support the development and implementation of a Wastewater Management Plan that will ensure there are less than minor adverse environmental effects on the environment from wastewater discharges.

17. The current State Highway 1 in Wayby Valley is being widened but centre line safety barriers are being put in place its entire length[3]. It will be one lane only in each direction, with no passing lanes, but wider shoulders to cater for cyclists. This means anyone stuck behind one of these landfill trucks has to follow it the entire section of this motorway, possibly causing frustration with slow speeds, and inhalation of exhaust of fumes and odour. NZTA has acknowledged that this road design cannot be altered either through the currently planned work or by the applicant therefore it is our opinion that there will be significant adverse traffic effects on the local network which cannot be mitigated.

18. We support the development and implementation of an Infrastructure Management Plan that considers, but is not limited to:
    a. how local infrastructure (including local and national roads) will be managed and at levels anticipated through this consent application and maintained in a condition that is suitable and adequate to avoid any adverse environmental effects
    b. how directly affected public infrastructure will be managed and maintained to pre-development levels to ensure the adverse impacts of the landfill activity do not deteriorate public assets faster than anticipated through normal activities.

19. We support the development and implementation of an Earthworks Management Plan that will ensure there are less than minor adverse environmental effects on the environment from sediment discharges.

20. We support the avoidance of all adverse environmental effects in the first instance and do not support any options to mitigate effects as a first choice of action. This is particularly apparent where any areas of works are known to adversely affects threatened species within the site.

[3] https://www.nzta.govt.nz/assets/projects/sh1-dome-valley/SH1-Dome-Valley-turnaround-map-April-2019.pdf

21. We support the development and implementation of a Threatened Species Management Plan that will ensure there are less than minor adverse environmental effects on the environment from destruction of threatened species habitat. This Management Plan must also clearly detail how the applicant will avoid any adverse effects on the many threatened species present on site as detailed in the consent application, specifically Hochstetter frogs.

22. We do not support offsite mitigation for stream habitat loss, but support avoidance of stream loss where possible and on-site mitigation and enhancement options. The larger project area has been identified as an area of mitigation through distancing for any effects on immediate neighbours so there will be no reason that these areas cannot be enhanced through any required mitigation and should not be required to remain clear for landfill extension opportunities.

23. We support the development of a Cultural Values Management Plan that will ensure there are less than minor adverse environmental effects on the cultural environment and local iwi from landfill operations.

24. We support the creation of a Community Liaison Group (CLG) that consists of at least one member of each adjoining property owner, a local iwi representative, and a RLB member to ensure landfill communications are managed well, and to allay fears and concerns that any party may have in the operation of the landfill. It is suggested that regular meetings are held throughout the year of the CLG and that at each meeting an Auckland Council Compliance Officer is invited that can assist in providing updated communications on the consent compliance status.

Outcome sought by local board

That the feedback provided by the Rodney Local Board be considered and considered as conditions of consent if the resource consent application is to be approved.

Attendance at any Hearing:

The Rodney Local Board would like an opportunity to speak to this feedback at any hearing on this matter.

This feedback is authorised by:

Danielle Hancock

Email: danielle.hancock@aucklandcouncil.govt.nz

Date: 29 April 2020

ATTACHMENT 6

DRAFT CONDITIONS

Draft Key Conditions of Consent – 21 September 2020

Changes since notification are shown as:

- **Additions are underlined**
- **Deletions are ~~struck through~~**

Definitions

Construction Commencement Date– is the date that initial site construction works will commence, as notified 30 working days in advance by the consent holder to Council.

Construction Completion Date – is the date that the consent holder notifies the Council that the Initial Site Construction Works are complete.

Council – means, unless otherwise stated, Team Leader Compliance Monitoring Northern.

Initial Site Construction Works – those works required on site up prior to the receipt of waste, including, but not limited to, the SH 1 roundabout, access road and bridge from SH 1 to the bin exchange area, the bin exchange area, the access road from the bin exchange area to the landfill area, the workshop and site facilities, the initial earthworks to prepare the first part of the landfill to receive waste, associated removal of vegetation, stockpiles, and sediment retention ponds.

Landfill Capping Completion Date – is the date on which the consent holder gives notice to the Council that they have completed the final capping of the landfill and that post-closure aftercare will commence.

Landfill Commencement Date – is the date that waste acceptance commences at the landfill, such date to be notified to Auckland Council in writing.

Table of contents

PART A - GENERAL CONDITIONS

1 The activity shall be carried out in general accordance with the application comprising the following plans and reports:

- 'Auckland Regional Landfill Assessment of Environmental Effects' prepared by Tonkin + Taylor Ltd, dated May 2019;
- 'Auckland Regional Landfill Geotechnical Factual Report' prepared by Tonkin+ Taylor Ltd, dated May 2019;
- 'Auckland Regional Landfill Geotechnical Interpretative Report' prepared by Tonkin + Taylor Ltd, dated May 2019;
- 'Auckland Regional Landfill Probabilistic Seismic Hazard Report', prepared by Tonkin + Taylor Ltd, dated May 2019;
- 'Auckland Regional Landfill Air Quality Assessment', prepared by Tonkin + Taylor Ltd, dated May 2019;
- 'Auckland Regional Landfill Hydrogeology Assessment', prepared by Tonkin + Taylor Ltd, dated May 2019;
- 'Auckland Regional Landfill Water Quality Baseline Monitoring Report', prepared by Tonkin + Taylor Ltd, dated May 2019;
- 'Auckland Regional Landfill Assessment of Aquatic and Terrestrial Ecological Values and Effects', prepared by Tonkin + Taylor Ltd, dated May 2019;
- 'Landscape and Visual Assessment', prepared by Boffa Miskell Ltd, dated May 2019;
- 'Assessment of Economic Effects of the Proposed Auckland Regional Landfill', prepared by Brown Copelands & Co Ltd, dated May 2019;
- 'Archaeological Assessment: Proposed Works', prepared by Matthew Felgate, dated September 2018;
- 'Auckland Regional Landfill Assessment of Environmental Noise Effects", prepared by Marshall Day, dated May 2019;
- 'Auckland Regional Landfill – Integrated Transport Assessment', prepared by Stantec, dated May 2019;
- 'Auckland Regional Landfill Engineering Report', prepared by Tonkin + Taylor Ltd, dated May 2019;
- 'Auckland Regional Landfill Waste Acceptance Criteria', prepared by Tonkin + Taylor Ltd, dated May 2019;
- 'Auckland Regional Landfill Stormwater and Industrial Trade Activity Report', prepared by Tonkin + Taylor Ltd, dated May 2019;
- 'Auckland Regional Landfill Sediment and Erosion Control Assessment', prepared by Tonkin + Taylor Ltd, dated May 2019;
- 'Auckland Regional Landfill Risk Management Assessment', prepared by AECOM, dated May 2019;
- 'Auckland Regional Landfill Complied Further Information Responses', prepared by Tonkin + Taylor Ltd, dated March 2020;
- 'Auckland Regional Landfill Stormwater pond dams: s92 response addendum report', prepared by Tonkin + Taylor Ltd, dated August 2020;
- 'Response to outstanding Freshwater Ecology section 92 questions', prepared by Tonkin + Taylor Ltd, dated August 2020;
- 'Response to outstanding Terrestrial Ecology Section 92 questions', prepared by Tonkin + Taylor Ltd, dated August 2020;

- 'DRAFT Hochstetter's Frog Management Plan', prepared by Tonkin + Taylor Ltd, dated August 2020;
- 'Auckland Regional Landfill – Supplementary 2020 Frog Survey Report', prepared by Tonkin + Taylor Ltd, dated August 2020;
- 'Auckland Regional Landfill Supplementary long-tailed bat report', prepared by Tonkin + Taylor Ltd, dated August 2020;
- 'Bat Management Plan', prepared by Tonkin + Taylor Ltd, dated August 2020;
- 'Auckland Regional Landfill Hydrogeological Assessment – Addendum Report (Volume 1), prepared by Tonkin + Taylor Ltd, dated August 2020;
- 'Auckland Regional Landfill – Hydrogeological Assessment Addendum Report (Volume 2), prepared by Tonkin + Taylor Ltd, dated August 2020;
- 'Auckland Regional Landfill Geotechnical Addendum Report', prepared by Tonkin + Taylor Ltd, dated August 2020;
- 'Sediment, Stormwater, Waste Acceptance Criteria and Health Risk Assessment Additional s92 Responses', prepared by Tonkin + Taylor Ltd, dated August 2020;
- 'Further Stormwater and Health Risk Assessment s92 Responses', prepared by Tonkin + Taylor Ltd, dated August 2020;
- 'Removal of Stockpile 2 from the Auckland Regional Landfill resource consent application BUN60339589', prepared by Tonkin + Taylor Ltd, dated August 2020;
- Sheet ENG-01 Site Plan;
- Sheet ENG-02 Landfill Layout Plan – West;
- Sheet ENG-03 Landfill Layout Plan – East;
- Sheet ENG-04 Landfill Layout Plan - phase 1-6;
- Sheet ENG-05 Office & Workshop Layout;
- Sheet ENG-06 Renewable Energy Centre Layout;
- Sheet ENG-10 Top of Liner Plan – Phase 1-7;
- Sheet ENG-11 Cut/Fill Plan;
- Sheet ENG-12 Final Cap Contours (Post Settlement);
- Sheet ENG-13 Waste Fill Contours After Phase 6;
- Sheet ENG-14 Leachate Collection System;
- Sheet ENG-16 Landfill Sections (Sheet 1 of 3);
- Sheet ENG-17 Landfill Sections (Sheet 2 of 3);
- Sheet ENG-18 Landfill Sections (Sheet 3 of 3);
- Sheet ENG-20 Typical Lining & Cap Details;
- Sheet ENG-21 Typical Bench Detail;
- Sheet ENG-25 Phase Plan;
- Sheet ENG-26 Landfill Staging Sections (Sheet 1 of 3);
- Sheet ENG-27 Landfill Staging Sections (Sheet 2 of 3);
- Sheet ENG-28 Landfill Staging Sections (Sheet 3 of 3);
- Sheet ENG-30 Overall Plan;;
- Sheet ENG-31 Bin Exchange Area;
- Sheet ENG-32 Bridge;
- Sheet ENG-33 Road Long Section;
- Sheet ENG-34 Road Cross Section (Sheet 1 of 2);
- Sheet ENG-35 Road Cross Section (Sheet 2 of 2);

- Sheet ENG-40 Phase 1 & Phase 2 – Plan;
- Sheet ENG-41 Phase 6 – Plan;
- Sheet ENG-42 Phase 3 – Plan;
- Sheet ENG-43 Proposed Wetland Schematic;
- Sheet ENG-44 Typical Filter Strip Design;
- Sheet ENG-45 Typical Access Road Cross Section; and
- Sheet ENG-60 Indicative LFG Well Layout Plan.

2 In the event of any conflict between those plans and reports and these conditions, these conditions will take precedence.

Duration

3 Consents that solely authorise elements of the Initial Site Construction Works shall expire 15 years after the Construction Commencement Date. The regional consents for landfill operations and discharges shall expire 35 years after the Landfill Commencement Date. This expiry does not apply to the land-use consents for landfill operations

Bond

4 Prior to the placement of refuse the Consent Holder shall provide and maintain in favour of Auckland Council (the Council), a financial assurance (bond) which, in the event of default by the Consent Holder, would:

i. Secure compliance with all the conditions of these consents and enable any adverse effects on the environment resulting from the Consent Holder's activities, and not authorised by a resource consent or rule in the Auckland Unitary Plan to be avoided, remedied or mitigated. This will include a provision for any plausible risks or events that could potentially arise and require remedial works to prevent adverse environmental effects (Compliance);

ii. Secure the completion of closure and rehabilitation in accordance with the approved Aftercare section of the Landfill Management Plan, including provision for early closure costs in the event of abandonment of the site (Closure):

iii. Ensure the performance of any monitoring obligations of the Consent Holder under this consent post closure, as well as any site aftercare obligations such as care of the landfill cap and pollution prevention infrastructure (Aftercare).

5 The amount (quantum) of the bond shall be adjusted over time as determined by any review conducted in accordance with Condition 12, provided that at any given time the amount shall be sufficient to cover the estimated cost at that time (including any contingency) of the bond components outlined in Condition 4.

6 The quantum for the components in Condition 4 shall be determined as follows:

(a) Part 1 – Compliance

The Part 1 component of the bond shall be derived based on reasonably foreseeable contingency scenarios defined in the Risk Management Assessment Report (Appendix X of the application). This component of the bond shall be required for as long as a discharge consent is required for the landfill activity.

The amount shall include provision for the cost of short-term monitoring, site management and regulator inputs required by the resource consents.

Advice Note: The scope and quantum of the Part 1 – Compliance component is expected to reduce during the aftercare period given the greatly reduced scope of activities occurring on site that would need to be monitored, and the resulting reduced risk.

(a) Part 2 – Closure

The Part 2 component of the bond shall be calculated by determining the likely maximum cost to close and secure the site at any point within a 5 year period following the review date. The Part 2 bond quantum will be derived in current day dollars and include 10% contingency.

The amount shall include provision for all works necessary to close the site, including but not limited to the following:-

- Allowance for repair of damage associated with plausible early closure scenarios including, if applicable, repair of damage due to earthquake or extreme weather events.
- Allowance for remediation of any adverse effect on the environment that may arise from the site relating to plausible early closure scenarios.
- Allowance for the full extent of the works needed to complete final capping, revegetation, leachate and gas collection infrastructure and removal of any redundant site infrastructure.
- Allowance for any other rehabilitation work required by the sections on closure and aftercare in the Landfill Management Plan.
- Allowance for the cost of short-term monitoring, site management and regulator inputs required by the resource consents during closure works.

(b) Part 3 – Aftercare

The Part 3 component of the bond shall be calculated as the Nett Present Value of all aftercare costs and shall be based on the cost elements as set out in the Ministry for the Environment Landfill Full Cost Accounting Guide March 2004. Aftercare costs shall be assessed as series of individual cost items, appropriately assessed over the duration of the aftercare period, with the amounts to be inclusive of contingency and a reasonable allowance for capital works or capital equipment replacement. This component will be developed using commercial financial parameters appropriate at the time of the initial assessment subject to amendment by scheduled review.

(c) Where a risk based approach is adopted to assess potential remedial or other costs associated with the bond quantum, then costs shall be assessed to the 90% confidence limit using appropriate engineering methodology.

7 The amount of the bond required by Condition 4 shall be initially set on the basis of cost estimates, using the methodology in Condition 6, prepared by the Consent Holder and detailed in a bond report. The bond report shall be submitted to the Council for review and approval prior to the commencement of placement of refuse at the site. The amount of the bond shall cover costs associated with the three components defined in Condition 4.

8 An experienced practitioner shall conduct the assessment required by Condition 6 in accordance with conditions 4 and 6 and prepare the bond report required by Condition 7. The method of conducting the bond assessment shall be documented in the bond report. The bond report will include all assumptions made in completing the quantitative riskassessment.

9 The Consent Holder's bond shall be in a form agreed between the Consent Holder and Council and shall, subject to these conditions, otherwise be on terms and conditions agreed between them.

10 The Consent Holder's bond shall name the Council as the party able to draw on the bond. The bond shall be available to the Council regardless of whether the qualifying event for payment of the bond is the result of any deliberate or inadvertent act of the Consent Holder or its agents.

11 Should the Consent Holder and the Council be unable to reach mutual agreement on the form, terms and conditions, or amount of the bond, in either the establishment of the bond in accordance with Conditions 4 to 10 or in subsequent review of the bond in accordance with Conditions 13 or 14 or in terminating the bond in accordance with Condition 15, then the matter shall be referred to arbitration in accordance with the provisions of the Arbitration Act 1996. Arbitration shall be commenced on advice by either party that the amount of the bond is disputed, such notice to be given within 14 days of receipt by the Council of the amount of the bond established or proposed to be established by the Consent Holder. If the parties cannot agree upon an arbitrator within 7 days of receiving advice that the amount of the bond is in dispute, then an arbitrator shall be appointed by the President of Engineering New Zealand. Such arbitrator shall give an award in writing within 30 days after his/her appointment, unless both parties mutually agree that time shall be extended. The parties shall bear their own costs in connection with arbitration. In all other respects, the provisions of the Arbitration Act 1996 shall apply.

12 If the decision of the arbitrator is not made available by the 30th day after appointment of the arbitrator, then the amount of the bond shall be fixed by the Council, until such time as the arbitrator does make his/her decision. The Consent Holder shall establish or re-establish the bond in accordance with the arbitrator's decision within 60 days after the decision.

13 The quantum of all components of the Consent Holder's bond defined in Condition 4 shall be reviewed every five years from the first placement of refuse at the landfill, by means of review of the bond report required by Condition 8. More frequent reviews may be undertaken at the discretion of Council, in which case the Council shall provide the Consent Holder with no less than 60 days notice in writing of the review. If, on review, the quantum of the bond to be provided by the Consent Holder varies by more than 10% of the sum secured by the current bond, then within 60 days of the Consent Holder being given written notice by Council of the new amount to be secured by the bond, the Consent Holder shall execute and lodge with the Council a variation of the existing bond or a new bond for the amount fixed on review by the Council.

14 The Consent Holder may apply to have the bond amended, discharged or reviewed at any time, in which case the Council shall advise the Consent Holder of its decision on the application within 60 days of it receiving the application. An application by the Consent Holder to amend the amount of the bond shall be supported by a bond report carried out in accordance with the condition 4, 6 and 7, giving consideration to the following:

i. Environmental performance including verification that groundwater and surface water are not polluted as a result of the landfill activities;
ii. Degree of waste stabilisation as reflected in the results of monitoring of settlement, landfill gas and leachate; and,
iii. Integrity of closure works including landfill cap and surface water controls.

15 The bond shall continue to be maintained in favour of the Council throughout the aftercare period specified in this consent and shall be adjusted at the periodic reviews required by Condition 13 to align with future conditions at the site following closure. Unless otherwise defined in these conditions, the aftercare period commencement date shall be no earlier than the date of completion of capping of the final landfill cell, or the date of closure following abandonment prior to the final landfill cell being completed. If the landfill has been monitored and a bond report approved by the Council affirms that there are no existing or predicted adverse environmental effects from the landfill operation, then the Council may at its discretion discharge any remaining component(s) of the bond. The bond period may at Council's discretion be extended beyond 30 years following site closure, if the bond report at that time indicates that the landfill continues to pose an ongoing unacceptable risk to the environment such that there is an ongoing requirement for aftercare.

16 All costs relating to the bond shall be paid by the Consent Holder, other than in relation to arbitration (see above) in respect of which both parties shall bear their own costs.

Kaitiaki Forum

17 The consent holder shall invite mana whenua [specific groups to be identified in consultation with mana whenua] to establish a Kaitiaki Forum at least 3 months prior to the Construction Commencement Date. The Kaitiaki Forum shall operate for the life of the landfill's construction, operation and aftercare period.

18 The Kaitiaki Forum shall be invited to prepare their own terms of reference for the conduct of the forum and elect their chairperson.

19 The purpose of the Kaitiaki Forum is to assist the consent holder to recognise and provide for:

- the relationship of mana whenua with the land (whenua) and waterways (awa) within and adjacent to the site; and
- the exercise by mana whenua of kaitiakitanga of affected whenua and awa; and
- involvement in the development, implementation and monitoring of cultural indicators;
- provide recommendations to the consent holder in respect of the matters listed above.

20 The consent holder's obligations in respect of the Kaitiaki Forum shall be to:

(a) Provide a venue for the Kaitaiki Forum's meetings;

(b) Provide remuneration for any Independent Chair, if the Kaitiaki Forum wish to appoint an Independent Chair (such remuneration to be agreed to between the consent holder and the Independent Chair);

(c) Consider all recommendations made by the Kaitiaki Forum to the extent detailed in these conditions or otherwise agreed with the Kaitiaki Forum;

(d) To appear on request before the Kaitiaki Forum to respond to any concerns, or to provide an update as to activities on the site;

(e) To provide final drafts of any management plans – or any future resource consent applications prior to lodgement with Council and provide 4 weeks for the Kaitiaki Forum members to provide comments - and to consider any recommendations made by the Kaitiaki Forum members;

(f) To make available any independent experts engaged by WMNZ to appear before the Kaitiaki Forum to explain the outcomes of any annual monitoring programme, or, if a significant contingency event occurs, to explain the steps taken in response to that contingency event;

(g) Provide an opportunity for mana whenua to walk the site before works commence to identify, acknowledge and take care of tupuna;

(h) Offer mana whenua the opportunity to be involved in providing a karakia on site prior to the Landfill Commencement Date, and prior to the formal opening of the Landfill.

Cultural Indicators monitoring

21 The consent holder shall invite the Kaitiaki Forum to nominate a suitably qualified person to prepare a Cultural Indicators monitoring programme. The objective of the Cultural Indicators monitoring programme is to specify indicators of the cultural effects of the activities authorised by the Consents, and to assist the Consent Holder and the Council to understand those cultural effects, including how any such effects may change over time.

22 The methodology of the mātauranga Māori-based cultural monitoring and assessment shall be determined following consultation with the Kaitiaki Forum. Any mātauranga Māori-based

assessments shall be carried out by suitably qualified individuals appointed by the Consent Holder on the recommendation of the Kaitiaki Forum.

23 The Cultural Indicators referred to in conditions XX-XX may include, but are not limited to, assessing changes in the characteristics of vegetation, the health of culturally significant flora and/or fauna, and the health of waterways in the vicinity of the landfill.

24 The consent holder shall commission the suitably qualified individuals appointed by the Consent Holder to undertake mātauranga Māori-based assessments in accordance with XX, to provide a written report on the cultural indicators monitoring on an annual basis during initial construction and operation of the landfill. The reporting associated with the cultural indicators monitoring shall be provided to Auckland Council on an annual basis.

25 The consent holder shall cover the reasonable actual costs of developing, implementing and reporting on cultural indicators, as agreed in advance by the consent holder and the Kaitiaki Forum.

Community Liaison Group

26 The consent holder shall, in consultation with mana whenua (or, if already established, the Kaitiaki Forum), local community groups and representatives of local residents from Dome Valley, Wayby Valley and Wellsford~~(including those living close to the landfill and in the wider community)~~ establish and maintain a Community Liaison Group (CLG). The CLG shall comprise: [to discuss]

- An independent Chair, the identity of and terms of engagement to be agreed by the consent holder and Auckland Council
- A representative from Wayby Valley Road area residents
- A representative from the Spindler Road area residents
- A representative from the Dome Valley area residents
- A local board member from Wellsford or Council nominee
- A representative from the Kaitiaki Forum
- Two representatives from the consent holder

  ~~up to 4 representatives of those groups, an independent Chairperson, a representative of the Landfill operator / consent holder and two representatives of Auckland Council.~~ The role of this group will be to bring feedback from the community to the consent holder, disseminate information about the Landfill to the local community, and to hear concerns of local residents relating to the landfill and receive, discuss and consider material.

27 The CLG shall comprise no fewer than [6] and no more than [8] representatives (including the chair but not including the consent holder). Meetings of the CLG shall be held on a quarterly basis (or less frequently as determined by the CLG). Meeting minutes shall be taken and distributed to the members of the CLG. The consent holder shall cover the costs of the meeting venue, secretarial services and independent chair.

Advice note: Meetings of the CLG will be open to the public to attend but without member rights and voting rights and will be subject to the meeting protocols set by the chairperson.

28 The consent holder shall present information at meetings of the CLG including:

- Any proposed changes to management plans
- Any new resource consent applications, including variations to existing consents, prior to lodgement
- Operational aspects of the landfill

- The results of monitoring required as a condition of consent

and will provide the opportunity for the CLG to give feedback on these matters.

Complaints management

29 Upon receiving a complaint, the consent holder shall:

a Identify the nature of the complaint, the location, date and time of the alleged incident event(s);

b Acknowledge receipt of the complaint to the complainant within 1 working day of receipt;

c Respond to the complaint in accordance with any relevant Management Plan or condition; ~~and~~

d Advise the complainant as soon as the investigation is complete and no later than10 working days following (if their contact details are provided) of what steps have been taken to investigate ~~in response to~~ the complaint and remedial actions ~~within 10 working days~~; and

e Notify Auckland Council of the complaints within a timeframe as agreed with the Council, depending on the nature of the complaint.

30 A record of all complaints received shall be kept by the consent holder. This record shall include:

a The name and address of the person(s) who raised the complaints (unless they elect not to provide this) and time and nature of the complaint;

b Where practicable, weather conditions at the time of the concern or complaint, including wind direction and cloud cover if the complaint relates to noise, dust or air quality;

c ~~Known A~~ Activities occurring on site at the time ~~and~~ in the vicinity of the source of the ~~concern or~~ complaint; and

d Remedial actions taken (if any) and the outcomes of these.

31 The record specified in Condition XX shall be maintained on site by the consent holder, be available for inspection or to be provided on request to ~~and shall be provided every 6 months (or as otherwise agreed) to~~ Auckland Council.

Accidental Discovery Protocol

32 Should earthworks on the site result in the identification of any previously unknown archaeological site, including any archaeological artefact, koiwi or taonga, the Land Disturbance – Regional Accidental Discovery rule [E12.6.1] set out in the Auckland Unitary Plan Operative in Part (July 2020) shall be applied. In addition, unless otherwise agreed with the Kaitiaki Forum, ~~where, during earthworks, are accidentally uncovered or are suspected to have been discovered, the following protocol shall apply. Evidence of archaeological sites can include oven stones, charcoal, shell middens, ditches, banks, pits, old building foundations, artefacts of Maori and European origin or human burials.~~

~~a All works within the vicinity shall cease immediately (10 m radius)~~

~~b The site supervisor shall take steps immediately to secure the area so that the artefact, koiwi or taonga remain untouched and site access is restricted~~

~~c~~ The site supervisor will ensure that no eating, drinking, and smoking occurs in the immediate vicinity

~~d~~ The consent holder shall notify

- ~~The New Zealand Police (in the case of koiwi/skeletal remains only);~~

- ~~Heritage New Zealand;~~
- The Kaitiaki Forum ~~Manuhiri Kaitiaki Charitable Trust (registration number CC48343) and [other appropriate mana whenua groups to be confirmed];~~

~~Advice note: The consent holder will invite Manuhiri Kaitiaki Charitable Trust to contact the appropriate kaumatua in order to advise the parties involved as to the appropriate course of action. The costs of the kaumatua's inputs shall be met by the consent holder~~.

- An archaeologist appointed by the consent holder~~s archaeologist~~.

33 The consent holder shall ensure staff are available on site to guide police (as appropriate) and Kaitiaki Forum nominee/s ~~the kaumatua~~ to the site in the event of discoveries specified in Condition 9.

34 In the case of discovery of koiwi, site access shall be restricted to other parties until Police are satisfied the remains are not of forensic relevance.

Advice note: If the parties involved are satisfied that the koiwi or taonga are of Māori origin, the ~~kaumatua~~ Kaitiaki Forum nominee/s will decide how they are to be dealt with and will communicate this to the New Zealand Police and other parties as appropriate. The consent holder shall meet any appropriate costs with this process.

35 ~~Activity within 10m of discoveries specified in Condition 9 will remain on hold until the Police (in the case of koiwi), the kaumatua and Heritage New Zealand have given approval for the activity to recommence.~~

36 The consent holder shall ensure that ~~kaumatua~~ Kaitiaki Forum nominee/s have the opportunity to undertake karakia and other cultural ceremonies and activities at the site of the discovery as specified in Condition XX, as may be considered appropriate in accordance with tikanga Māori (Māori customs and protocols).

Management and Monitoring Plan revisions

37 The consent holder may make amendments to the final monitoring and management plans that may change how any adverse effect is managed at any time before the relevant works are undertaken subject to the certification of Auckland Council prior to the change taking effect.

a The amendment to the monitoring or management plan/s shall be consistent with the objectives and performance requirements of the ~~management~~ plan and these consent conditions.

b In the event of an amendment to a management or monitoring plan under Condition 14(a), the consent holder must submit, in writing, the amendment to Auckland Council for certification 20 working days before the commencement of the relevant works. Certification shall confirm that the amendment is in accordance with Condition 1 and meets the objectives and performance requirements of the ~~management~~ plan.

c Auckland Council shall be requested, no later than 30 working days of receipt of the amendment, to confirm in writing to the consent holder that the amendment is either certified or declined, or shall request that the consent holder incorporate changes suggested by the Council. If a revised timeframe has been agreed, confirmation shall be made in accordance with that timeframe. If no response is received, approval is deemed to have been given as set out in condition 16.

d Should Auckland Council decline to certify the amendment or request the incorporation of changes to the amendment the consent holder may then resubmit a revised material amendment to the ~~management~~ plan.

e The Certification process for a revised amendment shall follow the same process described above in Conditions 14 (a) to (d).

Deemed ~~approval~~ certification

38 If no response is received from Auckland Council within 40 working days of submission of any plan, proposed revision or other information provided for ~~approval~~ certification, the submitted information shall be deemed to have been ~~approval~~ certified.

Public walkways and cycle tracks

39 The consent holder shall, subject to reaching agreement on reasonable recommendations from the Department of Conservation and Walking Access Commission, and obtaining the necessary landowner approval and any other statutory approvals, ~~implement~~ shall make all reasonable attempts to provide the following:

a Maintain public access along Wilson Road

b Provide a public ridgeline track in recognition of traditional mana whenua use of the site and in recognition of tupuna, with appropriate Pou and/or information boards as recommended by and agreed with the Kaitiaki Forum

c ~~two~~ opportunities to enhance the recreational value of Sunnybrook Scenic Reserve;

d ~~two~~ opportunities to create mountain bike tracks;

e establish and form a walking and cycling access to and along the Waiwhiu Stream, including amenity areas that may be appropriate at any swimming or picnicking sites along the stream subject to any restriction that may be imposed by any local territorial authority or government;

f All access tracks shall be registered by way of an esplanade strip or walkway easement within 12 months of being completed;

g Such access arrangements shall be subject to any requirements to protect native flora, fauna or taonga.

Gas and Petroleum pipelines

[wording updated 15 September 2020 following discussions between WMNZ and NZ Refining and FirstGas]

XX Any sub-surface activity within 20 metres of the centre-line of Designation 9101 (Taupaki to Topuni Gas Pipeline) and Designation 6500 (Petroleum Pipeline) shall require the written authorisation from the infrastructure asset owner prior to the works commencing.

XX In consultation with New Zealand Refining Company Ltd and First Gas Ltd, WMNZ shall develop procedures, methods and measures to be implemented during any works or construction activities within 20 metres of the centre-line of Designation 9101 (Taupaki to Topuni Gas Pipeline) and Designation 6500 (Petroleum Pipeline) to:

- Manage any works or construction activities which have the potential to affect the continued safe and efficient operation of the designated infrastructure assets specified above; and
- Meet applicable standards and Codes of Practice applying to the design and construction of works that interface with the designated infrastructure assets specified above.

XXX The high-pressure gas and petroleum pipelines shall be accurately shown and labelled on all design, tender, and construction drawings, and landfill operation and management plans.

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PART B - INITIAL SITE CONSTRUCTION WORKS CONDITIONS

Advice note: These conditions apply to the site establishment and initial enabling works, as defined and described in the Assessment of Environmental Effects prepared by Tonkin + Taylor (May 2019), and includes all work required to be undertaken in order to prepare the landfill to accept waste. Once the landfill becomes operational, these conditions will no longer apply, and will be superseded by the operational conditions.

43 The consent holder shall notify Auckland Council of the Construction Commencement Date at least 30 working days prior to the Construction Commencement Date.

Baseline monitoring

44 Baseline sampling and analysis of surface water, groundwater and groundwater levels from each of the monitoring locations listed in Schedule 1, or other locations at the reasonable approval of the Auckland Council, shall be undertaken three monthly (quarterly) for a continuous period of at least two years prior to the Construction Commencement Date, with the exception of any new parameters which may be added during the consenting process, in which case monitoring of those parameters shall commence within three months of consent being granted.

Advice note: Baseline monitoring undertaken prior to consent being granted can form part of the continuous period of baseline monitoring.

Schedule 1: Baseline Water monitoring locations

Reference	Groundwater level	Groundwater chemistry
BH1	*	*
BH2	*	*
BH3	*	*
BH4	*	
BH5	*	*
BH6	*	
BH7	*	*
BH8	*	
BH9	*	*
BH10	*	*
BH11	*	
BH12	*	
BH13	*	
BH14	*	
BH15 (until removed for landfill footprint)	*	*
TB01 (potable)		*
TBA1 (downstream from landfill footprint in the direction of Watercare's well))	*	*
TBA2 (downstream from landfill footprint in the direction of Watercare's well))	*	*

Reference	Macroinvertebrates, periphyton and macrophytes ~~(three monthly intervals)~~	Surface water chemistry
MC1	*	
MC2	*	
MC3	*	
MC4	*	
MC5	*	
MC6	*	
SW1		*
SW3		*
SW4		*
(discharge from bin exchange area)		*

45 The baseline analysis of groundwater chemistry and surface water chemistry required by Condition XX shall be for the following parameters:

PARAMETER UNITS

- Temperature ^{o}C
- Sodium g Na/m3
- pH
- Chloride g Cl/m3
- Conductivity mS/m
- Potassium g K/m3
- Total Ammoniacal Nitrogen g N/m3
- Total Hardness g CaCO3/m3
- Zinc (soluble) g Zn/m3
- Manganese (soluble) g Mn/m3
- COD g O/m3
- Arsenic (soluble) g As/m3
- Copper (soluble) g Cu/m3
- Lead (soluble) g Pb/m3
- Nitrate Nitrogen g N/m3
- Sulphate g SO4/m3
- Alkalinity g CaCO3/m3
- Boron g B/m3
- Nickel (soluble) g Ni/m3
- Calcium g Ca/m3
- Iron (soluble) g Fe/m3
- Magnesium (soluble) g Mg/m3

Initial Construction Management Plans

46 The consent holder shall prepare the following Management Plans for initial construction, each encompassing a number of sub-topic Management Plans identified in Schedule xxx:
Construction Environmental Management Plan (CEMP)
Construction Ecological Management Plan (EcoMP)
Construction Traffic Management Plan (CTMP)
Construction Noise and Vibration Management Plan (CNVMP)
Streamworks Methodology Management Plan (SMMP)

47 The consent holder shall prepare and submit a Construction Environmental Management Plan (CEMP) to Auckland Council at least three months prior to the Construction Commencement Date. The purpose of the CEMP shall be to establish general procedures for all of the enabling works up until the landfill opens so that the construction works remain within the limits and standards approved under this consent and set out the management procedures and construction methods to be undertaken in order to avoid, remedy or mitigate potential adverse effects arising from construction activities.

48 The CEMP shall specify which upcoming ~~is not required to include all details for every~~ stage of work is being addressed by the CEMP at the time the CEMP ~~plan~~ is submitted for certification by Auckland Council. Whenever ~~If~~ further details are to be provided in advance for later stages of the work, then the CEMP shall be revised and again clearly state which aspects of the upcoming work are covered within the submitted plan.

49 ~~The CEMP shall incorporate or refer to the following management plans:~~

~~a Construction Erosion and Sediment Control Plan (CESCP)~~

~~b Construction Traffic Management Plan (CTMP)~~

~~c Construction Noise and Vibration Management Plan (CNVMP)~~

~~d Vegetation Clearance Management Plan (VCMP)~~

~~e Fauna Management Plan (FMP)~~

~~f Streamworks Management Plan (SMP)~~

50 The CEMP shall provide details of the responsibilities, reporting frameworks, coordination and management required for effective site management. The CEMP shall provide information on the following matters:

a Construction works programming;

b Site management;

c Consultation and communications;

d Confirmation of the construction methodology, including for permanent and temporary structures and clear identification of working areas and sensitive areas to be protected;

e Contact details of the Consent Holder's Project Liaison Person (phone, postal address, email address);

f Methods and systems to inform and train all persons working on the site of potential environmental issues and how to avoid remedy or mitigate any potential adverse effects;

g Procedures used to avoid discharges of contaminants from ~~for~~the refuelling, cleaning, maintenance and storage of plant and equipment~~, methods to be used to avoid discharges of contaminants from these activities~~;

h Measures to address the storage of fuels, lubricants, hazardous and/or dangerous materials, in particular measures to ensure hazardous substances are stored outside of the 1 per cent annual exceedance probability (AEP) floodplain; and ~~alongwith~~

i Contingency procedures to address emergency spill response(s) and clean up; and

j Procedures for incident management and to deal with extreme weather events.

Construction Erosion and Sediment Control Plan

51 At least three months prior to the Construction Commencement Date, the consent holder shall submit to Auckland Council for certification, an updated Construction Erosion and Sediment Control Plan (CESCP) for the site establishment and enabling works earthworks, prepared in general accordance with the 'Construction Erosion and Sediment Control Plan', prepared by Tonkin + Taylor, dated May 2019. The purpose of the CESCP is to provide a framework of controls for the construction earthworks to avoid, remedy and/or mitigate the potential adverse effects on the receiving environment, including measures to ensure sediment generation is minimised and the works are conducted in accordance with best practice.

52 The CESCP required by Condition 24 shall include a sediment monitoring programme with the following information:

a Details of the baseline monitoring for suspended solids and turbidity within the catchments of the works;

b Monitoring, including frequency of monitoring, to be undertaken during the construction works including:

- Programme for regular visual inspections of all receiving environments, and sediment control devices;
- Rainfall and weather forecasts ~~ingforecasting~~;
- Rainfall trigger levels for supplementary visual inspections;
- Sampling at inlets and outlets of sediment settlement devices;
- Sampling in the receiving environment;
- Turbidity monitoring downstream of any works within any tributary of the Waiteraire stream; and
- Turbidity monitoring downstream of the landfill footprint.

c Development of monitoring response trigger levels ~~triggers~~ and associated actions in the event that the trigger levels ~~triggers~~ are exceeded.

Site Specific Erosion and Sediment Control Plans

53 Prior to the Commencement of earthworks for each stage of the initial construction works, a Site Specific Erosion and Sediment Control Plan (SSESCP) shall be prepared by a suitably qualified person in general accordance with Auckland Council Guideline GD05, Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region and the CESCP.

54 The consent holder shall submit the SSESCP to Auckland Council at least two months prior to the commencement of that stage of works. The purpose of the SSESCP is to set out the specific measures to be implemented during construction to minimise erosion and the discharge of sediment beyond the boundaries of the site.

55 The SSESCP shall include the following information as appropriate to the scale, location and type of earthworks:

a The location and total area of earthworks, including catchment boundaries and contour information;

b Details of construction methods to be employed, including timing and duration;

c The volume of earthworks. This is to include details of the volumes to be excavated, stockpiled, re-used and disposed of off-site;

d The location of erosion controls of the types described in GD05 (e.g. perimeter control such as a clean water diversion bunds) and any other controls;

e The location of sediment controls of the types described in GD05 (e.g. silt fence along low point of site where surface water will discharge from site or around stockpile areas) and any other controls;

f Supporting calculations for erosion and sediment controls;

g Staging of the earthworks ~~(if appropriate).~~ If works are to be staged then the details of a to e above need to be provided for each stage and the means of progressive stabilisation of exposed areas need to be provided for each stage;

h Key responsibilities for implementing and maintaining the controls detailed in the SSESCP during the project;

i A description of any proposed chemical treatment, with consideration given to preferential use of organic flocculants;

j The location of site entrance points and means to control tracking of dirt off-site;

k The frequency and responsibility for monitoring the effectiveness of controls, downstream water quality, and the undertaking of any maintenance on controls;

l The details for decommissioning controls;

m Contingency plans in case of unexpected sediment discharges during works and to respond to extreme weather events;

n Drawings showing items a, c, d, e and g above..

Erosion and sediment controls certification and maintenance

56 Prior to any earthworks commencing within a works area, a certificate signed by an appropriately qualified and experienced person shall be submitted to Auckland Council, to certify that the erosion and sediment controls have been constructed in accordance with the approved SSESCP required by Condition XX ~~26 and Auckland Council Guideline GD05~~. Information supplied if applicable, shall include:

a Contributing catchment area;

b Shape and capacity of structure (dimensions of structure);

c Position of inlets/outlets;

d Stabilisation of the structure; and

e A statement that the erosion and sediment control measures have been constructed in general accordance with Auckland Council Guideline GD05; except where a higher standard is detailed in the documents referred to the CESCP required by Condition 24, in which case the statement shall confirm that the higher standard has been constructed.

57 The sediment and erosion controls for each stage of the initial construction works shall be inspected on a regular basis, no less often than monthly, and within 24 hours after each rainstorm event that is likely to impair the function or performance of the control measure. A record shall be maintained of the date, time and extent of any inspection, maintenance and repair undertaken in association with this condition which shall be forward to Auckland Council on request.

Advice note: Erosion and Sediment Control during operations and seasonal construction are addressed in Conditions 168 - 170.

Construction Earthworks Design and Oversight

58 The investigation, final design, specification and construction of landfill and appurtenant structure earthworks shall be carried out or reviewed by a Chartered Professional Engineer practicing in geotechnical engineering or an experienced Engineering Geologist.

59 A detailed construction methodology shall be prepared and included in the CEMP as required by Condition 47 to ensure that the proposed earthworks are staged and carried out in a manner that will not contribute to slope instability, and to ensure that subsoil drainage is provided where appropriate. A signed and dated record of each assessment shall be kept including a pictorial representation of the slope showing all relevant geotechnical and geological features, all unanticipated conditions, and including notes describing any recommended mitigation measures. This record shall be incorporated in the completion report (as required by Condition 49).

60 Cut slopes shall be assessed by a Chartered Professional Engineer practicing in geotechnical engineering or an experienced Engineering Geologist for the presence of adverse geological conditions including landslide deposits, geological faults and the groundwater seepage.

61 On satisfactory completion of earthworks the consent holder shall submit a completion report and appropriate stability and ~~land use and earthfill~~ suitability statements prepared by a Geotechnical Engineer or Engineering Geologist.

62 ~~All earthworks shall be carried out in accordance with NZS4431:1989 and all fill foundations should be stripped, benched and drained.~~

Advice note: Conditions 57, 58, 59 and 60 apply to both initial construction and to seasonal construction under the landfill consents.

Construction Traffic

63 In the period of Monday to Friday during school terms of [xxx school/s], there shall be no heavy vehicle movements associated with the works authorised by this consent into or out of the Crowther Road intersection during the following times:

a Thirty (30) minutes before to ten (10) minutes after the school bus pick-up time in the morning (40 minutes in total), and;

b Twenty (20) minutes before to twenty (20) minutes after the school bus drop-off in the afternoon (40 minutes in total).

Advice note: A heavy vehicle is defined as a vehicle which has a gross vehicle mass (GVM) of more than 3500 kilograms

64 A Construction Traffic Management Plan (CTMP) shall be prepared by a suitably qualified and experienced person in accordance with the NZTA Code of Practice for Temporary Traffic Management and after consultation with NZTA, addressing all construction and temporary works that involve access onto or across SH1. The CTMP shall be in two parts being for works affecting SH1 under the jurisdiction of NZTA and one being for works on public roads under the jurisdiction of Auckland Council / Auckland Transport. The objective of the CTMP is to provide a framework to be adopted by the consent holder to avoid, remedy or mitigate the adverse traffic and access effects of the construction works. The CTMP shall be submitted to relevant authority for certification at least three months prior to the construction commencement date.

65 ~~There shall be no queuing of earthworks or construction-related vehicles accessing the site out on to State Highway 1 (as result of site establishment or construction-related activities) at any time.~~

66 The CTMP shall include the following details:

a the Traffic Management Co-ordinator for the preliminary site earthworks and construction works phase;

b the proposed construction programme identifying the sequence and timing of construction phases;

c the traffic generating activities and vehicle types expected during the construction programme;

d material/equipment source locations;

e construction transport routes;

f anticipated daily and peak hour traffic volumes for each construction phase;

g driver and other contractor staff induction requirements and processes;

h construction site access and parking arrangements;

i Details of specific Temporary Traffic Management Plans (TTMP) to be employed for each construction phase or stage of construction or those associated with specific pieces of larger or unique equipment moved to and from the Project site;

j a communication plan for notifying residents of the local area and other members of the community who may be potentially affected by construction traffic of the nature, timing and duration of the different construction phases of the construction works, including noise mitigation options and their implementation;

k a complaints procedure for community members to report construction traffic issues.

l a process for review and monitoring of CTMP.

67 The CTMP shall also include consideration of:

~~a Avoidance of hazards upon the operation of the school bus pick-up and drop-off activity at the Crowther Road intersection with SH1, (such as but not necessarily limited to the avoidance of construction traffic movements to and from the Crowther Road intersection with SH1 between 7.30am and 8.30am, 3.30 – 4.30pm on school term weekdays);~~

~~b~~ Minimisation of the safety impacts and effects of construction activities on users of the SH 1 and public roads;

~~c~~ Means by which the total number of truck movements to and from the construction activities could be minimised (e.g. back loading of departing vehicles);

~~d~~ Means by which the movement of large machinery/items can be undertaken at times and in a manner which minimises effects on SH1 users;

~~e~~ Timing and sequencing of any road closures that will be required and the nature and duration of any traffic management measures that will result, including any temporary restrictions, detours or diversions;

~~f~~ Measures to minimise potential effects on other SH1 and public road users and surrounding residents
specific management for property access during periods of traffic disruption;

~~g~~ Identification of public holidays and on the day immediately prior to public holiday weekends periods where movements of large trucks (longer than 10 m) shall be restricted.

~~h~~ Provision for a Site Traffic Management Supervisor (STMS) when required ~~to be in attendance (or adoption of other methods) to ensure that the movement of construction-related vehicles to and from SH1 is undertaken in a safe and controlled manner;~~

~~i~~ Measures to be employed on-site which seek to minimise the effect of construction related vehicles on the adjoining transport network such as:

- variable start and end times for contractor staff
- shared transport arrangements for contractor staff;
- back-loading of earthmoving transporters.

~~j Together with methods to address those matters.~~

Advice note: If the NZTA Dome Valley Safety Improvements project is still underway at the time of works commencing under this consent, the CTMP shall include measures to co-ordinate and operate alongside the Safety Improvements project.

Finalised State Highway 1 intersection design

68 The access road intersection and roundabout shall be designed in accordance with the 'Integrated Traffic Assessment', prepared by Stantec, dated May 2019, to the relevant standards as set out in NZ Transport Agency's Register of Network Standards and Guidelines ISBN 978-0-478-38032, and the design shall be subject to detailed design road safety audit in accordance with NZTA procedures.

69 The roundabout shall be subject to, and satisfy, NZTA road safety requirements. ~~audit stages during detailed and pre-opening stages.~~

Construction lighting

70 Signage shall be installed within the site requiring that when vehicle headlights are used, they shall be dipped (low beam) at all times.

71 Exterior lighting on buildings, structures and temporary lighting platforms (i.e. all exterior lighting other than vehicle mounted luminaires) shall be installed with zero upward tilt and produce no more than 1% direct upward light, except in the bin exchange area.

Construction noise

72 Construction noise shall be measured and assessed in accordance with NZS 6803:1999 "Acoustics - Construction Noise".

73 Construction noise shall comply with the noise limits in Standard E25.6.27 of the Auckland Unitary Plan.

74 A Construction Noise and Vibration Management Plan (CNVMP) shall be prepared by a suitably qualified person and submitted to Auckland Council for certification at least three months prior to the construction commencement date. The CNVMP must be implemented throughout the initial construction works and expanded and updated as appropriate. The CNVMP shall include as a minimum the relevant measures from Appendix E of NZS 6803:1999 "Acoustics – Construction Noise". The CNVMP shall also include the following controls:

a No heavy vehicles associated with the landfill construction shall access the site via the Crowther Road access prior to 0730 hrs

b No construction materials or earthmoving plant delivered to the site via the Crowther Road access prior to 0730 hrs; and

c No construction or maintenance works on Crowther Road prior to 0730 hrs within 150 m of a residential dwelling.

75 Noise measurements shall be carried out by a suitably qualified acoustic engineer within one week of construction works commencing on each of the roundabout and the upgrade of Crowther Road to determine whether compliance with Standard E25.6.27 of the Auckland Unitary Plan is being achieved. If non-compliance with the Standard is identified, noise

mitigation measures are to be implemented. Once compliant noise emissions are confirmed the process shall be documented and submitted to the satisfaction of Auckland Council.

Streamworks Methodology Management Plan

76 Prior to any streamworks commencing, a detailed Streamworks Methodology Management Plan ~~Methodology~~ (SMMP) shall be prepared, submitted to, and ~~approval obtained from~~ certified by Auckland Council. The streamworks methodology shall include but is not limited to:

a a SSESCP in accordance with Condition 53, and
providing location, dimensions, capacity, supporting calculations and design drawings for the streamworks and any wetland reclamations~~. All controls should be in line with industry best practice~~;

b timing and duration of works (in relation to the staging and sequencing of both streamworks and earthworks), including scheduling at times when normal (for the time of year) in-stream flows can be diverted around the works and a four-day weather forecast predicts no rainfall;

c ~~provision for a~~ reference where applicable to the Native Freshwater Fish and Fauna Management Plan (Condition XX);

d ~~appropriate~~ contingency plans~~ and measures~~, and;

e monitoring and maintenance requirements for the proposed erosion and sediment controls, in reference to the CESCP required by Condition 24.

Advice note: The streamworks methodology may be submitted for the whole site or as a number of plans for specific works areas to allow for different methods within different areas and different timing/staging of works.

77 Streamworks shall only be carried out in accordance with the approved Streamworks Methodology required in Condition XX.

78 Notwithstanding condition XX above, no streamworks on the subject site shall be undertaken between 30 April and 1 October in any year, without the prior written approval of Auckland Council.

Conditions 74, 75 and 76 apply to both initial construction and to seasonal construction under the landfill consents.

Culvert design

79 Where practicable, fish passage shall be provided through culverts unless deemed unnecessary or impractical by a suitably qualified freshwater ecologist, who has assessed the fish passage requirements in accordance with New Zealand Fish Passage Guidelines for structures up to 4 metres (NIWA, 2018). Where fish passage is deemed unnecessary or impractical, appropriate data and rationale for this decision shall be provided with the design drawings to Auckland Council for certification. This requirement does not apply to culverts entering or discharging from Ponds 1 to 5.

80 Culvert design shall:

a Be designed to accommodate the 1 per cent annual exceedance probability flood without materially increasing flood levels upstream or downstream of the structure;

b Fish passage elements shall be informed by the 'New Zealand Fish Passage Guidelines for structures up to 4 metres' (NIWA, 2018); and

c Incorporate energy dissipation and erosion control to minimise the occurrence of bed scour and bank erosion in receiving environments.

Conditions 77 and 78 apply to both initial construction and to seasonal construction under the landfill consents.

Vegetation Covenants

81 The consent holder shall enter into covenants in favour of Auckland Council. The covenants shall:

• Protect [111.9ha] of indigenous/native forest and [25.59ha] of wetlands from development;

• Protect any riparian planting undertaken on the WMNZ landholdings as a requirement of the conditions of this consent that is required to be protected in perpetuity;

• be drafted and submitted to the council's nominated Solicitor for certification at the consent holder's cost; and

• be registered against the Computer Register(s) (certificate(s) of title) to the affected land by the consent holder at their cost; and

• require the consent holder to:

a. be responsible for all legal fees, disbursements and other expenses incurred by the council in connection with the covenant; and

b. reimburse the council for costs, fees, disbursements and other expenses incurred by the council as a direct or indirect result of the council being a party to this covenant.

82 A copy of the updated Computer Register (certificate of title) showing that the covenant has been registered shall be provided to the Council [timing of covenants to be further discussed, where practicable these covenants will be in place prior to the landfill accepting waste].

Construction Ecological ~~Fauna~~ Management Plan

83 The consent holder shall develop a Construction Ecological ~~Fauna~~ Management Plan (FMP), prepared by an appropriately qualified ~~and experienced~~ ecologist/s. The FMP shall be submitted to Auckland Council at least three months prior to the construction commencement date. The FMP shall describe the measures to address effects on fauna and their habitat during construction of the project. The FMP shall be comprised of the following sub-sections (described in conditions 52 - 58):

a Bats;

b Avifauna (birds);

c Lizards;

d Hochstetter's frogs;

e Native fish and kōura;

f Invertebrates (peripatus, snails); and

g Vegetation clearance;

By 1 December of each year of the initial construction period, an appropriately qualified ~~and experienced~~ ecologist(s) shall certify that ~~the works~~ fauna relocations have been carried out in accordance with the approved FMP, and shall provide details of any species removed or relocated to the Council's ecologist.

Bats

84 At least three months prior to the Construction Commencement Date, the consent holder shall provide a Bat Management Plan (BMP) to Auckland Council for certification. The purpose of the BMP is to minimise any potential effects on bats within the vegetation to be cleared.

The BMP shall be prepared by a suitably qualified ~~and experienced~~ ecologist. The BMP shall include standard best practice tree felling protocol and lighting management.

Advice Note: The objective of the BMP is to set out the procedures to be implemented by the consent holder to avoid and mitigate the effects on long-tailed bats from the removal of any vegetation and/or trees that are potential bat roost habitat.

In particular the BMP shall include ~~measures to be implemented prior to removing the potential bat roost trees identified in Tonkin + Taylor's Assessment of Ecological Effects (2019), which shall include:~~

a A pre-tree felling protocol prepared by a qualified ~~recognised~~ bat ecologist that sets out the monitoring procedures to be implemented for the removal of any vegetation and/or trees that are identified as potential bat roost. This can be achieved through acoustic surveys, direct observation of trees prior to their removal, and by managing the time (month) of removal;

b Details of ongoing monitoring and reporting of bat activity where occupied bat roosts are discovered;

c Proposal for minimising disturbance from construction activities near any discovery of active roosts until the bat ecologist confirms they are vacant; and

d Methods for the replacement of any actual and potential bat roosts that are removed as part of the proposal.

85 The pre-tree felling protocol set out in the BMP shall be implemented for the removal of any vegetation and/or trees that are identified as potential bat roost by a suitably qualified ecologist

Avifauna (birds)

86 An Avifauna Management Plan (AMP) shall be submitted and certified by Auckland Council at least three months prior to the construction commencement date. The AMP shall be prepared by a suitably qualified ~~and experienced~~ ecologist. The purpose of the plan is to minimise any potential effects on avifauna from the construction works. The Avifauna Management Plan shall provide forest and wetland bird breeding protection including:

a Seasonal constraints on felling and/or noise disturbance in habitats that are likely to have high bird values to avoid or minimise harm to eggs and chicks;

b Proposed controls for maintaining a 30 m setback of construction works from the margin of wetlands during peak breeding season (September – December);

c A process for ensuring no nesting birds are present within vegetation to be cleared if works are required during peak breeding season (September – December).

Lizards

87 At least three months prior to the construction commencement date, the consent holder shall provide for the certification of Auckland Council a Lizard Management Plan (LizMP) to minimise any potential effects on indigenous skinks and/or geckos within the vegetation. Copies of any Department of Conservation permits shall be attached to the plan. The Lizard Management Plan shall be prepared by a suitably qualified ~~and experienced~~ herpetologist and shall include:

a Timing of the works;

b A description of salvaging methodology;

c A description of relocation methodology, including transfer methods, relocation site(s) selection and habitat enhancement measures (such as deployment of logs and pest control).

Hochstetter's frog

88 At least three months prior to the construction commencement date, the consent holder shall provide for the certification of Auckland Council a Hochstetter's Frog Management Plan (HFMP) to minimise any potential effects on frogs within streams. Copies of any Department of Conservation permits shall be attached to the plan. The HFMP shall be prepared by a suitably qualified ~~and experienced~~ herpetologist and shall include:

a Timing of the works;

b A description of salvaging methodology;

c A description of relocation methodology, including transfer methods, relocation site(s) selection and habitat enhancement measures (such as deployment of rock refugia and pest control).

d Proposed monitoring at the relocation site(s) ~~and adaptive management measures and threshold triggers~~.

Fish and kōura

89 At least three months prior to the construction commencement date, the consent holder shall provide for the certification of Auckland Council a Native Freshwater Fish and Fauna Management Plan (NFFFMP). The purpose of the NFFFMP is the recovery and relocation of fish, kōura and kākahi (if present) in the sections of waterways affected by instream works, prior to instream works occurring. The NFFFMP shall include and in reference to the CEMP and streamworks methods required by conditions XX and XX:

a The timing and duration of fish capture, taking into account the timing of construction and forestry works to ensure capture occurs before works;

b The methodologies used to ensure all fish are captured and transported in accordance with the New Zealand Freshwater Fish Sampling Protocols;

c Specific measures for ensuring fish upstream in the catchment do not enter the works area;

d Specific measures to provide for passage past the works area (if required), and,

e Fauna relocation sites.

90 A suitably qualified freshwater ecologist shall oversee the streamworks for the project and specifically to conduct the freshwater fauna relocation as per the NFFFMP.

Invertebrates

91 At least three months prior to the construction commencement date, the consent holder shall provide for the certification of Auckland Council an Invertebrate Management Plan (IMP). The objective of the IMP is to describe the specific procedures to address potential adverse effects associated with the construction and operation of the Project on peripatus, rhytid snails and kauri snails (if present) through salvage and relocation. The IMP shall be prepared by a suitably qualified ~~and experienced~~ ecologist and shall include:

In relation to peripatus:

a Timing of works;

b Identification of decaying logs (high quality peripatus habitat) that can be relocated. A minimum of 10 logs or 10% of available and moveable decaying logs shall be relocated; and

c Relocation methods, including transfer methods and selection of appropriate native forest relocation site(s).

In relation to snails:

a Timing of the works;

b A description of salvaging methods; and

c A description of relocation methods, including transfer methods, relocation site(s) selection and pest control.

d Copies of any Department of Conservation permits shall be attached to the plan.

Vegetation Clearance Management Plan

92 A Vegetation Clearance Management Plan (VCMP) shall be prepared by an appropriately qualified ~~and experienced~~ ecologist(s). At least two months prior to the construction commencement date, the VMP shall be submitted to Auckland Council. The VMP shall describe the measures to minimise the area of habitat/vegetation impacted by the project construction of the project. The plan shall address native forest and wetland protection measures, including:

a Vegetation clearance protocols to protect surrounding habitat and to avoid intrusion of construction works beyond the construction area, such as the physical delineation/protection of areas and individual significant or high value large trees that are close to but outside the project footprint, directional felling of vegetation away from areas which are to be retained and protected, or sediment controls around wetlands;

b Timing of removal of indigenous vegetation (of contiguous areas more than 10 m²) to avoid the bird breeding season (September – December inclusive) to the extent practicable;

c Proposed measures to stockpile and manage cleared vegetation to avoid or minimise potential adverse effects (e.g. lizards not detected during salvaging or from wood leachate);

d Procedures for moving felled logs with a dbh (diameter at breast height) of 60 cm or greater into areas proposed for revegetation. 12 m² of felled logs shall be moved into each hectare of revegetation planting; and

e Consideration of bat roosts as required by Condition 84.

~~Biosecurity~~ Kauri Dieback

93 Where works occur ~~All vegetation, soil, and other material from~~ within a "kauri contamination zone" (defined as 3 x the radius of the canopy dripline of any kauri tree), all vegetation, soil, and other material from that zone must remain ~~on site~~ within the zone or be disposed of within the landfill.

94 ~~All footwear, clothing, tools, vehicles and equipment used on site within a kauri contamination zone must be cleaned of all soil, vegetation, or other material that has, or may have, come from a "kauri contamination zone" must be thoroughly washed with Sterigene (or other suitable agent) on entry and exit from the site, on every occasion, to avoid the spread of kauri dieback (Phytophthora agathidicida).~~

95 At least 40 working days prior to the construction commencement date, the consent holder shall submit a Kauri Dieback Management Plan (KDMP) to the Council for certification. The purpose of the KDMP shall be to set out the protocols and monitoring to be used for the works to form the access road to Stockpile 1 and the Clay borrow area, to avoid and minimise the risks of introducing or spreading kauri dieback disease. The KDMP shall be prepared by a suitably qualified expert in biosecurity, plant pathology or similar and shall be prepared in accordance with the Draft KDMP. The KDMP will as a minimum stipulate:

- How Kauri Contamination Zones (KCZs) in proximity to the stockpile access road will be protected from access, identified and signposted to clearly communicate the delineation and protocols required in relation to the KCZ.
- The kauri dieback hygiene protocols to be followed by any staff or visitors entering a KCZ.
- The tree protection protocols to be followed in order to minimise damage or stress to kauri in proximity to the stockpile access road or with rootzones extending into the access road works area.
- Measures to minimise the need for works within the KCZ, and how works within KCZs will be carried out in a manner that minimises the impact on the kauri and the risk of introducing or spreading P. agathidicida within or between KCZs.
- Identification of the suitably qualified person who will supervise works within KCZs.
- Methods used to remove all soil from and decontaminate vehicles, equipment, personnel, footwear etc when entering and exiting KCZs, and how run-off from this activity will be contained and disposed of in a manner that poses minimal risk of spreading P. agathidicida.
- How drainage, run-off, or other water discharges from the access road will be directed away from kauri and their rootzones.
- How material from within KCZs will be transported to approved landfill facilities with minimal risk of material loss en route.
- The KDMP should be reviewed and updated to reflect the most up-to-date best practice for the prevention and treatment of kauri dieback, to ensure that when works commence, the most appropriate controls are in place to manage the spread of kauri dieback disease.

96 For the avoidance of doubt, the KDMP can be prepared as a standalone plan or as part of the CEMP required by Condition XX above

Stormwater Pond Dams – Construction Quality Procedures

97 Construction Quality Procedures shall be in place prior to and throughout the construction of the stormwater pond dams to ensure the dams are constructed in accordance with the design and specifications. Construction quality control will be undertaken in general accordance with recommendations in Module 4 of the New Zealand Dam Safety Guidelines, 2015 (DSG), published by the New Zealand Society on Large Dams (NZSOLD) or as otherwise required by any building consent. All the testing and inspection records of dam construction shall be collected together at the time of completion and included in a dam construction completion report. Each dam construction completion report shall be made available to the Auckland Council on request.

Advice note: Condition XX applies to permanent dams for Ponds 1 to 3 constructed during the initial construction; the temporary dam for Pond 4 constructed during the initial construction;

and the temporary dam for Pond 5 constructed as scheduled during the landfill operations period.

PART C - LANDFILL OPERATIONS

98 The consent holder shall notify Auckland Council of the Landfill Commencement Date at least 30 working days prior to the Landfill Commencement Date.

Hours of operation

99 Except as otherwise provided for the Landfill Management Plan, the hours of operation shall be:

a 5.00am to 10.00pm for the working face on all days. Operation of the working face includes all tipping operations and daily opening and closing works that involve the use of landfill machinery, including machinery used to remove or place daily cover, but does not include the bin exchange area.

b 24 hours a day, 7 days a week for the bin exchange area.

c 7.00am to 8.00pm Monday to Saturday for stockpiles and borrow areas outside of the landfill valley, with the exception of Stockpile 1 and the clay borrow area, where between September to December works are to occur from one hour after sunrise to one hour before sunset Monday to Saturday. Outside of these months, the hours of operation will be 7.00am to 8.00pm Monday to Saturday.

d 6.00am to 8.00pm Monday to Sunday for seasonal construction, and up until 10pm during summer for placement of GCL and HDPE liner.

e 24 hours a day, 7 days a week for maintenance of plant and machinery.

Site access

100 The landfill, including the bin exchange area, shall not be open to the public.

101 Entrance gates across the access to the landfill shall be provided and closed ~~locked~~ outside the specified hours of operation.

102 ~~Under normal traffic conditions,~~ there shall be no queuing of vehicles accessing the site from the main site entrance out on to State Highway 1 at any time.

103 Signage on SH1 for the entrance of the site shall adhere to NZTA sign requirements for State Highways.

Refuse Placement

104 Refuse placement shall include the following measures:

a The working surface of the daily refuse cell shall be kept to a practicable minimum and shall not exceed 80 metres by 80 metres (excluding the open area of any inert material).

b Daily cover shall be removed by cutting windows through the previous layer of daily cover before refuse placement at the start of each day.

c Stormwater diversion bunds shall be formed to prevent surface stormwater running into the current working area.

Daily cover

105 Daily cover shall be placed over the entire working face (excluding areas of inert waste) by the end of each operating day and no refuse shall remain exposed overnight. Daily cover shall be a nominal 150 mm thickness or more of soil, but may also be one of a number of non-soil alternative daily cover (ADC) options of an appropriate thickness where it can be demonstrated that they achieve a comparable level of control with respect to discharges of odour or dust to air, vermin, birds, litter, and visual effects. An equivalent alternative daily cover may be used with the prior certification of the Auckland Council.

Litter

106 Effective procedures shall be implemented to control litter. In particular the following measures shall be taken:

a Best practicable options shall be used in the vicinity of the working face in order to control windblown litter;

b Regular patrols (approximately weekly) shall be conducted to identify and pick up wind-blown litter within the landholding;

c Any trucks delivering waste to the landfill shall be covered if there is any potential for litter leaving the trailer.

107 Waste shall be transported to the landfill as follows:

a In fully enclosed bins if being delivered to the bin exchange area; ~~Municipal waste in sealed bins;~~ or

b In covered loads where delivered directly to the working face, if the waste may create dust or windblown debris ~~including C&D waste and any fill, which~~ may create dust or windblown debris~~, shall be covered;~~

c ~~C&D waste and other~~ Materials that are non-dusty and non-odorous are not required to be covered but shall be contained within the truck/trailer

Lining system

108 The lining system for the landfill on both the base and side slopes shall, as a minimum, comprise one of the following two lining systems:

a Type 1 Lining system (from top to bottom)

- 300 mm layer of leachate drainage material
- Protection geotextile
- 1.5 mm HDPE geomembrane
- 600 mm compacted soil (clay) with a coefficient of permeability $k < 1 \times 10^{-9}$ m/s

b Or Type 2 lining system

- 300 mm layer of leachate drainage material
- Protection geotextile
- 1.5 mm HDPE geomembrane
- Geosynthetic clay liner (GCL)
- 600 mm compacted soil with a coefficient of permeability $k < 1 \times 10^{-8}$ m/s

c The Consent Holder may use an alternative lining and leachate drainage systems demonstrated to provide equivalent or better performance compared with the specified systems. Use of an alternative lining system shall be subject to prior written approval of the Peer Review Panel and Auckland Council.

d Where the ~~bottom~~ base of the lining system is less than 2 m vertically above fractured rock, the rock shall be sub-excavated by 2 m and replaced with compacted ~~inorganic soil~~ suitable material to provide an additional attenuation layer.

109 A Type 2 lining system shall be used on the bottom of the landfill and on sidewalls up to the first bench.

110 The selected GCL and geomembrane shall meet the requirements of the [GRI Standards *reference to come*]

111 Except in the sumps, the leachate drainage system shall be designed to achieve leachate head not in excess of 300 mm at any point against ~~on~~ the lining system ~~geomembrane liner, except in the sump.~~

112 A double layer of HDPE geomembrane shall be provided underneath leachate sumps.

113 The consent holder shall retain an independent testing organisation to the satisfaction of the PRP to monitor the construction of the lining system including the subgrade and to undertake quality assurance (QA) of all components of the lining system and their installation. QA shall include oversight of the testing undertaken by the contractor, regular observation of lining system placement and testing, and a review of all quality control documentation produced by the supplier and contractor. ~~Unless otherwise agreed with the PRP, the~~ items to be observed ~~and reviewed as part of the QA process are to include:~~

~~a Inspection of the subgrade.~~

~~b All specified manufacturing QA documentation and/or independent testing of the geosynthetic materials supplied.~~

~~c Specifications of the standards to be achieved~~

~~d All compaction testing associated with installing the compacted soil liner (strength, density, moisture content, air voids).~~

~~e Permeability testing of the placed compacted soil layer.~~

~~f Thickness of the layers.~~

~~g Approval of the clay surface for placing any geosynthetic liner components.~~

~~h Approval of the geosynthetic liner placement methodology and panel layout.~~

~~i Observation of placing, welding and testing of geosynthetic liner for example:~~

- ~~Shear and peel testing of test weld samples at the commencement of each day.~~
- ~~Shear and peel testing of destructive test samples.~~
- ~~Air pressure testing of all dual track fusion welds.~~
- ~~Vacuum box or spark testing of all extrusion welds.~~
- ~~Visual inspection of the completed surface.~~

~~j Review of all lining system construction records.~~

~~k Observation of placement of leachate drainage material.~~

114 On completion of each stage of lining system installation, a report is to be prepared by the independent testing organisation and shall include all of the test results, a description of the observations undertaken and certification that the lining system had been installed in accordance with the specification. This report is to be submitted to the Peer Review Panel (PRP) who will make recommendations to Auckland Council on whether the lining system has been installed in accordance with the specifications. The consent holder shall obtain certification from Auckland Council of each stage of lining system construction prior to any waste being placed in the area.

Peer Review Panel

115 The consent holder shall establish one month prior to the landfill commencement date and maintain a Peer Review Panel (PRP) at its cost. The objective of the PRP will be to monitor the design and construction of the landfill lining system and its performance in order to confirm that these activities are consistent with the requirements of the conditions of these consents and good practice and that the work is undertaken by appropriately qualified personnel.

116 The PRP shall consist of a maximum of five members and a minimum of two members, all of which must have appropriate experience and qualifications. All members are to be appointed

by the consent holder following consultation between the consent holder and Auckland Council.

117 The consent holder shall provide a report from the PRP at six monthly intervals ending 31 March and 30 September each year to the Auckland Council, summarising ~~on~~ the following matters as relevant to each report period:

a final design;

b construction undertaken

c QA documentation;

d ~~lining system performance and design of~~ any new lining system installed;

e review of monitoring records relevant to demonstrating performance of areas of completed lining system with waste on them; and

f other ~~more frequent~~ reporting relating to lining system design and construction ~~or special reports shall be made~~ as determined by the Auckland Council or the PRP.

118 The consent holder shall ensure that records are kept of any geotechnical and civil engineering site investigations for any engineering works associated with all consents granted~~for the landfill operation and that these records are forwarded monthly to the PRP~~.

Waste Acceptance

119 Material accepted into the landfill shall be limited to non-hazardous commercial wastes, non-hazardous industrial wastes, residential wastes, construction and demolition debris, contaminated soils, sludges from wastewater treatment plants with a solids content greater than 20% and site-generated sludges. Wastewater treatment plant sludges with a solids content less than 20% may be accepted if the chemical and physical stabilisation processes ensure that the sludges contain no free liquids as determined by the paint filter test at the point of loading into trucks going direct to the landfill.

120 Material accepted in to the landfill must meet the Waste Acceptance Criteria set out in the Landfill Management Plan and / or be accepted on the basis of the Waste Acceptance Procedures described in the Landfill Management Plan

121 The landfill shall not accept any hazardous wastes as defined in [USEPA Subtitle C [US Code of Federal Regulations Title 40 Volume 18 Parts 260 to 295 and in particular Part 261 - Identification and Listing of Hazardous Waste], or prohibited waste as defined by WasteMINZ [Technical Guidelines for Disposal to Land, Waste Management Institute New Zealand, August 2018], with the modifications shown in ~~the application Technical Report by T+T titled 'Auckland Regional Landfill, Waste Acceptance Criteria', May 2019~~ Landfill Management Plan. The consent holder ~~landfill~~ must keep sufficient records to show that any waste accepted for disposal is not hazardous.

122 The consent holder shall commission an independent review of the waste acceptance criteria specified in condition XX every 5 years. The purpose of this review is to consider whether any additional waste acceptance criteria should be added or if existing criteria should be adjusted to account for emerging contaminants. The results and conclusions, along with any recommended changes to the waste acceptance criteria shall be provided to Auckland Council within three months for their information and to support any proposed change to the Landfill Management Plan.

123 Leachate, condensate and site-generated sludges from the operation of any leachate evaporator unit, cesspits and drains, and landfill gas reticulation system on the site may also be disposed of into the landfill in areas and by procedures and within volumes and/or weight limits approved by the Auckland Council and described in the LMP required by Condition XX-XX....

124 If any waste load is rejected at the gatehouse or at the working face because it is hazardous, then ~~Auckland Council is to be notified within 48 hours. T~~ the consent holder shall notify the Auckland Council within 2 working days including ~~of~~ details of the generator and transporter of that ~~any~~ hazardous waste ~~that has been refused entry to the landfill~~.

125 Pre-acceptance testing is required for all special wastes and likely contaminated soils whose contaminant concentrations are not known, with the exception of up to 100m3 of soil from any site up to 2000m2 where that site is a discrete development site, where the only HAIL activity is historical horticulture, provided the source site was only ever part of broad-acre pesticide application, where pre-acceptance testing shall be at the discretion of the consent holder. The consent holder shall ensure that disposers provide appropriate evidence to demonstrate that the source site was only ever used for broad-acre horticultural activity in accordance with the process described in the Landfill Management Plan.

126 All special wastes shall have at least 1 sample tested for the key contaminants of concern associated with that waste for both total concentrations and TCLP concentrations. The methodology for determining sampling density to be set out in the Landfill Management Plan

127 Any new waste where there are no TCLP limits or total limits for the contaminants of concern then acceptance of the waste will be based on the case-by-case assessment process described in the Landfill Management Plan.

128 ~~Any new special waste with potential ecotoxicity shall not be accepted unless the customer can provide the consent holder with test results that show that the waste meets the TLCP limits or the total concentration limits.~~

129 The requirements for TCLP testing are:

a The testing must be done by an accredited laboratory.

b The sample size must be sufficient to effectively characterise the material.

c The sampling programme design shall be aimed at finding ~~will typically include~~ worst-case and average concentrations~~, but this is disposer specific~~.

Operational noise

130 If trucks accessing the bin exchange area between 7pm-7am are fitted with reversing alarms, then the alarms shall be ~~to be fitted with a~~ broadband reverse alarms.

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

Time period	**Time period Noise limit**
0700 – 2200 hours Monday to Saturday 0900 - 1800 hours Sunday	55 dB LAeq
At all other times	45 dB LAeq 75 dB LAFmax

132 Noise levels shall be measured and assessed in accordance with New Zealand Standards NZS 6801:2008 “Acoustics - Measurement of Environmental Sound” and NZS 6802:2008 “Acoustics - Environmental Noise”.

133 Noise measurements shall be carried out:

a Within one month after the commencement of ~~initial~~ operation of:

- The Working Face
- The Clay Pit
- Stockpile 1

- Stockpile 2
- Bin Exchange area

b Within three months after ~~of~~ commencing operations of any item of permanent fixed plant, including any landfill gas utilisation plant, landfill gas powered electricity generator, leachate treatment plant, leachate evaporator or flare, that brings the total power (adding power consumption or power output whichever is the greater for each item), ignoring silent heat loss, to 3 MW more that at the time of any previous noise monitoring.

134 The Consent Holder must submit to Council a report by a suitably qualified acoustic engineer outlining the measured noise levels at the notional boundaries of the nearest residential dwellings existing as at the date of granting consent with all the plant operating that can reasonably be operated together at the instances described in Condition XX.

135 Prior to the installation of any new plant on site (e.g. generators, leachate evaporators, blowers and flares) within 1 km of a dwelling existing at the time of granting of this consent (excluding dwellings within the Precinct ~~WMNZ landholdings~~), the potential noise levels at the notional boundary of those dwellings shall be calculated, including the simultaneous operation of the new and existing plant that would reasonably be expected to operate together. Once the new plant is operational, the noise emissions shall be measured to confirm compliance with noise limits in Condition XX. If non-compliance with the noise limits of Condition XX is identified, noise mitigation measures are to be implemented as soon as practical to achieve compliance. Once compliant noise emissions are confirmed, the results and any mitigations ~~process~~ shall be documented in a report and that report shall be submitted to Auckland Council.

Lighting

136 Lighting of the roundabout shall comply with the relevant NZTA standards for lighting on State Highways.

137 Prior to any permanent exterior lighting being established within the WMNZ landholding, the consent holder shall provide a finalised lighting design to the satisfaction of Auckland Council in sufficient detail that demonstrates that:

a The proposed lighting meets the relevant permitted standards in Chapter E24 of the Auckland Unitary Plan.

b Except in the bin exchange area, all permanent elevated lighting (mounted above ground) is downward facing, with zero upward tilt, emits zero direct upward light and is not located on the ridgelines (unless there is no practicable alternative or it is required for safety reasons), and will have lighting shields (where appropriate).

138 Within 2 months after installation of lighting, the consent holder shall provide a report from a suitably qualified lighting expert confirming that all lighting has been installed in accordance with the ~~approved~~ finalised lighting design plan prepared in accordance with Condition XXX.~~ and complies with the permitted standards in chapter E24 of the Auckland Unitary Plan~~

139 Lighting within the site shall not be obtrusive and shall meet lighting standards (as outlined in Condition XXX) so that glare and light spill is generally confined to the site to minimise sky glow effects on the surrounding environment.

140 Signage shall be installed within the site requiring that when vehicle headlights are used, they shall be dipped (low beam) at all times.

Air quality

141 There shall be no burning of waste ~~material~~ on site.

Dust

142 Beyond the boundary of the site there shall be no dust caused by discharges from the landfill operations on the site which, in the opinion of a suitably qualified and experienced enforcement officer, is noxious, offensive or objectionable.

143 Effective dust control procedures shall be implemented at the site including, but not limited to:

a Watering of unpaved internal access roads and manoeuvring areas in active use during dry periods.

b Maintenance of all access and manoeuvring areas to the satisfaction of the Auckland Council in order to reduce the creation of dust and to prevent the deposition of significant dirt or other material onto public roads.

c Maintenance of a permanent water supply on the site to control dust at the working face and to dampen down unsealed access roads ~~and for fire control~~.

Landfill gas

144 The Consent Holder shall install and operate a gas extraction system in a manner which ensures that the rate of extraction of landfill gas is maximised, while minimising the risk of landfill fire due to over extraction.

145 All extraction wells shall be connected to the gas extraction system as soon as practicable and in any case not longer than 12 months after placing wastes within the radius of influence of the wells. Passive flares with flame arresters shall be allowed to burn the gas venting from the wells prior to connection to the gas extraction system.

146 The gas extraction and treatment system shall be restored as soon as practicable in the event of a malfunction or fault. The Consent Holder shall maintain a standby diesel generator or equivalent on site for the purpose of restarting gas extraction blowers as soon as possible in the event of a mains power failure. The procedures for reducing emissions to air during a mains power failure including the operation of the generators, flares and standby diesel generator and during routine maintenance shall be documented in the Landfill Gas Management Plan (LGMP) required by Condition 214.

147 All extracted landfill gas shall be combusted in a flare(s) or generator(s) or evaporator(s) in accordance with the following requirements:

a Any landfill gas flare(s) shall comply with ~~the requirements of the Resource Management Act (National Environmental Standards for Air Quality) Regulations 2004 for a principal flare, and shall have~~ the following minimum specifications:

i flame arrester and backflow prevention devices, or similar equivalent system,

ii continuous automatic ignition system;

iii automatic isolation systems to ensure that there is no discharge of unburnt landfill gas from the flare in the event of flame loss;

iv minimum temperature of 750 °C and retention time of 0.5 seconds;

v a permanent temperature indicator at half a diameter from the top of the flare with a visual readout at ground level.

vi Adequate sampling ports to enable emissions testing to be undertaken; and

vii Provision for safe access to sampling ports while any emission tests are being undertaken

b The landfill gas powered generator shall comply with specifications a(i) and a(iii) above.

c Any landfill gas emergency flare shall comply with specifications a(i) to a(iii) above.

148 No more than 12 generators shall be operated at any one time for the purposes of landfill gas combustion.

149 There shall be no visible emission, other than water vapour, light, heat haze, or steam, from a landfill gas destruction device.

150 Each generator engine shall be tuned at least once every six months to comply with a maximum concentration of 550 mg/m3 NOx in the exhaust gas.

151 The concentration of methane at the surface of landfill areas with intermediate or final cover shall not exceed 0.5% by volume except where repairs are completed and retests confirm non-exceedance of this limit in accordance with the timeframes specified in Condition XX.

152 The concentration of methane in sub-surface gas migration monitoring probes outside the landfill footprint shall not exceed 5% by volume.

153 The residual nitrogen content of landfill gas in all extraction wells shall not exceed 20% by volume.

Monitoring

154 A walkover site inspection within the landfill footprint shall be undertaken no less frequently than weekly. Any evidence of actual or potential landfill gas leaks, such as odour, cracks in the landfill surface, gas bubbles, leaks in the gas extraction system or vegetation damage shall be investigated. Where necessary remedial action shall be undertaken as soon as practicable to minimise fugitive gas discharges.

155 A Flame Ionisation Detector (FID) or equivalent shall be used to carry out surface emissions monitoring for methane over the entire surface of the landfill on a 30 m by 30 m grid basis excluding the working face at least once every three months.

156 If monitoring carried out in accordance with Condition XXX demonstrates that the surface methane gas concentration limit specified in Condition XXX is exceeded, then remedial action shall be carried out and the concentrations re-tested within 14 days. If this is not practicable, the Consent Holder shall obtain the approval of Auckland Council for a proposed programme of remedial action, including a timetable, within 14 days of the exceedance. The proposed programme shall be implemented to the satisfaction of Auckland Council within the proposed time period.

157 Methane concentrations shall be measured and recorded using hand-held landfill gas analysis instruments on a monthly basis in each of the sub-surface gas migration monitoring probes outside the landfill footprint to demonstrate compliance with Condition XXX.

158 Landfill gas shall be monitored at each extraction wellhead or, if more appropriate, at manifold points, on a monthly basis. Monitoring shall be carried out using calibrated ~~hand-held landfill gas analysis~~ instruments. The following parameters shall be measured and recorded:

a Gas flowrate (m3/hour);

b Composition (methane (%v/v), oxygen (%v/v), carbon dioxide (%v/v), carbon monoxide (ppm), hydrogen sulphide (ppm));

c Residual nitrogen (% v/v) shall be calculated as the balance of gas measured in clause (b) to demonstrate compliance with Condition 107;

d Gas temperature (°C);

e Ambient temperature (°C);

f Gas pressure (mb);

g Barometric pressure (mb).

159 The total LFG flow rate (m3/hour) and totalised LFG flow volume (m3) shall be monitored and recorded continuously at the Renewable Energy Centre. The flow meter shall be calibrated annually.

160 Landfill gas (blended) shall be monitored at the Renewable Energy Centre on a six monthly basis. The following parameters shall be measured and recorded:

a Gas flowrate (m3/hour);

b Composition (methane (%v/v), oxygen (%v/v), carbon dioxide (%v/v), carbon monoxide (ppm));

c Gas temperature (°C);

d Ambient temperature (°C);

e Gas pressure (mb);

f Barometric pressure (mb);

g Hydrogen sulphide (ppm);

h Total non-methane organic compounds (ppm).

161 Emission 'stack' testing shall be undertaken on the generator exhausts to demonstrate compliance with condition XXX~~and determine sulphur dioxide emission concentrations~~. On each sampling occasion in 155b, emissions measurement results ~~Emissions~~ shall be averaged over all test results ~~measured~~ for each pollutant, for each generator tested. These tests shall:

a Be conducted for nitrogen oxides and sulphur dioxide;

b Be conducted within one year after the first generator is installed and thereafter at least once every three years. Once there are two or more generators installed, at least two representative generators shall be tested on each sampling occasion. Once there are four or more generators installed, different generators shall be tested on each consecutive sampling occasion;

c Be conducted in accordance with:

- ISO 7935:1992, ISO 7934:1998, USEPA Method 6 or 6C (sulphur dioxide);
- ISO 10849:1996 or US EPA Method 7E (nitrogen oxides); and/or
- other equivalent methods to the satisfaction of the Auckland Council.

d Be carried out by a company with International Accreditation New Zealand (IANZ) accreditation for the method(s) required by (c) above;

e Be conducted during normal process conditions that will give rise to representative ~~maximum~~ emissions;

f Comprise not less than three separate samples for each type of emission test undertaken at each generator.

162 On-site weather conditions shall be measured and recorded at least every 30 minutes. The parameters measured shall include:

a wind velocity

b wind direction

c barometric pressure

d rainfall

e temperature

163 The Consent Holder shall maintain a log of all monitoring ~~data~~, inspections, investigations and actions taken in respect of ~~with regard for~~ landfill gas in accordance with Conditions XXX-XXX. The log shall be made available to the Auckland Council upon request.

164 The Consent Holder shall submit a summary of landfill gas monitoring results to Auckland Council annually ~~at the end of each year~~. The summary shall include;

a the average flow rate ~~volume~~ of landfill gas extracted (m3/hr);

b a summary of monitoring undertaken;

c a comparison of the actual landfill gas extraction ~~production~~ rate with the predicted gas generation rate. Revised predictions shall be included where significant discrepancies are identified, as well as an explanation for the discrepancies; and

d an estimate of average waste composition.

Leachate evaporator

165 Any ~~The~~ low temperature leachate evaporation unit and all associated ducting and pipework shall be maintained in good condition and be free of gas or liquid leaks.

166 The temperature of leachate in the low temperature leachate evaporation unit shall not exceed 95°C. The temperature shall be continuously monitored and recorded. The records shall be marked with the correct time and date.

Odour

167 Beyond the boundary of the site, there shall be no odour caused by discharges from the landfill which, in the opinion of a suitably qualified and experienced enforcement officer when assessed in accordance with the Best Practice Guide for Assessing and Managing Odour (Ministry for the Environment, 2016) is noxious, dangerous, offensive or objectionable.

168 Effective odour control procedures shall be implemented at the site including, but not limited to:

a Keeping the working surface of the daily refuse cell to a practicable minimum in accordance with condition XX.

b Applying daily cover in accordance with condition XX.

c Managing known odorous wastes in accordance with specific procedures in the Landfill Management Plan, including but not limited to:

- Waste acceptance and pre-treatment criteria
- Restrictions on the hours of delivery
- Procedures for excavations and immediate covering of placed waste

d Ensuring equipment and materials for application of odour neutralising sprays are available for use, if required.

Landscape and visual mitigation

169 All earthworks areas, including soil stockpiles, not intended to be disturbed for more than 4 months shall be grassed, hydroseeded or otherwise planted.

170 Any areas of the landfill which are no longer required for filling activity, and have reached the final contour and have final cover placed, shall be reseeded or planted with suitable groundcover species as outlined in the report titled 'Landscape and Visual Assessment'' Dated May 2019 by Boffa Miskell Ltd and as specified in the Landscape and Visual ~~Mitigation and~~ Management Plan required by Condition XX except if there is a difference then the current certified LVMP shall prevail. The timeframe of this planting will be determined by the requirements and restraints of gas extraction infrastructure, schedule of progressive final capping, waste settlement and optimum planting seasons but shall be within 12 months of completion of the part of the final cover.

171 The final landform and restoration of the landfill cap and associated works shall be in accordance with the Landscape and Visual ~~Mitigation and~~ Management Plan required by Condition XX.

172 Final contouring of earthworks, including stockpiles and landfill cap shall ~~be contoured to~~ reflect natural or existing adjacent ground contours as far as practicable within engineering constraints.

173 The primary (main) colour or colours of all external buildings, roofs and structures shall be in the range of greys, charcoal, dark greens and browns with a reflective value no more than 40%, subject to any variation recommended by the Kaitiaki Forum and certified by Auckland Council. Non-reflective glass shall be used in glazing.

Erosion and Sediment control for operations and seasonal earthworks

174 The operational effectiveness and efficiency of all erosion and sediment control measures required by the ESCPO provided in accordance with Condition XX shall be maintained throughout the duration of earthworks activity, or until the area of works is permanently stabilised against erosion.

175 No bulk construction earthworks shall be undertaken between 30 April and 1 October in any year, without the submission of a 'Request for winter works' to Auckland Council. All requests for winter works must be renewed annually, and must be submitted at least 10 days prior to 30 April each year of proposed winter works. No works shall occur until written certification ~~approval~~ has been received from Auckland Council.

176 Prior to any earthworks commencing each October or later within each summer construction season, a certificate signed by an appropriately qualified ~~and experienced~~ person shall be submitted to Auckland Council, to certify that the erosion and sediment controls have been constructed in accordance with the approved ESCPO and Auckland Council Guideline GD05 except if there is a difference then the current certified ESCPO shall prevail. The certificate required by this Condition shall not be required if the impending season's proposed earthworks and installed controls are the same as in the previous certificate.

~~ITA activities~~

177 ~~The Consent Holder shall ensure that each ITA activity within the landholding is operated and managed in accordance with the ITAMP required by Condition 161 for the duration that the ITA continues.~~

178 ~~The Consent Holder shall prepare and provide a copy to Auckland Council of a Hazardous Substances Management Plan (HSMP) for the management and storage of any hazardous substance that is stored or used at the site. The HSMP shall be implemented for the duration of hazard substances being stored on site.~~

Spill prevention

179 All machinery shall be operated in a way, which ensures that spillages of fuel, oil and similar contaminants are prevented, particularly during machinery servicing and maintenance. Refuelling and lubrication activities shall be carried out away from any water body such that any spillage can be contained so it does not enter any watercourse. All mixing of chemicals for construction purposes including grouts, additives and adhesive products shall be carried out outside the 2 year ARI floodplain area such that any spillage can be contained so it does not enter any watercourse. Provisions for being prepared for any spill shall be described in the Site Emergency Management Plan required by Condition XXX.

Stormwater Treatment Devices

180 The permanent stormwater treatment devices shall be designed to treat the runoff from the 90th Percentile Storm Event for water quality treatment.

181 The stormwater treatment devices identified in Condition XXXX shall be designed to hold and release the runoff volume from the 95th Percentile Storm Event for avoidance of stream erosion.

182 The consent holder may make modifications to the stormwater systems and treatment devices shown in the Stormwater and Industrial and Trade Activities Report by Tonkin + Taylor Ltd, date May 2019, submitted with the consent application, including the use of alternative Council approved stormwater treatment devices, subject to the prior certification ~~approval~~of Auckland Council.

183 Wheel washing facilities shall be provided and shall be used by all vehicles that have travelled off the sealed road and hardstand areas, prior to the vehicle departing the site in any instance where there is potential for mud to be tracked out onto SH1.

184 At least 20 working days prior to construction of the proposed stormwater systems and treatment devices, the Consent Holder shall submit a design report, including detailed engineering drawings, specifications, and calculations for the stormwater treatment devices. The details shall include:

a Confirmation that the design achieves the requirements of Conditions 134-141;

b Contributing catchment size and boundaries and impervious percentage;

c Specific design and location of stormwater treatment devices; and

d Supporting calculations for stormwater treatment devices, including capacity and suspended solids removal efficiency.

185 The stormwater pond system for the landfill shall be designed to achieve the following maximum rates of discharge ~~maximum design rate of discharge from the stormwater ponds system shall be no more than the following:~~

- 5.8 m^3/s for the 2 year ARI;
- 11.7 m^3/s for the 10 year ARI; and
- 21.9 m^3/s for the 100 year ARI.

186 All structures authorised by this consent including earth fill dams, stormwater ponds, spillways, pipes and permanent erosion protection shall be maintained by the consent holder to ensure that they perform at all times to the standards specified in this consent.

187 Stormwater discharged from the site boundary to tributaries of the Hoteo River shall contain no more than an average of 30 g/m3 of suspended solids in 95% of samples in any consecutive twelve month period where one sample is one half-hourly reading in NTU units of a nephelometric turbidity meter converted to its equivalent reading in g/m3 units of suspended solids.

Stormwater pond monitoring

188 The consent holder shall continuously ("continuously" shall mean at intervals of not more than 30 ~~15~~ minutes) monitor the inlet flow to the first stormwater pond to be reached by landfill run-off immediately downstream from the landfill for the following:

- electrical conductivity (mS/m); and

The consent holder shall continuously ("continuously" shall mean at intervals of not more than 30 ~~15~~ minutes) monitor the discharge from the outlet of the pond system for the following:

- Flow rate; L/min

- Electrical conductivity; mS/m
- Temperature °C

189 If continuous monitoring results obtained at the pond outlet show electrical conductivity has exceeded the approved trigger level, then a grab sample of the stormwater shall be taken at the point of discharge (outlet) and analysed for the following parameters.

- Temperature °C
- pH;
- Total Ammoniacal Nitrogen; gN/m3,
- COD; and gO/m3,
- Chloride gCl/m3.

190 If the results of samples obtained from stormwater pond system inlet in accordance with Condition 182 and tested for the parameters listed in Condition 183 show that leachate contamination or other pollutants associated with the consent holder's operations is occurring (as defined in the Stormwater Monitoring and Contingency Plan (SMCP) required by Conditions 174-176), then discharge from the stormwater ponds outlet shall be ceased immediately. The following shall then occur:

a Further testing of the stormwater shall be undertaken to characterise the contamination;

b Downstream testing shall be conducted to determine whether any contamination has been discharged from or escaped the stormwater ponds;

c An investigation shall be undertaken to determine the source of the contamination;

d Measures shall be put into place to prevent further contamination; and

e Discharges of stormwater from the relevant treatment device shall not recommence until electrical conductivity at the point of discharge no longer indicates that contamination is occurring.

191 Where any leachate contamination or other pollutants associated with the consent holder's operations escapes to a natural surface water body, the consent holder shall:

a Undertake appropriate remedial action immediately as prescribed in the SMCP.

b Immediately notify the Auckland Council of the escape of leachate or other pollutants.

Subsoil drainage monitoring

192 The consent holder shall sample the discharge from the subsoil drains beneath the lining system on a quarterly basis for the following:

- Electrical conductivity; mS/m
- Temperature °C
- pH;
- Total Ammoniacal Nitrogen; gN/m3,

193 If the results of samples obtained from the subsoil drains in accordance with Condition 186 and tested for the parameters listed in Condition 186 show that leachate contamination is occurring (as defined in the Leachate Monitoring and Contingency Plan (LMCP) required by Conditions XX-XX), then discharge from the subsoil drains to the stormwater ponds outlet shall be ceased immediately, and all discharge from the drains shall be captured and treated as leachate. The following shall then occur:

c Further testing of the water shall be undertaken to characterise the contamination;

d Downstream testing shall be conducted to determine whether any contamination has been discharged from or escaped the stormwater ponds;

e An investigation shall be undertaken to determine the source of the contamination

f Measures shall be put into place to avoid further contamination entering the subsoil drains system;

g Discharges of water from subsoil drains to the stormwater ponds shall not recommence until electrical conductivity at the point of discharge from the subsoil drains no longer indicates that contamination is occurring.

Groundwater monitoring after landfill commencement

194 The existing groundwater monitoring bores on the site listed in Schedule XXXX as shown on the plan titled XXXX are to be maintained to ensure ongoing monitoring data is obtainable. Should any of the monitoring bores be damaged or become in-operable, then a replacement monitoring bore, to the same depth or greater, is to be drilled at a nearby location in consultation with the Auckland Council.

195 The list of wells shall include two wells downgradient from the landfill footprint located in consultation with Watercare Services Ltd.

196 Groundwater shall be monitored on a quarterly basis from the landfill commencement date in accordance with the Groundwater Monitoring and Contingency Plan (GWMCP) required by Condition XX.

197 Should groundwater monitoring results identify leachate contamination as defined in the GWMCP (condition XX), then the consent holder shall immediately notify Watercare Services Limited (WSL) and Auckland Council.

198 Within 5 working days of receipt of sample results showing contaminants exceeding the agreed trigger levels:

a an investigation shall be undertaken to determine why exceedances were detected and to identify any additional source controls or treatment required; and

b any additional structural or procedural controls, including increased monitoring frequency or parameters proposed by the consent holder shall be submitted to the Auckland Council for certification prior to their implementation.

199 If 2 or more groundwater quality exceedances of any 2 or more pollutant indicator parameters at any one well are recorded within a 12 month period, the consent holder shall engage a suitably qualified independent reviewer to review the response to recurring exceedances of trigger levels, and to provide recommendations to the consent holder and Auckland Council.

Groundwater take from potable supply bore TB01

200 The daily abstraction shall not exceed 50 cubic metres. The total volume of water abstracted in each 12 month period, commencing 1 July of any year and ending 30 June of the following year, shall not exceed 18,250m^3 cubic metres.

201 A water meter shall be installed and maintained at the head of the bore to the satisfaction of Auckland Council. The water meter and recording device/system shall:

- be fit for the purpose and water it is measuring;
- measure the volume of water taken, with an accuracy of +/- 5% of the actual volume taken;
- be tamper-proof and sealed;
- be installed and maintained in accordance to the manufacturer's specifications.

202 The water meter, and any device or system used to record water take volume, shall be verified as accurate by a suitably qualified professional at the following times:

- prior to the exercise of this permit;
- within 5 working days of the water meter being serviced or replaced;
- by 30 June of the fifth year from the commencement of consent, and thereafter at five yearly intervals.

203 The water meter, its verification and evidence of its accuracy shall be in accordance with the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010 (or any equivalent regulations that may replace them) and a copy of the verification shall be provided to Auckland Council within 10 working days of the meter/devices being verified as accurate.

204 Provision at the top of the bore for water level measurements shall be made and maintained so that a probe can be lowered vertically into the bore between the riser tube and casing to measure the static water level in the bore

205 Provision at the top of the bore for water quality sampling shall be made and maintained so that a sample of water can be taken from the bore for water quality analysis. A tap or hand valve shall be fitted as close to the pump outlet as possible and before the water enters any storage tank or filter. The tap or valve should have at least 0.3 metre clearance above ground level or any other obstruction to allow a sample bottle to be filled.

206 The method of monitoring of the groundwater take from the bore shall be described in the Groundwater Monitoring and Contingency Plan required by Condition...

Fire Fighting Water Supply

207 Upon completion of the construction of the site buildings, sufficient water volume, pressure and flows shall be provided for those buildings in accordance with NZFS Fire Fighting Water Supplies Code of Practice SNZ PAS 4509:2008.

208 If the water supply in reference to any site building is to be provided by way of tank storage, this tank storage should be located between 5m and 90m away from the building in accordance with NZFS Fire Fighting Water Supplies Code of Practice SNZ PAS 4509:2008, unless otherwise agreed in writing with Fire and Emergency New Zealand. Any tank used for the storage of fire fighting water supplies is to be fitted with a 100 mm female round thread suction hose adaptor in accordance with the NZFS Specification for Firefighting Waterway Equipment SNZ PAS 4505:2007.

Environmental reporting

209 An Annual Report evaluating the site's environmental performance for the preceding year shall be forwarded annually to Auckland Council from a date that is within 12 months from the landfill commencement date, and thereafter annually.

210 Advice Note: The month of submission of the Annual Report shall be agreed with Auckland Council

211 The Annual Report shall include but not be limited to:

a all aspects of the performance of ITAMP, and LMCP (Condition XX and XX) relating to this consent;

b a summary of all revisions and revised sections of the ITAMP and LMCP;

c summary details of all inspections and maintenance of the stormwater treatment devices for the preceding 12 months;

d details of the person(s) or body responsible for maintenance of site and the organisation's structure supporting this process;

e results ~~and analysis~~ of the preceding 12 months' stormwater, surface water, subsoil drainage, leachate and groundwater~~, macroinvertebrate, periphyton and macrophyte monitoring,~~ along with an interpretation of those results and suggestions for improvement to the site operations;

f results and analysis of less frequent macroinvertebrate, periphyton and macrophyte monitoring whenever that monitoring has been carried out in the previous 12 months; and

g ~~records~~ summaries of any spills or incidents which occurred within the previous 12 months and the response which was undertaken.

PART D - LANDFILL MANAGEMENT PLAN

212 The consent holder shall develop and implement an overall Landfill Management Plan (LMP) for the duration of this consent. At least one printed copy of the LMP shall be held on site at all times. The overall objective of the LMP shall be to set out the practices and procedures to be adopted to achieve compliance with the conditions of consent.

213 At least six months prior to the landfill commencement date (acceptance of waste at the site), the LMP shall be submitted to the Auckland Council for certification, to confirm that the activities undertaken in accordance with the LMP will achieve the objectives of the LMP and compliance with the relevant consent conditions.

214 The LMP shall address how the following matters will meet any requirements, limits or restrictions set out by the consent conditions:

- Height and timing of visual screening ~~screen bund construction~~.
- The stages and order of landfill development.
- Construction and testing of the lining system.
- Gas, leachate and water management and monitoring.
- Types of waste to be accepted and those that are prohibited.
- Waste acceptance control and methodology of monitoring types of refuse accepted.
- Sampling methodology for special wastes, including differentiation between routine, consistent, and well-characterised waste and variable waste sources
- ~~Restricted and prohibited materials.~~
- Methods of placing refuse
- Methods of handling special wastes, ~~including biosolids~~.
- Landfill working face and cover management.
- ~~The width of the working surface in relation to the rate of refuse deposition.~~
- Noise and vibration management.
- Nuisance control procedures.
- ~~Dust management.~~
- Pest and weed control.
- Monitoring procedures.
- Emergency procedures.
- Contingency plans.
- Odour management ~~including best practice methods to manage odour.~~
- Complaints response procedure~~for odour effects~~.
- ~~The method for odour field inspections.~~
- Record-keeping.
- Traffic management with reference to vehicle movements to and from ~~including means by which the total number of vehicle movements to and from the~~ State Highway 1~~can be minimised~~.
- Final post settlement height, shape and contours of the land, in accordance with the plans.
- List of items to be completed prior to each stage including prior to landfill commencement date.
- After-care.

215 The LMP shall also include the subordinate management plans listed in Schedule XX ...The LMP, when approved, shall be adhered to at all times.

216 The LMP shall be subject to review annually from the date the landfill commencement date (unless the requirement for review is waived by the Auckland Council), such review to include assessment of the performance of the practices and procedures specified in it. Any amendment required by the Auckland Council arising out of this review or requested by the PRP arising out of their role in design and construction of the lining system shall be incorporated into the LMP without delay. The consent holder shall lodge a copy of the certified ~~approved~~ LMP with the Auckland Council and a hard copy shall be made available at the Landfill during office hours for use by the CLG. Auckland Council may waive the annual review requirement for that year if no amendments are required by the PRP and Auckland Council.

Bin Exchange Area Management Plan

217 The consent holder shall prepare and maintain a Bin Exchange Area Management Plan (BEAMP). The BEAMP shall describe the operations of the bin exchange area, including demonstrating how compliance with the conditions of this consent will be achieved. The plan shall include (if appropriate by way of reference to other plans described in these conditions):

a Methods for recording time of bin arrival and exit from the bin exchange to ensure that bins containing waste will be taken to landfill within 2 working days;

b Measures to control and manage the bin exchange area in the event of a forecast extreme weather event;

c Controls on traffic movements into and out of the bin exchange area, including measures to restrict public/non-permitted access to the bin area (and means to direct public/non-permitted users back to the public road SH1);

d Processes ~~Means~~ to prevent queuing onto SH1 from the Bin Exchange Area and ~~maintain the safe and effective operation of the State Highway for all users;~~

e ~~Methods and recommended~~ actions to be implemented should any queuing generated by the Bin Exchange Area extend onto Landfill Access Road, to ensure queuing onto SH1 is avoided;

f Measures to manage noise in the area, including restrictions on reversing alarms;

g Appropriate cross references to measures in other management plans applying to the Bin Exchange Area;

h Methods to confirm bins are sealed and contained.

Site Emergency Management Plan

218 The consent holder shall prepare and maintain a Site Emergency Management Plan (SEMP). Advice of the existence of this Plan, and information on how to obtain a copy, shall be provided by the consent holder to the Auckland Council and other appropriate organisations such as Fire and Emergency New Zealand and the District Health Board. The SEMP shall include procedures to manage the risk from and contingency measures for:

- Landfill fire
- Wildfire
- Forecast extreme weather event
- Flooding

Landfill Gas Management Plan

219 The Consent Holder shall maintain a Landfill Gas Management Plan (LGMP), as part of the Landfill Management Plan. The purpose of the LGMP is to record all management and

operations procedures, methodologies, and contingency and emergency plans necessary to comply with the conditions of this consent. The LGMP shall include the following information:

- Landfill Gas System – Design and Construction
- Landfill Gas System – Operation
- Landfill Gas Monitoring
- Landfill Gas Contingency

220 The LGMP shall include measures to monitor for elevated temperatures, and provide trigger levels and contingency actions. The measurements shall include monitoring the CH_4:CO_2 ratio and landfill gas temperatures, with CH_4:CO_2 ratio of <0.6 being the trigger to investigate any higher temperatures, possible causes and possible remedial works.

Erosion and Sediment Control Plan - Landfill Operations

221 An Operational Erosion and Sediment Control Plan (ESCPO) shall be prepared by a suitably qualified person in general accordance with Auckland Council Guideline GD05, Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region, and submitted to Auckland Council for certification. The purpose of the ESCPO is to set out the measures to be implemented to minimise erosion and the discharge of sediment beyond the boundaries of the site after the landfill commencement date.

222 The ESCPO shall include the following information as appropriate to the scale, location and type of earthworks:

a Drawings showing location and quantities of earthworks, contour information, catchment boundaries and erosion and sediment controls (location, dimensions, capacity);

b Supporting calculations for erosion and sediment controls;

c Catchment boundaries and contour information;

d Details of construction methods to be employed, including timing and duration;

e Dewatering and pumping methodology (if applicable);

f Details of the proposed water treatment devices (if applicable);

g Specific location of stockpile areas (if applicable);

h A programme for managing exposed area, including progressive stabilisation considerations;

i Roles and responsibilities under the ESCPO and identification of those holding roles including the suitably qualified person; and

j Monitoring, maintenance and record-keeping requirements.

223 The Consent Holder shall carry out monitoring in accordance with the ESCPO and shall keep records detailing:

a The monitoring undertaken;

b The erosion and sediment controls that required maintenance;

c The time when the maintenance was completed; and

d Areas of non-compliance with the erosion and sediment control monitoring plan (if any) and the reasons for the non-compliance.

This information shall be made available to Auckland Council upon request.

224 Prior to the commencement of seasonal earthworks each October for the life of this consent, the consent holder shall undertake an annual review of the ESCPO, and re-submit for certification to Auckland Council if works are proposed in a new area of the landholding or to re-disturb ~~excavate~~ an area which has been vegetated on a temporary basis.

Industrial and Trade Activities Management Plan

225 The consent holder shall prepare and submit a Stormwater and Industrial and Trade Activities Management Plan(s) (ITAMP) to Auckland Council. The purpose of the ITAMP is to set out the Best Practicable Option (BPO) approach to avoid, remedy or mitigate potential adverse effects arising from stormwater management and the ITAs on site, including treatment devices, operational procedures and management systems.

226 The ITAMP shall include the following:

a Site activities, layout and drainage plans, including an up-to-date and accurate site drainage plan showing the location of all stormwater treatment devices on site and the final discharge point(s) of the site stormwater system;

b Identification of potential contaminants associated with the activities conducted on the site(s), methods to avoid, control and treat discharges of these from the site(s), and methods to manage environmental risks from site activities as far as practicable;

c Identification of hazardous substances on site;

d an emergency Spill Response Plan (SRP) (which includes the provision that all spills over 20 litres, or any spill of Environmentally Hazardous Substances that has entered the stormwater system, a water-body or has contacted unsealed ground, shall be reported immediately to the Auckland Council's 24 Hour Pollution Hotline (09-377-3107)) or reference to a SRP contained in the SEMP;

e Operation and maintenance procedures for treatment devices, or cross-reference to the SSOMP required by Condition 224 if it contains this information ~~which may be contained in a separate plan cross referenced in the ITAMP as required by Condition 164 (design report for stormwater treatment);~~

f Roles and responsibilities associated with the ITAMP;

g Methods for providing and recording staff training on the ITAMP;

h Stormwater Monitoring and Contingency Plan (SMCP) (as described in Condition 168;

i a Stormwater System Operation and Maintenance Plan (SSOMP) as outlined in Condition 224;

j A programme for auditing site performance against the ITAMP provisions; and

k Reporting and review of the ITAMP.

227 The site shall be operated and managed in accordance with the ITAMP to ensure the risks to surface water quality from the site are managed appropriately.

Stormwater Operation and Maintenance Plan

228 A Stormwater System Operation and Maintenance Plan (SSOMP) shall be provided to Auckland Council at least three months prior to Industrial and Trade Activities occurring on site. The SOMP shall set out how the stormwater management system is to be operated and maintained so that adverse environmental effects are minimised or mitigated. The plan shall include:

a Details of who will hold responsibility for maintenance of the stormwater management system and the organisational structure which will support this process;

b A monitoring programme to determine maintenance frequency;

c A programme for regular maintenance and inspection of the stormwater management system;

d A programme for the collection and disposal of debris and sediment collected by the stormwater management devices or practices;

e A programme for post storm inspection and maintenance;

f A programme for inspection and maintenance of the outfalls;

g General inspection checklists for all aspects of the stormwater management system, including visual check

229 The stormwater ~~management~~ system shall be managed in accordance with the certified ~~approved~~ Stormwater System Operation and Maintenance Plan.

230 Details of all inspections and maintenance for the stormwater ~~management~~ system, for the preceding three years, shall be retained, and shall be provided to Auckland Council on request, including:

a Details of who is responsible for maintenance of the stormwater management system and the organisational structure supporting this process;

b Details of any maintenance undertaken; and

c Details of any inspections completed.

231 A final updated Stormwater System Operation and Maintenance Plan shall be submitted for the approval of Auckland Council ~~within 90 days~~ before the landfill commencement date ~~of the commencement of this consent.~~

Stormwater Monitoring and Contingency Plan

232 At least 90 days prior to the commencement date, a final Stormwater Monitoring and Contingency Plan (SMCP), incorporating a Stormwater Monitoring Programme (SMP), to assess the ongoing adequacy of all water quality management practices shall be developed and submitted to Auckland Council for certification ~~approval~~

233 The SMCP shall include, but not be limited to:

a Sampling location for final discharge from the site stormwater treatment device outlets;

b Sampling locations from the surface water bodies within the site;

c Methods and procedures for water quality sampling;

d Monitoring parameters for analysis from the stormwater discharge points on a fortnightly basis and shall include:

- pH
- Temperature oC
- Total Suspended Solids (TSS) mg/L
- Alkalinity $gCaCO3/m^3$
- Chloride gCl/ m^3
- Total ammonical Nitrogen gN/ m^3
- Electrical Conductivity (EC) mS/m
- Dissolved Oxygen gO/ m^3

e Monitoring parameters for analysis from the stormwater pond discharges and the receiving water downstream on a quarterly basis and shall include:

- Temperature ^oC
- Total heavy metals (dissolved copper, lead, Cadmium chromium, nickel and zinc) mg/L
- Oil & grease mg/L
- Chemical Oxygen Demand (COD) gO/m^3
- Total petroleum hydrocarbons mg/L

f Sampling location for discharges from the site wheel wash pond;

g Monitoring parameters for analysis from the wheel wash pond shall include:

- pH mg/L
- Total suspended solids (TSS) mg/L
- Electric conductivity mS/m
- Oil and grease mg/L
- Temperature oC
- Total ammoniacal nitrogen g N/ m^3

h ~~Proposed m~~ Monitoring of macroinvertebrates and of periphyton and macrophytes, which shall occur ~~at 6-monthly intervals~~, annually for the first 3 years of the landfill's operation, and then on a bi-annual basis ~~and of periphyton and macrophytes~~, ~~which shall occur at 3 monthly intervals~~

i Trigger levels for each of the above parameters in Conditions 168.d and 168.e based on the relevant ANZECC Guidelines values, the baseline monitoring results, and the concentrations measured upstream prior to mixing.

j The methods and procedures for investigating and reporting stormwater discharge monitoring results to Auckland Council.

Reference	Macroinvertebrates, periphyton and macrophytes	Surface water chemistry
MC1	*	
MC2	*	
MC3	*	
MC4	*	
MC5	*	
MC6	*	
SW1		*
SW3		*
SW4		*
(discharge from bin exchange area)		*

234 The SMCP shall be implemented after the landfill commencement date.

235 Within 5 working days of receipt of sample results showing contaminants exceeding the agreed trigger levels:

a an investigation shall be undertaken to determine why exceedances were detected and to identify any additional source controls or treatment required;

b the results of the investigation shall be reported to Auckland Council; and

c any additional structural or procedural controls proposed by the consent holder shall be approved by Auckland Council, in writing prior to their implementation.

Groundwater Monitoring and Contingency Plan (GWMCP)

236 At least three months prior to the commencement date, a final Groundwater Monitoring and Contingency Plan (GWMCP), incorporating a Groundwater Monitoring Programme (GMP), to assess the ongoing adequacy of all water quality management practices shall be developed and submitted to Auckland Council for certification ~~approval~~. At least 30 days prior to

submission to Auckland Council for certification, the consent holder shall provide a copy of the draft GWMCP to Watercare Services Limited (WSL) for feedback. The GWMCP submitted to Auckland Council shall record any feedback received from WSL and an explanation for any recommendations which have not been adopted. The GWMCP shall include, but not be limited to:

a Up-gradient and down-gradient groundwater monitoring bore locations and details;

b Methods and procedures for water quality sampling;

c Water levels and water quality in the groundwater monitoring bores shall be measured and recorded at quarterly intervals. Monitoring parameters for groundwater quality shall include:

- soluble arsenic
- cadmium
- chromium
- copper
- lead
- nickel
- zinc
- total petroleum hydrocarbons (TPH)
- organochlorine pesticides (OCP), including DDT-compounds
- polycyclic aromatic hydrocarbons (PAH)

d Identified trigger levels for each of the above parameters. Trigger levels for contaminants not included in the schedule submitted with the application shall be developed with reference to the 95% trigger value for fresh water ANZECC Guidelines for water quality where applicable.

e contain guidelines for the determination of whether leachate contamination of groundwater is occurring; and

f provide contingency plans for remedial actions should contamination of groundwater by leachate or other pollutants associated with the landfill and activities on the site associated with this consent be detected.

g The methods and procedures for investigating and reporting groundwater monitoring results to Auckland Council.

h The response if a bore structure fails

237 The GMP shall be implemented after the landfill commencement date.

238 ~~Within 5 working days of receipt of sample results showing contaminants exceeding the agreed trigger levels:~~

~~i an investigation shall be undertaken to determine why exceedances were detected and to identify any additional source controls or treatment required;~~

~~j the results of the investigation shall be reported to Auckland Council; and~~

~~k any additional structural or procedural controls proposed by the consent holder shall be approved by Auckland Council, in writing prior to their implementation.~~

Leachate Monitoring and Contingency Plan

239 The consent holder shall provide a Leachate Monitoring and Contingency Plan (LMCP) for the approval of the Auckland Council at least three months prior to the landfill commencement date. The LMCP shall describe in greater detail proposals for water chemistry monitoring,

detection limits, methods of analysis and units of measurement for all parameters listed in Conditions. The LMCP shall:

a include methods for managing the collection, treatment and disposal of leachate to manage potential adverse effects;

b ~~contain guidelines for the determination of whether leachate contamination is occurring; and~~

c ~~provide contingency plans for remedial actions should leachate contamination or other pollutants associated with the landfill and activities on the site associated with this consent occur.~~

240 In addition to the requirements of Condition XX, the LMCP shall:

a Specify methods for managing the collection of leachate, including pump out of sumps, regime of maintenance checks on integrity of pipes, and management of trucks to prevent spills;

b Include methods for disposal of leachate and any by-products from leachate treatment, including any measures to manage the process and potential adverse effects;

c Include detection limits, methods of analysis and units of measurement for all parameters;

d describe procedures for water chemistry, groundwater level and leachate level monitoring;

e specify the methods of analysis for samples taken in accordance with these special conditions;

f specify the units of measurement for reporting of analysis of water samples;

g specify the detection limits for analysis of water samples;

h summarise the results of baseline monitoring;

i summarise how the results of the leachate levels in the landfill will be compared to ground water levels outside the landfill;

j provide a definition of leachate contamination;

k contain guidelines for procedures to determine whether leachate contamination is occurring;

l state the sources of the criteria and water quality standards used as a basis for the definition of leachate contamination;

m define the circumstances and times when notification to Auckland Council is required;

n Procedures or systems will also be implemented to monitor and identify potential leachate breakouts or contamination of surface water including:

- Weekly inspections of the landfill surface to look out for any evidence of leachate breakouts and any malfunctioning or leaking associated with the reticulation system;
- Continuous monitoring of conductivity at the inlet to the ponds as an indicator of the presence of leachate in surface water including automated notification from site operated telemetry system if pond inlet conductivity exceeds the trigger limits; and
- Monitoring of contaminants at pond outlets.

o provide contingency plans for mitigation and remedial actions should leachate contamination occur.

241 The testing suite described in the LMCP is to include (but not limited to):

Leachate monitoring

Quarterly (including annual)	Annual only
Metals for which there are leachability limits ('Total' concentrations to be measured in the case of leachate): • Arsenic • Boron • Cadmium • Copper • Chromium • Lead • Nickel • Mercury • Selenium • Zinc	Nitrate and nitrite BOD and COD PFAS, including PFOA Volatile organic compounds, including: • Benzene, toluene, ethylbenzene, xylenes • Chlorinated solvents SVOC suite, including: • Organochlorine pesticides, including DDT-compounds • Polycyclic aromatic hydrocarbons Other compounds in NZ DWS suite: • Antimony • Barium • Cyanide • Iron • Manganese • Molybdenum • Nickel • Selenium • Silver • Sodium • Potassium • Sulphate • 1,4-dioxane
Other leachate quality parameters: • pH • Ammonia • Conductivity • Potassium • Chloride • Sodium • Sulphide • Total petroleum hydrocarbons (TPH) • Temperature	

~~Landscape Mitigation and Management Plan~~

242 ~~At least three months prior to the landfill commencement date, the consent holder shall submit to Auckland Council for certification a detailed Landscape Mitigation and Management Plan (LVMMP) which has been prepared by a qualified Landscape Architect. This plan is to be read in conjunction with the Ecological Enhancement and Restoration Plan (condition 180) and shall be based on the conceptual layouts of the Mitigation Plans depicted in Appendix 3 of the Boffa Miskell Ltd document entitled "Landscape and Visual Assessment, May 2019". The objective of the LMMP is to meet the conditions of this consent and to avoid, remedy or mitigate the adverse landscape and visual effects of the project through the following measures:~~

~~a Establish and maintain tree shelterbelts to provide effective visual screening of the landfill during its development and during the aftercare period;~~

~~b Ensure planting is of appropriate scale and mix of species to reflect the existing vegetation structure of the rural and forested area;~~

~~c Outline an ongoing and adaptive planting and management process for the landfill both during its development and during the aftercare period.~~

243 ~~The LMMP shall detail areas of planting, or landscape treatment and shall include the following information:~~

~~a Description of the objectives of the mitigation planting / landscape treatment, including the mitigation intent of each of the planting areas and how this will be fulfilled over time as the plants develop and age;~~

~~b Identification of areas of existing vegetation to remain or be removed and the methodology for managing, and supplementing this vegetation where necessary in a timely manner to maintain the mitigation objectives;~~

~~c Schedules of planting, including details of proposed species, grass mixes, plant grades, numbers and planting density,~~

~~d A proposed timetable for planting and;~~

~~e Ongoing planting maintenance and management techniques, including demonstration that the proposed vegetation will be myrtle rust resistant.~~

Ecological and Landscape Enhancement and Restoration Plan

244 An Ecological and Landscape Enhancement and Restoration Plan (ELERP) shall be prepared and provided to Council for certification at least three months prior to ~~within six months of~~ the construction commencement date. The objectives of the ELERP is to meet the conditions of this consent, to describe forest, wetland, and riparian and wetland margin revegetation. The focus of the ELERP is the replacement/replanting of plant species that have been affected by the project and the optimisation of ecological benefits through improving ecological connectivity between habitat types and protecting significant habitat types through buffer/margin plantings. The ELERP shall be consistent with and complementary to the Ecological Enhancement Pest Management Plan required by condition 187.

The planting areas shall be in general accordance with those shown in the Ecological Values and Effects Report by Tonkin + Taylor, date May 2019:

a Enhancement and/or protection of 14 km of stream within or as close as practicable to the WMNZ landholdings.

b Planting of [9.9] ha of native terrestrial vegetation within WMNZ landholdings.

c Long term pest control on WMNZ landholdings and Sunnybrook Reserve.

d Protection of [111.9] ha native forest areas within WMNZ landholdings by covenant.

e Planting and protection of [4.63] ha of degraded wetlands within the Western Block that are not affected by the project.

f Planting of wetland buffers of 10 m or 5 m around SEA and non-SEA wetlands within the Western Block, approximately [15.18] ha.

g Protection of all native wetland habitats by covenant, approximately [25.59] ha.

In addition to the above, the planting shall be based on the conceptual layouts of the Mitigation Plans depicted in Appendix 3 of the Boffa Miskell Ltd document entitled "Landscape and Visual Assessment, May 2019".

245 The ELERP shall avoid, remedy or mitigate the adverse landscape and visual effects of the project through the following measures:

h Establish and maintain tree shelterbelts to provide effective visual screening of the landfill during its development and during the aftercare period;

i Native revegetation along the cut and fill slopes around the bin exchange area and along the main access road

j Planting of fast growing trees and native plants adjacent to the roundabout and SH1 to re-establish this roadside character and provide further screening of the project activities

k Management of the off-site visually exposed face of the stockpiles wherever possible, with the front face formed, shaped and vegetated, as filling progresses

l Stabilisation with grass, erosion mats or tarps, of bare earth surfaces of the stockpiles and clay borrow pit areas on completion of filling/earthworks at the end of each summer earthmoving season.

m Planting on the side slopes and ridges around the perimeter of Valley 1 and around the stockpiles and clay borrow pit to assist in integrating and screening project works.

n Screen planting along access roads within the site to the extent practicable

o Ensure planting is of appropriate scale and mix of species to reflect the existing vegetation structure of the rural and forested area;

p Outline an ongoing and adaptive planting and management process for the landfill both during its development and during the aftercare period.

246 The details of this plan shall include:

a Confirmation of the areal extent and spatial configuration of plantings proposed.

b Description of the objectives of the mitigation planting / landscape treatment, including the mitigation intent of each of the planting areas and how this will be fulfilled over time as the plants develop and age;

c Identification of areas of existing vegetation to remain or be removed and the methodology for managing, and supplementing this vegetation where necessary in a timely manner to maintain the mitigation objectives;

d Site preparation (if required), e.g. fencing, weed or animal pest management and habitat enhancement (e.g. deployment of felled logs in revegetation sites).

e Timing of plantings.

f Schedules of planting, including plant species composition, plant sizes, plant densities, measures of stock condition (e.g. health of plant stock) the use of growth enhancement measures where required (e.g. fertiliser tablets or stock guards). Where available, plants will be eco-sourced native species from the same ecological district. Planting plans for stream riparian margins and wetland areas shall be in accordance with the Auckland Regional Council Riparian Zone Management Strategy for the Auckland Region, Technical Publication 148, June 2001 (TP148) and Appendix 16 of the Auckland Unitary Plan 'Guideline for native revegetation plantings'.

g Plant maintenance methods for ensuring successful establishment and long-term persistence of plantings, including the duration of maintenance, methods for ongoing control of weed or animal pests and infill planting.

h Monitoring and reporting requirements.

i Covenanting/encumbrance details.

247 Should the actual area of habitat impacted by the project be reduced through detailed design, the consent holder shall have the ability to demonstrate, through use of a mitigation/compensation model prepared by a suitably qualified ecologist, that the required area of ecological restoration has been reduced. This is subject to the consent holder providing sufficient evidence of the actual area of clearance and demonstrating to Auckland Council that the area of clearance is less than the consented area. The consent holder shall then submit an updated EERP based on the revised restoration planting area.

248 All plantings from the Myrtaceae family of species shall be sourced from a nursery that is a signatory to Myrtle Rust Nursery Management Declaration V6, 11 October 2017 that certifies that the plant producer has implemented the New Zealand Plant Producers Incorporated

Myrtle Rust Nursery Management Protocol (Myrtle Rust Nursery Management Protocol – V6, 11 October 2017).

249 All restoration planting described in the ELERP shall be completed within three years of the initial construction and enabling works being completed. Written confirmation shall be provided to the Auckland Council within 30 days of the works being completed confirming that all works have been completed in accordance with the ELERP.

250 A monitoring and maintenance plan for the duration of the landfill operation shall be developed and implemented to ensure plant densities and 90% survival rate are maintained. Monitoring shall be undertaken at times that avoid transient conditions, such as flood events. In relation to wetlands, monitoring shall include site photographs to demonstrate that a compliment of facultative wetland species at a density and a planting survival rate of at least 90% that is in accordance with the ELERP referenced in condition XXX. Any plants that die should be replaced the following planting season. The findings of the monitoring shall be reported to Auckland Council on a two-yearly basis.

Pest Control Plan - Landfill Operations

251 A Pest Control Plan - Landfill Operations (PCPO) shall be submitted to Auckland Council for certification at least three months prior to the landfill commencement date ~~waste being accepted at the site~~. The purpose of the PCPO is to control unwanted weeds, plant disease, vermin and predators that could be attracted to the landfill, and to prevent populations from being established.

Advice note: This plan applies specifically to the landfill operational areas. The broader pest management for the project is described in conditions XXX-XXX.

252 The PCPO shall include methods specifically for controlling ~~weeds, vermin and predators, including~~ rats, feral cats and seagulls within the landfill valley. Control methods for these pests may include physical controls such as fencing or traps, shooting or bait.

The PCPO shall be implemented from the landfill commencement date ~~time of the use commencing~~ to prevent pest populations from being established at the site, and form part of the LMP as set out in Conditions XXX-XXX.

Advice note: Appropriate control methods shall be selected to control red billed gulls to avoid killing or harming them ~~birds~~.

Ecological Enhancement Pest Management Plan

Advice note: These conditions refer to the pest management programme being offered to help address ~~as compensation for~~ the adverse effects of the project on ecological values. Separate conditions are proposed (Conditions 185-186) to address predators and vermin within the landfill operational areas.

253 An Ecological Enhancement Pest Management Plan (EEPMP) shall be prepared by a suitably qualified ~~and experienced~~ ecologist. The EEPMP shall be prepared and submitted to Auckland Council for certification three months prior to the Construction Commencement Date. The purpose of the EEPMP shall be to improve the ecological integrity of forest, wetland and riparian ecosystems within areas by pest control, including the protection and recovery of bats, lizards, Hochstetter's frogs, invertebrates and native forest and wetland plants). The objective of the EEPMP is to achieve:

j a long-term reduction in rats, possums, feral cats and mustelids densities;

k a long-term reduction in feral goats and pig densities; and

l the exclusion of farm stock within habitat for native fauna and areas of native vegetation within the WMNZ landholding and the Sunnybrook Reserve.

254 The EEPMP shall specify:

m Target pest species and target thresholds to be aimed for to achieve the objectives of the EEPMP; and

n Methods to achieve target species outcomes, ~~with a preference for physical controls over chemical wherever practicable~~. ~~Methods~~ which may include descriptions of spatial configuration of bait lines and baiting and/or trapping details including types of baits/traps and frequency of baiting; and

o A description of monitoring/auditing proposed in accordance with standard accepted practice.

255 Pest control specified in the EEPMP shall commence one month prior to construction works commencing. Pest control shall be undertaken in accordance with the EEPMP for the duration of the construction and operation of the landfill (i.e. placement of waste) ~~a period of 35 years~~ within:

- All native bush and wetland habitat that will remain on WMNZ land after the project commences (approximately 127.6 ha);
- Approximately 40.4 ha of mature wattle forest on WMNZ land that is not within the project footprint;
- Approximately 29.7 ha of restoration planting (wetland and terrestrial) on WNMZ land proposed as part of the Effects Management Package;
- Approximately 14.6 ha of riparian planting that will occur on WMNZ land;
- [Sunnybrook Scenic Reserve (154.6 ha)];
- Approximately 89ha of plantation pine forestry in WMNZ landholdings;

~~appropriate and accessible areas in Sunnybrook and WMNZ landholding.~~ The areal extent of pest control operations within Sunnybrook Reserve is to be confirmed following consultation with the Department of Conservation, ~~and may vary over the life of the consent~~.

256 [Rat control within the Dome Forest shall commence one month prior to construction works commencing. Rat control shall be undertaken in accordance with the EEPMP for the duration of the construction and operation of the landfill (i.e. placement of waste). The areal extent of rat control operations within Dome Forest is to be confirmed following consultation with the Department of Conservation.

257 The following rat control targets (i.e. the objective to be aimed for) within the Dome Forest apply:

- Rats will be maintained at or below a 5% Rat Tracking Index (RTI) every year with target monitoring to occur at the start of bird breeding season and as set out in C.A Gillies and D Williams 'DOC tracking tunnel guide v2.5.2: Using tracking tunnels to monitor rodents and mustelids' dated 2013.

If the above targets densities are exceeded in any two consecutive years, the Consent Holder shall consult with DOC and provide a report to Council for certification, identifying any amendment to the methods and effort levels that reasonably would improve the likelihood of achieving the target densities. These amendments shall be subsequently implemented.

258 The following pest control targets (i.e. the objective to be aimed for) within the WMNZ landholding and Sunnybrook Reserve apply:

- Rats will be maintained at or below a 5% Rat Tracking Index (RTI) every year with target monitoring to occur at the start of bird breeding season and as set out in C.A Gillies and

D Williams 'DOC tracking tunnel guide v2.5.2: Using tracking tunnels to monitor rodents and mustelids' dated 2013.

- Possums will be maintained at or below a 5% Residual Trap Catch (RTC) or equivalent target following the National Pest Control Agencies' 'A1 Possum Population Monitoring Using the Trap-Catch, Waxtag and Chewcard Methods' dated April 2020.
- Mustelids and feral cats will be maintained to low detection levels every year.
- Feral pigs, goats and deer will be controlled to zero density.

If the above targets densities are exceeded in any two consecutive years, the methods and effort levels in the EEPMP shall be reviewed.

259 ~~The scope and frequency of the ecological pest control shall be reviewed by the consent holder at 5 year intervals. Should a change to the scope or frequency be considered appropriate, a report on the effectiveness of the existing pest control programme shall be provided to Auckland Council, along with a description of the proposed changes and an explanation of how the new proposal will achieve the objectives of condition XXX.~~

Off-Site Stream Compensation Plan

260 An Off-Site Stream Compensation Plan (OSSCP) shall be prepared and provided to Council for certification within six months of the construction commencement date. The OSSCP shall include performance measures, actions, methods, trigger levels and monitoring programmes designed to achieve the below objectives. The objective of the OSSCP shall be to describe the principles by which the consent holder shall provide compensation for residual adverse effect on ecological values associated with the project. The OSSCP shall set out methodologies and processes that will be used to achieve these objectives and shall include habitat restoration/offset on the following basis: a 3:1 restoration ratio for residual stream length affected which has not been fully offset in accordance with condition 180 (i.e. to achieve a total ~~46.2~~ 42.3 km stream length including on-site measures, if the loss of permanent and intermittent streams is equal to ~~15.4~~ 14.1 km). The OSSCP provisions for stream restoration shall include the following:

a Overarching principles for the identification of restoration sites including a preference for sites within the Hoteo Catchment, and in close proximity to the location of development, where this will result in the best ecological outcome.

a Process for the consent holder informing landowners within the Hoteo Catchment, including criteria for selection and the establishment of a group comprising mana whenua and community representatives and land-owners to provide suggestions on restoration sites.

b The ecological values being achieved through the offset are the same or similar to those being lost.

c Provisions to protect restored areas in perpetuity.

261 Should the actual length of intermittent and/or permanent streams impacted by the project be reduced through detailed design or further ground-truthing, the consent holder shall have the ability to recalculate the required length of stream restoration. This is subject to the consent holder providing sufficient evidence of the actual length of stream impacted and demonstrating to Auckland Council that the length of intermittent and permanent stream is less than the consented area. The consent holder shall then submit an updated OSECP based on the revised restoration planting area.

262 The consent holder shall undertake the compensation described in the OSSCP in a staggered manner, providing at least 1.5km of stream enhancement each year until the required restoration ratio has been achieved.

263 A Stream Compensation Works Plan (SCWP) shall be prepared and provided to Auckland Council for certification every 5 years in accordance with the OSSCP, and will:

a describe the proposed compensation to occur within the next 5 planting seasons, including identification of compensation site(s);

b describe the proposed enhancement (eg riparian planting, stream habitat creation, in-stream habitat enhancement, fencing and stream protection) for the Compensation Sites, the purpose of which is to enhance the Compensation Sites' condition;

c provide details regarding how compensation sites shall be protected in perpetuity (where practicable) by land covenant or consent notice(s) or similar, placed on the subject area of the land's title and provide evidence that this protection is sufficient for the purpose of this consent.

264 A monitoring and maintenance plan for a period of five (5) to ensure plant densities and 90% survival rate are maintained. Any plants that die should be replaced the following planting season. Replacement planting and planting maintenance shall continue beyond year 5 until 90% survival is achieved. The 5 year period shall commence once all the compensation works describe within a SCWP have been completed.

265 By 1 December every 5th year, the consent holder shall provide a report to Auckland Council, prepared by an appropriately qualified person, confirming that the requirements of that period's SCWP have been achieved.

Dam Safety Management Plan

266 A Dam Safety Management Plan (DSMP) shall be submitted to Auckland Council for certification at least three months prior to waste being accepted at the site. The DSMS shall be implemented and be in place for the duration of the consent.

Advice note: If the dams are not decommissioned then new consents might be required in future for their continued operation.

267 The DSMP shall include procedures relating to governance, roles and responsibilities, operations, maintenance, surveillance, and emergency management to ensure that ongoing dam safety is managed in accordance with accepted practice.

The DSMP shall be designed to ensure the dam is well maintained, carefully monitored for any signs of distress, and that emergency management systems are in place to minimise the risk associated with any dam safety incident.

The DSMP shall be developed for the three dams and include the elements recommended in Table 1 of Module 5 of the DSG. These are:

a. Governance and responsibilities

b. Dam and reservoir operation, maintenance and surveillance. This includes appurtenant structures, such as valves and spillways, and includes regular intermediate and comprehensive dam safety reviews and special inspections following unusual events

c. Emergency preparedness

d. Identifying and managing dam safety issues

e. Audits and reviews of the dam safety management system.

PART E – AFTERCARE CONDITIONS

268 The consent holder shall adopt a minimum post-closure aftercare period of 30 years. Monitoring and maintenance requirements for the aftercare period shall be set out in the Post Closure Management Plan required by Condition 261. The term of the aftercare period may be reduced in accordance with the provisions of Condition XXX.

269 At the time of closure of the landfill the site shall be restored in accordance with the the LMVP without undue delay.

Leachate and Landfill Gas collection and disposal

270 The consent holder shall have a continuing responsibility for leachate and gas collection and disposal beyond the operating life of the landfill as a disposal facility, as described in Condition XXX.

271 The consent holder shall produce a report at the end of the post-closure aftercare period which shall demonstrate that the leachate and landfill gas no longer presents any undue or unacceptable risk to the environment to the satisfaction of the appropriate regulatory authority.

Aftercare / Post Closure Management Plan

272 At least 12 months prior to the reasonably projected landfill closure date ~~ceasing to accept waste for placement~~, the consent holder shall provide a Post Closure Management Plan (PCMP) for certification by Auckland Council. The objective of the PCMP is to describe the measures to be taken to stabilise the site and maintain environmental controls including stormwater, leachate and landfill gas collection and treatment. The consent holder shall adhere to and maintain the PCMP for the duration of the post-closure aftercare period. The PCMP shall be updated as necessary and any updates shall be submitted to ~~certified by~~ Auckland Council for certification prior to implementation.

The PCMP shall include details of:

a Ongoing measures for collection and disposal of leachate and landfill gas;

b Ongoing monitoring and reporting of groundwater, surface water and landfill gas;

c Proposed planting of the landfill cap;

d Proposed access and use of the site, including consideration of public access to the site whilst limiting activities to avoid damage to the final cap and gas extraction infrastructure ~~plant~~;

e monitoring of site integrity, including repairs to the final cover system; contingency measures in case of natural hazards, and maintenance and control of vegetation;

f contact arrangements for Auckland Council and adjacent property owners to maintain communications with aftercare operations personnel.

SCHEDULE OF MANAGEMENT PLANS

Vol.	Sec.	Title	Abbreviation
0		FRONT COVER	
1		INTRODUCTION AND SUMMARY	
	1.00	Vol 1 Cover pages	
	1.01	Introduction	
		• incl. Landfill Management Plan overview	LMP
	1.02	Project Description	
	1.03	Summary of Risks and Risk Management	
2		COMMUNITY AND IWI LIAISON	
	2.00	Vol 2 Cover pages	
	2.01	Community Liaison	
	2.02	Iwi Liaison	
	2.03	Public Access	
	2.04	Community Trust	
	2.05	Complaint Response	
3		SITE OPERATIONS MANAGEMENT PLANS	
	3.00	Vol 3 Cover pages	
	Group	Disposal Operations Management Plans	
	3.01	Waste Control Plan	WCP
	3.02	Working Face Management Plan	WFMP
	3.03	Cover Management Plan	CoverMP
	3.04	Erosion and Sediment Control Plan - Operations	ESCPO
	3.05	Bin Exchange Area Management Plan	BEAMP
	3.06	Pest Control Plan - Operations	PCPO
	3.07	Noise Management Plan	NMP
	3.08	Traffic Management Plan	TMP
	3.09	Litter Management Plan	LitterMP
	3.10	Biosecurity Management Plan	BiosecMP
	Group	Water and ITA Management Plans	
	3.21	Stormwater and Industrial and Trade Activities Management Plan	ITAMP
	3.22	Stormwater Management Plan	SMP
		• incl. Stormwater Monitoring and Contingency Plan	SMCP
		• incl. Stormwater System Operation and Maintenance Plan	SSOMP
	3.23	Groundwater Management Plan	GWMP

		• incl. Groundwater Monitoring and Contingency Plan	GWMCP
	3.24	Leachate Monitoring and Contingency Plan	LMCP
	3.25	Dam Safety Management Plan	DSMP
	Group	Ecology Management Plans (after initial construction)	
	3.31	Ecology Management Plan	EcoMP
		• incl. Ecological Enhancement Pest Management Plan	EEPMP
		• incl. Off-Site Stream Compensation Plan	OSSCP
	Group	Air Quality Management Plans	
	3.41	Odour Management Plan	OMP
	3.42	Landfill Gas Management Plan	LGMP
	3.43	Dust Management Plan	DMP
	Group	Lining System Management Plans	
	3.51	Lining System Management Plan	LSMP
		• incl. Lining System Construction Quality Assurance Plan guidelines	LSCQAP
	3.52	Peer Review Panel Management Plan	PRPMP
	Group	Closure	
	3.71	Ecological and Landscape Enhancement and Restoration Plan	ELERP
		• incl. Landscape and Visual Management Plan	LVMP
	3.73	Closure and Final Capping Management Plan	CFCMP
	Group	Emergency Management	
	3.91	Site Emergency Management Plan	SEMP
		• incl. Spill Response Plan	SRP
4		**PROCEDURES AND CHECKLISTS**	
5		**INITIAL CONSTRUCTION (enabling works)**	
	5.01	Construction Ecological Management Plan	CEcoMP
		• incl. Avifauna Management Plan	AMP
		• incl. Bat Management Plan	BMP
		• incl. Invertebrate Management Plan	IMP
		• incl. Lizard Management Plan	LizMP
		• incl. Hochstetters Frog Management Plan	HFMP
		• incl. Vegetation Clearance Management Plan	VCMP
		• incl. Native Freshwater Fish and Fauna Management Plan	NFFFMP
		• incl. Residual Effects Management Plan	REMP
		• incl. Kauri Dieback Management Plan	KDMP
	5.02	Construction Environmental Management Plan	CEMP
		• incl. Construction Erosion and Sediment Control Plan	CESCP

		• incl. Site Specific Erosion and Sediment Control Plan guidelines	SSESCP
	5.03	Construction Traffic Management Plan	CTMP
		• incl. Temporary Traffic Management Plans guidelines	TTMP
	5.04	Construction Noise and Vibration Management Plan	CNVMP
	5.05	Streamworks Methodology Management Plan	SMMP
		• incl. Streamworks Methodology Statement guidelines	SMS
6		**AFTERCARE**	
	6.01	Post Closure Management Plan	PCMP