IN THE ENVIRONMENT COURT **ENV-**

AUCKLAND

I MUA I TE KOOTI TAIAO O AOTEAROA
I TE TĀMAKI MAKAURAU ROHE

IN THE MATTER	of the Resource Management Act 1991 ("**RMA**")
AND	
IN THE MATTER	of Clause 14(1) of Schedule 1 of the RMA
BETWEEN	**KIWIRAIL HOLDINGS LIMITED**
	Appellant
AND	**AUCKLAND COUNCIL**
	Respondent

NOTICE OF APPEAL AGAINST DECISION ON PROPOSED PRIVATE PLAN CHANGE 101 TO THE AUCKLAND UNITARY PLAN

13 MAY 2025

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To: The Registrar
The Environment Court
AUCKLAND

KIWIRAIL HOLDINGS LIMITED ("**KiwiRail**") appeals against parts of the decision of the Auckland Council ("**Council**") on the Proposed Plan Change 101: Pilkington Park, 167-173 Pilkington Road and railway land on the corner of Apirana Avenue and Merton Road (North Island Main Trunk 671.04-672.38 KM), Point England ("**PC101**").

BACKGROUND AND DECISIONS APPEALED

1. KiwiRail made a submission on PC101 on 21 June 2024. KiwiRail prepared evidence and legal submissions in support of its submission, and presented at the hearing before a panel of independent commissioners ("**Panel**") on 2 December 2024.

2. KiwiRail received notice of the Panel's decision (on behalf of the Council) on PC101 on 27 March 2025 ("**Decision**").

3. KiwiRail is not a trade competitor for the purposes of section 308D of the RMA.

4. KiwiRail is a State-Owned Enterprise responsible for the management and operation of the national railway network, including within the Auckland region where the rail network has a critical role in the movement of people and goods.

5. KiwiRail is also a requiring authority under section 167 of the RMA and holds designations for railway purposes throughout New Zealand, including the North Island Main Trunk Line ("**NIMT**") (which runs alongside the PC101 site ("**Site**")).

6. KiwiRail has an interest in ensuring that urban development around the rail corridor does not adversely affect the operation of the rail corridor and that those who live or work near it are in safe and healthy environments.

SCOPE OF APPEAL

7. KiwiRail appeals the parts of the Decision that rejected the following relief sought in KiwiRail's submission on PC101, including:

   (a) new objectives and policies recognising the need to protect the operation of the rail corridor and manage adverse health and safety effects on the communities who live near it;

(b) amendments to Standard IX.6.2 regarding the distance over which the acoustic insulation and ventilation controls apply and associated matters of discretion (IX.8.1(3));

(c) a new rail vibration alert layer over an area of the Pilkington Park Precinct ("**Precinct**") as shown in the Precinct plan and amendments to the Precinct description; and

(d) new Standard IX.6.6 requiring a building setback from the rail corridor and associated matters of discretion (IX.8.1) and assessment criteria (IX.8.2).

GENERAL REASONS FOR APPEAL

8. PC101, in its present form:

(a) will not promote the sustainable management of the natural and physical resources in the Auckland region, and is therefore contrary to or inconsistent with Part 2 and other provisions of the RMA;

(b) is inconsistent with relevant planning documents, including the Auckland Unitary Plan Operative in part ("**AUP**");

(c) will not meet the reasonably foreseeable needs of future generations;

(d) will not enable the social, economic, and cultural wellbeing of the people of the Auckland region;

(e) does not avoid, remedy, or mitigate actual and potential adverse effects on the environment; and

(f) is not the most appropriate way to achieve the purpose of the RMA and the objectives of the AUP in terms of section 32 of the RMA.

9. In addition to the general reasons outlined above, KiwiRail appeals the Decision for the specific reasons set out below.

SPECIFIC REASONS FOR APPEAL

Noise

10. KiwiRail's submission sought an increase in the application of acoustic insulation and ventilation requirements for new and altered buildings containing activities sensitive to noise on the Site from 60 metres to 100 metres

from the rail designation boundary (and amendments to the associated matters of discretion).

11. In the Decision, the Panel rejected this relief and stated that these controls only need to extend to 60 metres because the scale of built form development enabled by the Site's rezoning to Business – Mixed Use Zone will effectively screen the western boundary of the Site from noise generated by the rail corridor.[1] In reaching this conclusion, the Panel did not refer to the technical evidence before it, including Dr Chiles' evidence which was that reliance cannot be placed on buildings closer to the NIMT screening buildings located further back from rail noise received on the Site.

12. KiwiRail's evidence raised a number of other matters which necessitate the extension of acoustic insulation and ventilation controls to 100 metres which are not acknowledged in the Decision. Instead, in rejecting the relief sought by KiwiRail, the Panel went on to state that:[2]

    (a) the arterial roads located to the east of the Site carry heavy commercial vehicle traffic (but did not explain what relevance this had to KiwiRail's relief or its decision to reject the relief); and

    (b) rail noise would be expected to carry across the Site further than 60 metres from the rail corridor if the proposed rezoning was to Residential – Mixed Housing – Urban or a less intensive zoning. This matter was not raised in any of the technical noise evidence, and it is difficult to see how a speculative alternative zoning to BMUZ (which is not proposed in PC101) is relevant to the Panel's decision to reject KiwiRail's relief seeking to extend the noise controls to 100 metres from the rail designation boundary on this Site.

13. PC101 will enable a range of uses, including sensitive activities like dwellings, to be developed adjacent to existing rail infrastructure of regional and national significance. Without adequate planning provisions, such as those sought by KiwiRail, such development has the potential to result in adverse health and amenity effects on communities living and working near the rail corridor, as well as reverse sensitivity effects on KiwiRail's operations.

14. The Decision also does not recognise the need to protect the rail corridor from reverse sensitivity effects at all. Reverse sensitivity is a well-established

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1 PC101 Decision dated 14 March 2025 at [88].

2 PC101 Decision dated 14 March 2025 at [88].

planning principle and is an adverse effect for the purposes of the RMA.[3] The AUP contains objectives and policies that recognise the potential for reverse sensitivity effects on regionally significant infrastructure, and direct that such infrastructure be protected from these effects.[4]

15. The relief sought by KiwiRail to increase the distance over which the acoustic insulation and ventilation controls apply (from 60 to 100 metres from the rail designation boundary) would give effect to these provisions by better protecting the rail network from reverse sensitivity effects and ensuring its ongoing operation is not unduly constrained.

Relief sought

16. KiwiRail seeks that PC101 is amended to apply the acoustic insulation and ventilation controls within 100 metres of the rail corridor (and associated amendments) as set out in **Attachment A** or such alternative or consequential relief that addresses KiwiRail's concerns.

Vibration

17. KiwiRail's submission sought to include a rail vibration alert layer within the Precinct provisions within 100 metres of the rail designation boundary to alert landowners of potential vibration effects from rail operations. No land use controls were sought to apply within the layer.

18. In the Decision, the Panel rejected the relief sought on the basis that it preferred the expert evidence of Mr Styles and Mr Gordon (over that of Dr Chiles on behalf of KiwiRail), including their opinion that rail vibration at the site was low and does not require a vibration alert layer.[5]

19. The Decision fails to acknowledge the adverse health and amenity effects arising from rail vibration, and that a vibration alert layer can be an effective tool to manage those effects by enabling landowners to mitigate vibration effects at their own discretion. The AUP contains objectives that recognise the need to protect people from unreasonable levels of vibration,[6] and for transport

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3 *Affco New Zealand v Napier City Council* NZEnvC Wellington W082/2004, 4 November 2004 at [29] as cited in *Tasti Products Limited v Auckland Council* [2016] NZHC 1673 at [60].

4 See for example AUP B3.2.1(6), B3.2.2(4) and (5), E26.2.1(6), E26.2.2(3), E25.2(3) and E25.3(7).

5 PC101 Decision dated 14 March 2025 at [92].

6 See for example AUP E25.2(1).

modes to avoid, remedy or mitigate adverse effects on amenity values and the health and safety of communities.[7]

20. In rejecting the relief sought by KiwiRail, PC101 in its present form does not adequately address potential rail vibration effects on surrounding communities and is not the most appropriate way to achieve to the objectives of the AUP or the purpose of the RMA.

Relief sought

21. KiwiRail seeks that PC101 is amended to include a vibration alert layer as set out in **Attachment A** or such alternative or consequential relief that addresses KiwiRail's concerns.

Setback from the rail corridor

22. KiwiRail's submission sought to include a new restricted discretionary activity standard in the Precinct provisions requiring new buildings to be set back 5 metres from the rail designation boundary (and associated provisions including a new objective and policy, matters of discretion and assessment criteria).

23. Setbacks are a critical planning control to manage the interface between rail operations and development on adjacent land that will be enabled by the Site's rezoning to Business – Mixed Use Zone. Insufficient space between development and the rail corridor creates a critical safety risk to both the community and rail operations on the NIMT if people or objects enter the rail corridor. A requirement in PC101 for buildings to be sufficiently set back from the rail designation boundary is therefore an appropriate mechanism to reduce the likelihood of adjoining land users or objects entering the rail corridor.

24. The Decision does not provide for any setback from the rail designation boundary, primarily because the Panel considered it is unnecessary and would create inefficient development outcomes on the Site.[8]

25. The Panel also noted the types of buildings enabled in the Business – Mixed Use Zone are expected to incorporate tilt slab walls "which for site utilisation purposes will be desirable to be located at the boundary".[9] The Panel did not cite any of the technical evidence in reaching this conclusion, instead appearing to speculate as to the location and design of buildings in the future

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7 See for example AUP B3.3.1(d).

8 PC101 Decision dated 14 March 2025 at [96].

9 PC101 Decision dated 14 March 2025 at [96].

redevelopment of the Site. That is not a proper basis on which to reject the relief sought by KiwiRail.

26. The Decision also states the need to avoid incursions into the rail corridor "does not outweigh the possible reduction of useable site development area that can be expected to occur if a 5 metre setback was required".[10] In reaching this conclusion, the Panel failed to acknowledge that the setback standard sought by KiwiRail does not make the land unusable. If a developer seeks to locate a building within the 5 metre setback (which it can do by seeking resource consent, noting that consent is required for new buildings regardless of whether they comply with the proposed setback), the standard simply requires other matters to be considered before consent is granted. These matters include the impacts on the safe and efficient operation of the rail corridor and the outcome of any consultation with KiwiRail.

27. A 5 metre setback minimises the risk of objects entering the rail corridor from the adjoining Site which could cause disruption to KiwiRail's network or, more seriously, a collision or accident. As the NIMT corridor is electrified, there are risks of electrocution should an object or person from the Site come into contact with the wires. That is a significant risk which has the potential to be exacerbated if new buildings are not sufficiently set back from the rail designation.

28. The Decision fails to consider these hazards and the potential adverse effects (on both future land users on the Site and the safe and efficient operation of the rail network) arising from not including the setback from the rail designation boundary in the Precinct provisions. Relying solely on KiwiRail's permit to enter process, as the Panel suggested, is not an appropriate solution.[11]

29. The AUP provides clear direction to "enable the effective, efficient and safe development, operation, maintenance and upgrading of all modes of an integrated transport system".[12] The setback standard sought by KiwiRail is appropriate to achieve this objective and to protect the safe and efficient operation of the rail network in an integrated way.

Relief sought

30. KiwiRail seeks that PC101 is amended to include a building setback standard from the rail corridor (and associated amendments) as set out in **Attachment**

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10 PC101 Decision dated 14 March 2025 at [98] – [99].

11 PC101 Decision dated 14 March 2025 at [97].

12 See for example AUP B.3.3.2(1).

A or such alternative or consequential relief that addresses KiwiRail's concerns.

ATTACHMENTS

31. The following documents are attached to this notice:

(a) A copy of KiwiRail's proposed amendments to the PC101 provisions (**Attachment A**).

(b) A copy of the Decision (**Attachment B**).

(c) A copy of KiwiRail's submission (**Attachment C**).

(d) A list of the relevant names and addresses of persons who lodged submissions on PC101 who are to be served with a copy of this notice (**Attachment D**).

KIWIRAIL HOLDINGS LIMITED by its solicitors and authorised agents Russell McVeagh:

Signature: L J E Rapley / N K Dally

Date: 13 May 2025

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TO: The Registrar of the Environment Court at Auckland.

AND TO: The Auckland Council.

AND TO: The relevant submitters on the provisions appealed.

Advice to recipients of copy of notice of appeal

How to become a party to proceedings

1. You may be a party to the appeal if you made a submission or a further submission on the matter of this appeal.

2. To become a party to the appeal, you must:

   (a) within 15 working days after the period for lodging a notice of appeal ends, lodge a notice of your wish to be a party to the proceedings (in form 33) with the Environment Court and serve copies of your notice on the relevant local authority and the appellant; and

   (b) within 20 working days after the period for lodging a notice of appeal ends, serve copies of your notice on all other parties.

3. Your right to be a party to the proceedings in the Court may be limited by the trade competition provisions in section 274(1) and Part 11A of the Resource Management Act 1991.

4. You may apply to the Environment Court under section 281 of the Resource Management Act 1991 for a waiver of the above timing requirements (see form 38).

Advice

If you have any questions about this notice, contact the Environment Court in Auckland, Wellington, or Christchurch.

ATTACHMENT A

Relief sought by KiwiRail shown in red underline and ~~strikethrough~~

IX. Pilkington Park Precinct

IX.1. Precinct description

The Pilkington Park Precinct covers approximately seven hectares of land in Point England. The precinct is separated from Apirana Avenue and Pilkington Road by the Pilkington Apirana Road Reserve, an area of public open space zoned land which adjoins the precinct's eastern boundary. The North Island Main Trunk Line rail corridor adjoins the precinct's western boundary.

The purpose of this precinct is to provide for a high-quality mixed use development, with additional building height and a greater intensity of development close to the Glen Innes Town Centre and Glen Innes Train Station. The provisions are designed to complement the underlying zoning of land being Business – Mixed Use and enable future development opportunities while ensuring the precinct is developed in a comprehensive manner.

The precinct includes controls to ensure that new and altered buildings containing Noise Sensitive Spaces that are adjacent to the rail corridor and arterial roads (Pilkington Road and Apirana Avenue) are designed and constructed to provide occupants with an adequate level of internal noise amenity.

An area within the Precinct which may experience vibration levels higher than would normally be expected because of proximity to the rail corridor is identified on Precinct Plan 2.

The precinct includes controls to ensure the development of residential activities is integrated with the availability of safe and efficient pedestrian connections from the precinct to the Glen Innes Town Centre and Glen Innes Train Station.

IX.2. Objectives

(1) The Pilkington Park Precinct is comprehensively developed as a high-quality, mixed-use precinct, which is well-designed, integrated, and connected with the surrounding area.

(2) New buildings respond to and positively contribute to the amenity values of the public space network including open spaces and streets.

(3) Development provides for an efficient use of land to deliver residential and commercial activities in proximity to existing centres, and public and active modes of transport.

(4) Protect communities and infrastructure by mitigating:

(a) the adverse health and safety impacts associated with accessing the rail corridor; and

(b) risk of disruptions to the safe and efficient operation of rail infrastructure.

~~(4)~~(5) Activities sensitive to noise located adjacent to the rail corridor and Apirana Avenue and Pilkington Road are designed to protect people's health and amenity values, and in a way which does not unduly constrain the operation of the rail corridor.

All relevant Auckland-wide and zone objectives apply in this precinct in addition to those specified above.

IX.3. Policies

(1) Optimise the transport and land use opportunities provided by the precinct's proximity to key transport corridors through the provision of a mixture of residential and commercial opportunities, with safe and efficient connections for pedestrians.

(2) Enable development in a variety of forms and heights by providing for additional building height in the north of the precinct, while responding to the planned urban built character of adjacent residential sites.

(3) Promote the comprehensive development and redevelopment of the Pilkington Park Precinct.

(4) Require activities sensitive to noise adjacent to the rail corridor and Apirana Avenue and Pilkington Road to be designed and constructed to achieve noise levels that protect the health and safety of occupants.

(5) Require buildings adjoining the rail designation boundary to be set back to provide for the health and safety of adjacent communities and efficient infrastructure operation.

All relevant Auckland-wide and zone policies apply in this precinct in addition to those specified above.

IX.4. Activity table

All relevant overlay, Auckland-wide and zone activity tables apply unless the activity is listed in Table IX.4.1 below.

Activity Table IX.4.1 specifies the activity status of land use and development activities in the Pilkington Park Precinct pursuant to section 9(3) of the Resource Management Act 1991.

Table IX.4.1 Activity table

Activity		Activity status
Development		
(A1)	New buildings	RD
(A2)	New buildings and alterations to existing buildings which do not comply with standards IX.6.1 to IX.6.46	RD
(A3)	New dwellings that do not comply with standard IX.6.5	RD

IX.5. Notification

(1) Any application for resource consent for an activity listed in Table IX.4.1 Activity table above will be subject to the normal tests for notification under the relevant sections of the Resource Management Act 1991.

(2) When deciding on who is an affected person in relation to any activity for the purposes of section 95E of the Resource Management Act 1991 the Council will give specific consideration to those persons listed in Rule C1.13(4).

IX.6. Standards

(1) Unless specified in Standard IX.6(2) below, all relevant overlay, zone and Auckland-wide standards apply in this precinct unless otherwise specified below.

(2) The following standard does not apply to activities listed in Activity Table IX.4.1 above:

(a) Standard H13.6.1 Building height.

(b) Standard H13.6.2(1) Height in relation to boundary and Table H13.6.2.1 Height in relation to boundary must not apply along the zone boundary where the site boundary adjoins the Open Space – Informal Recreation Zone.

(3) All activities listed in Activity Table IX.4.1 above must comply with the following standards.

IX.6.1 Building height

Purpose:

- Manage the effects of building height;
- Manage visual dominance effects;

- Enable greater height in the north of the precinct to provide a graduation in building height from the Glen Innes Town Centre.

(1) Buildings must not exceed the height in metres shown for that part of the precinct in the Height Variation Control on the planning maps.

IX.6.2. Activities sensitive to noise within ~~60m~~ 100m of the rail corridor

Purpose: To ensure activities sensitive to noise adjacent to the rail corridor are designed to protect people's health and amenity while they are indoors and that such activities do not unduly constrain the operation of the rail corridor.

(1) Any new activity sensitive to noise ~~sensitive space~~ or alteration to an existing activity sensitive to noise ~~sensitive space~~ with a façade within ~~60~~100 metres of the rail corridor, must be designed, constructed and maintained to ensure that rail noise does not exceed internal noise levels of 35 dB $L_{Aeq(1\ hour)}$ for sleeping areas and 40 dB $L_{Aeq\ (1\ hour)}$ for all other habitable rooms.

(2) Compliance with Standard IX.6.2(1) must be demonstrated by an acoustic design report prepared by a suitably qualified and experienced person, whereby railway noise must be assumed to be 70 $L_{Aeq(1h)}$ at a distance of 12 metres from the nearest track; and must be deemed to reduce at a rate of:

(a) 3 dB per doubling of distance up to 40 metres and 6 dB per doubling of distance beyond 40 metres; or

(b) As modelled by a suitably qualified and experienced person using a recognised computer modelling method for freight trains with diesel locomotives, having regard to factors such as barrier attenuation, the location of the noise sensitive space relative to the orientation of the track, topographical features and any intervening structures. ~~This includes the screening provided by new building(s) established within the precinct or building(s) proposed to be established under the same land use consent.~~

(3) Where opening windows of any new or altered noise sensitive space must be closed to ensure that the internal design noise levels in IX.6.2(1) are achieved for any noise sensitive space within ~~60m~~100m of the rail corridor, those spaces must be designed, constructed and maintained with a mechanical ventilation and cooling system that achieves E25.6.10(3)(b)-(f).

(4) A ventilation and HVAC design certificate prepared by a suitably qualified and experienced person must be submitted to the Council prior to occupation of the building demonstrating that the noise sensitive space(s) is provided with a system that meets or exceeds the outcomes described in E25.6.10(3)(b)-(f).

IX.6.3. Outdoor play areas of care centres within 60m of the rail corridor

Purpose: To ensure that outdoor play areas adjacent to the railway corridor are designed and located to protect people's health and amenity and that such activities do not unduly constrain the operation of the rail corridor.

(1) Any new outdoor play area of any care centres for a childcare centre, creche, kindergarten, kohanga reo, play centre, play group, early childhood learning service or an after school care centre within 60 metres of the rail corridor, must be designed, constructed, and maintained so that the cumulative level of rail and noise from the Business Zones does not exceed 55 dB $L_{Aeq(1hour)}$.

(2) Compliance with IX.6.2(1) must be based on:

(a) The noise level from rail in IX6.2(1) and;

(b) The cumulative noise levels that are permitted to be generated from neighbouring sites in the Business – Mixed Use and Business – Light Industry zones.

Note: The noise levels in (a) and (b) must be assessed at any point 1.5m above the main play surface of the outdoor play area;

(3) Compliance with Standard IX.6.3(1) must be demonstrated by an acoustic design report submitted by a suitably qualified and experienced person. The report may take into account the screening provided by new building(s) established within the precinct or proposed to be established under the same land use consent. The screening must screen all parts of the outdoor play area up to 1.5m above the play area surface, and excluding play equipment, from the rail corridor.

IX.6.4 Activities sensitive to noise within 60m of Pilkington Road and Apirana Avenue

Purpose: To ensure activities sensitive to noise adjacent to Pilkington Road and Apirana Avenue are designed to protect people's health and amenity while they are indoors.

(1) Where the new or altered noise sensitive space has a façade that is within 60m from the edge of the nearest traffic lane of Apirana Avenue or Pilkington Road, those spaces must be designed, constructed and maintained with a mechanical ventilation and cooling system that achieves E25.6.10(3)(b)-(f).

A ventilation and HVAC design certificate prepared by a suitably qualified and experienced person must be submitted to the Council prior to occupation of the building demonstrating that the noise sensitive space(s) is provided with a system that meets or exceeds the outcomes described in E25.6.10(3)(b)-(f).

Note: Closed windows and doors will be sufficient to protect people's health and amenity while they are indoors from predicted road traffic noise levels ten years after the noise sensitive space is first occupied. There are no internal design noise level requirements for road noise.

IX.6.5. Pedestrian crossing

Purpose: Provide safe crossing facilities ~~facility~~ and connections for pedestrians and active modes of transport between the Pilkington Park Precinct and the Glen Innes Town Centre and Train Station, consistent with Policies IX.3(1) and IX.3(3).

(1) Prior to the occupation of any new dwelling, one two new pedestrian (zebra) crossings must be constructed and operational at Merton Road and Apirana Avenue. The location of the pedestrian crossings must be generally at the locations shown on Precinct Plan 1

(2) Applications for resource consent in respect of new buildings will be deemed to comply with this standard IX.6.4(1) if the pedestrian crossings are is:

(a) Constructed and operational prior to lodgement of the resource consent application; and/or

(b) Under construction prior to the lodgement of the resource consent application and the application is expressly made on the basis that the pedestrian crossing will be constructed and operational prior to the occupation of any new dwelling; and/or

(c) Proposed to be constructed by the applicant as part of the resource consent application and the application is expressly made on the basis that the pedestrian crossing will be constructed and operational prior to the occupation of any new dwelling.

(3) For the purpose of this standard:

(a) 'Occupation' means occupation and use for the building's intended purpose, but not including occupation by personnel engaged in construction fit out or decoration; and

(b) 'Operational' means the relevant upgrade is completed and available for use.

IX.6.6. Safe operation of the rail corridor

Purpose: To ensure the safety of communities and operation of the North Island Main Trunk Line by providing for buildings on adjoining sites to be maintained within their site boundaries.

(1) Buildings must be set back at least 5 metres from any rail designation boundary.

IX.7. Assessment – controlled activities

There are no controlled activities in this precinct.

IX.8. Assessment – restricted discretionary activities

IX.8.1. Matters of discretion

The Council will restrict its discretion to the following matters when assessing a restricted discretionary activity resource consent application, in addition to the matters specified for

the relevant restricted discretionary activities in the overlays, Auckland-wide or zones provisions:

(1) New buildings:

(a) The provision of active frontages to the public space network including open spaces and streets.

(b) Whether the location and design of buildings will contribute to comprehensive and integrated development.

(c) The positive effects of landscaping, including required landscaping, on on-site amenity.

(d) The effects of new roads and/or service lanes on pedestrians and cyclists.

(e) The matters of discretion in H13.8.1(3).

(2) Non-compliance with standard IX.6.1 Building height:

(a) Matters of discretion H13.8.1(7) apply.

(3) Non-compliance with standards IX.6.2 Activities sensitive to noise within ~~60m~~ 100m of the rail corridor and IX.6.3 Outdoor play areas of care centres within 60m of the rail corridor:

(a) Measured or predicted internal noise levels within any noise sensitive space or outdoor play area of care centres.

(b) Any effects on human health and amenity values.

(c) Location, topographical, or building design features, or other alternative measures that will mitigate potential adverse health effects relevant to noise.

(d) Whether the infringement proposed will unduly constrain the operation of the rail corridor.

(e) The outcome of any consultation with KiwiRail.

(4) Non-compliance with IX.6.4 Activities sensitive to noise within 60m of Pilkington Road and Apirana Avenue

(a) Any effects on human health and amenity values.

(b) Location, topographical, or building design features, or other alternative measures that will mitigate potential adverse health effects relevant to noise.

(5) Non-compliance with IX.6.5 Pedestrian crossing:

(a) Effects on pedestrian safety.

(6) Infringement of standard IX.6.6. Safe operation of the rail corridor:

(a) Distance of building/structure from the rail corridor.

(b) Whether the proposal ensures that buildings can be maintained within their site boundaries.

(c) Whether the proposal is likely to affect the safe operation or operating efficiency of the rail corridor.

(d) Any characteristics of the proposed buildings that make compliance with the standard unnecessary.

(e) The outcome of any consultation with KiwiRail.

IX.8.2. Assessment criteria

The Council will consider the relevant assessment criteria below for restricted discretionary activities, in addition to the assessment criteria specified for the relevant restricted discretionary activities in the overlays, Auckland-wide or zones provisions:

(1) New buildings:

(a) Whether the building provides a quality and attractive frontage as viewed from the street or public open spaces, including through the relationship and orientation of buildings.

(b) The extent to which the effects of fences and walls, along frontages and adjoining public spaces are appropriately managed.

(c) The extent to which the design, layout, orientation, bulk and scale of buildings, and connections to the public space network (including open spaces and streets) will contribute to the amenity values of the public space network and the comprehensive development of the Pilkington Park Precinct.

(d) The extent to which landscaping contributes to on-site amenity values.

(e) The provision of convenient, safe, and legible access for pedestrians and cyclists.

(f) The assessment criteria in H13.8.2(3).

(2) Non-compliance with standard IX.6.1 Building height:

(a) Refer to Policy H13.3(3)(a), Policy H13.3(3)(b), Policy H13.3(8), Policy H13.3(13), Policy H13.3(21), Policy IX.3(1), and Policy IX.3(2).

(3) Non-compliance with standards IX.6.2 Activities sensitive to noise within 60m of the rail corridor and IX.6.3 Outdoor play areas within 60m of the rail corridor:

(a) Whether activities sensitive to noise adjacent to the rail corridor are designed to protect people's health and amenity values, and whether such activities unduly constrain the operation of the rail corridor. This includes:

(i) The extent to which building(s) containing activities sensitive to noise or outdoor play areas of care centres have been located and designed with particular regard to their proximity to the rail corridor;

(ii) The extent of non-compliance with the standard and the effects of any noncompliance; and

(iii) The extent to which topographical features or the location of other buildings or structures will mitigate noise effects.

(b) The outcome of any consultation with KiwiRail.

(4) Non-compliance with standard IX.6.4 Activities sensitive to noise within 60m of Pilkington Road and Apirana Avenue:

(a) Whether activities sensitive to noise adjacent to Pilkington Road and Apirana avenue are designed to protect people's health and amenity values. This includes:

(i) The extent of non-compliance with the standard and the effects of any noncompliance;

(ii) The extent to which topographical features or the location of other buildings or structures will mitigate noise effects; and

(iii) Technical advice from a suitably qualified and experienced person.

(5) Non-compliance with standard IX.6.5 Pedestrian crossing

(a) Whether safe pedestrian connections between the precinct and the Glen Innes Town Centre and Train Station are provided, including via alternative facilities or transport infrastructure.

(b) Refer to Policy IX.3(1).

(5) Infringement of standard IX.6.6. Safe operation of the rail corridor:

(a) Location of the building/structure.

(b) Methods of providing for building maintenance within site boundaries on a permanent basis.

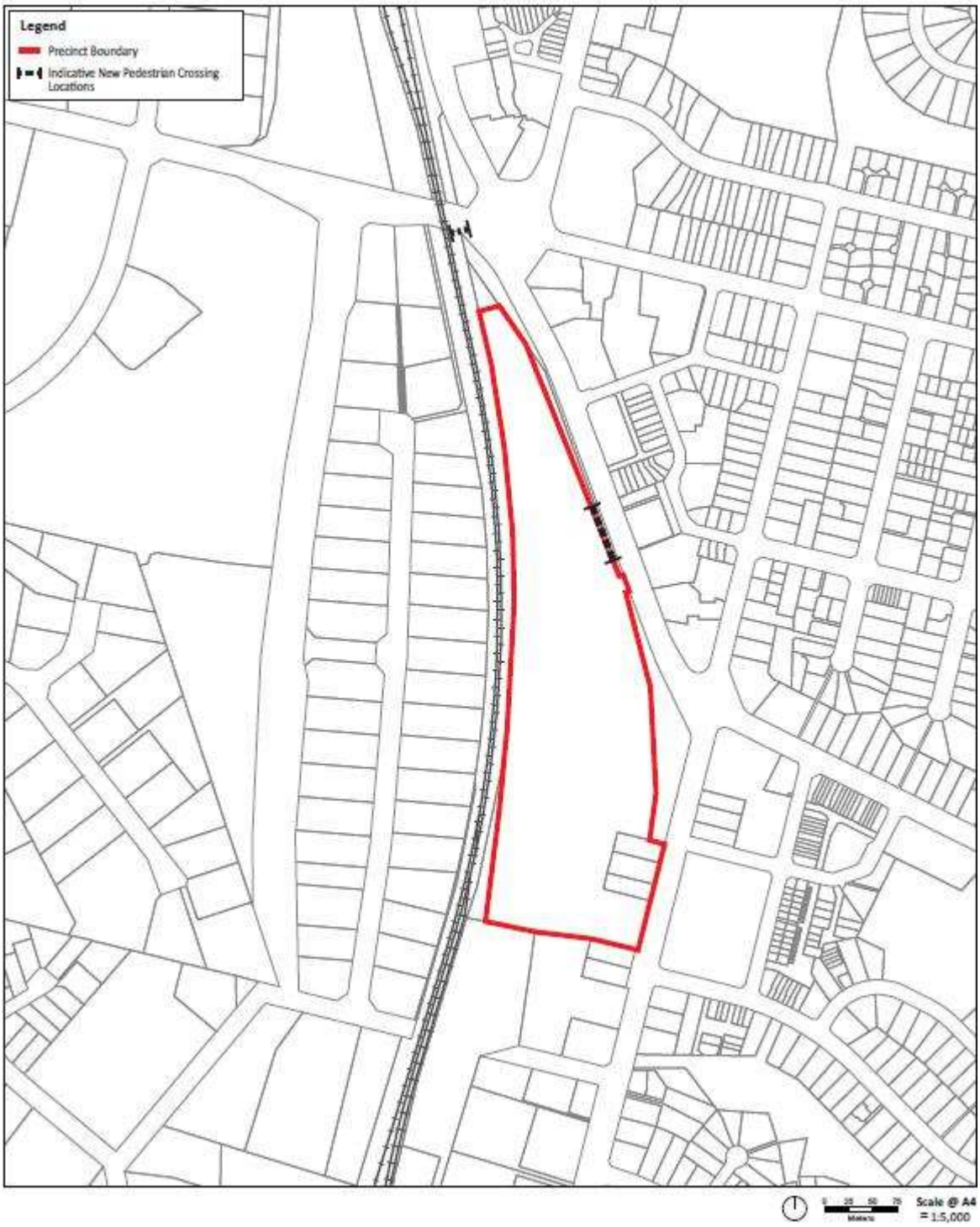
(c) The outcome of any consultation with KiwiRail.

IX.9 Special information requirements

There are no special information requirements in this precinct.

IX.10 Precinct Plans

IX.10.1 Pilkington Park Precinct: Precinct Plan 1: Indictive location of pedestrian crossing



IX.10.2 Pilkington Park Precinct: Precinct Plan 2: Rail vibration alert layer

Decision following the hearing of a Plan Change to the Auckland Unitary Plan under the Resource Management Act 1991

Proposal

to rezone 7.3 hectares of Business – Light Industry zoned land to Business – Mixed Use.

This plan change is APPROVED. The reasons are set out below.

Private Plan Change:	101 - 167-173 Pilkington Road, and railway land on the corner of Apirana Avenue and Merton Road (North Island Main Trunk 671.04-672.38 KM) Pt England
Applicant:	Wyborn Capital Investments Limited
Hearing commenced:	Monday 2 December 2024, 9.30 a.m.
Hearing panel:	David Wren (Chairperson) Nigel Mark-Brown Trevor Mackie
Appearances:	<u>For the Applicant:</u> Jeremy Brabant - Legal Counsel; Frank Pierard - Urban Design/Landscape; Claire Davies - Land Contamination; Tim Heath - Economics; Sean Dickinson - Civil; Jon Styles - Acoustic; John Parlane - Traffic and Transport; and Nick Roberts and Kasey Zhai - Planning. <u>For the submitters:</u> KiwiRail represented by: • Lauren Rapley / Nina Dally - Legal • Matthew Paetz - KiwiRail Corporate • Cath Heppelthwaite - Planning • Stephen Chiles – Acoustics (via MS teams from Christchurch) Robert Lee for Auckland Transport (via MS teams) <u>For Auckland Council:</u> In Person: Marc Dendale, Team Leader Michele Perwick, Planner Andrew Gordon, Noise and vibration Mat Collins, Transport Rebecca Skidmore, Urban Designer

	Online via MS Teams: Planner, Hannah Milatovic David Wong, Senior Policy Planner On Call: Gabrielle Howdle, Landscape Architect Matthew Revill, Wastewater/ Potable Water Danny Curtis, Consultant Stormwater Engineer Amber Tsang, Consultant Stormwater Engineer Susan Fairgray, Consultant Economist Paul Crimmins, Consultant Odour/Air quality James Hendra, Consultant Open Space **Chayla Walker,** Kaitohutohu Whakawātanga Hearings Advisor
Hearing adjourned	02 December 2024
Commissioners' site visit	28 November 2024
Hearing Closed:	13 December 2024

Introduction

1. This decision is made on behalf of the Auckland Council ("**the Council**") by Independent Hearing Commissioners David Wren (Chairperson), Nigel Mark-Brown and Trevor Mackie ("**the Panel'**) appointed and acting under delegated authority under sections 34 and 34A of the Resource Management Act 1991 ("**the RMA**").

2. The Commissioners have been given delegated authority by the Council to make a decision on Plan Change 101 ("**PC 101**") to the Auckland Unitary Plan Operative in Part ("**the AUP**") after considering all the submissions, the section 32 evaluation, the reports prepared by the officers for the hearing and evidence presented during and after the hearing of submissions.

3. PC 101 is a private plan change that has been prepared following the standard RMA Schedule 1 process (that is, the plan change is not the result of an alternative, 'streamlined' or 'collaborative' process as enabled under the RMA).

4. The plan change was publicly notified on 23 May 2024 following a feedback process involving Iwi, as required by Clause 4A of Schedule 1. Notification involved a public notice as well as letters to directly affected landowners and occupiers alerting them to the plan change. The latter step was aimed at ensuring that landowners and occupiers of properties affected by potentially significant changes were made aware of the changes.

5. The submission period closed 21 June 2024. A summary of submissions was notified for further submissions on 12 July 2024. A total of eight submissions (including three late submissions) and no further submissions were made on the plan change.

THE SITE AND EXISTING PLAN PROVISIONS

6. The site at 167–173 Pilkington Road and the railway corner at Pt England has a narrow triangular shape with an area of 7.3 hectares, with a length of approximately 580m. The site is currently zoned Business – Light Industrial Zone ("**LIZ**") in the AUP.

7. The plan change area borders the North Island Main Trunk Railway along the site's western boundary. To the east the site adjoins a long linear park (Pilkington Apirana Road Reserve) which is zoned Open Space- Informal Recreation Zone ("**IRZ**"). To the immediate east of the reserve are Apirana Avenue (the northern section) and Pilkington Road (the southern section). The plan change site itself has frontage to Pilkington Road in the south and a short frontage to Apirana Avenue. There are other vehicular accesses to the site over the reserve, not all of which appear to be legalised. Apirana Avenue and Pilkington Road are classified as arterial roads in the AUP.

8. The land to the south is zoned Business –Mixed Use Zone ("**MUZ**"). The northern tip of the plan change area is where the reserve and the railway line meet. To the north of that is Merton Road. The Glen Innes railway station and town centre are located just to the north of the site.

9. The site is also subject to the following;

    a. Regionally Significant Volcanic Viewshafts and Height Sensitive Areas Overlay - W12, Mount Wellington, Viewshafts
    b. Locally Significant Volcanic Viewshafts Overlay - W13, Mount Wellington
    c. Macroinvertebrate Community Index – Urban
    d. Stormwater Management Area Control - OMARU STREAM, Flow 2
    e. Airspace Restriction Designations - ID 1102, Protection of aeronautical functions - obstacle limitation surfaces, Auckland International Airport Ltd.

SUMMARY OF PLAN CHANGE

10. The proposed plan change is described in detail in the hearing report. A summary of key components of the plan change is set out below.

11. The proposed plan change seeks to rezone the land at 167-173 Pilkington Road and railway land on the corner of Apirana Avenue and Merton Road (North Island Main Trunk 671.04-672.38 KM), Point England from LIZ to MUZ . Amendments to the planning maps are sought to enable greater building heights of 21m and 27m. A new precinct is proposed to manage site-specific matters, including the management of the location and design of buildings and the effects of rail and road noise and vibration on sensitive activities located within the site. The railway land at the northern tip of the site is not part of the proposed precinct provisions.

12. A number of changes were proposed though the submission and hearing process. The final set of provisions that we considered were attached to the reply submissions from the applicant's legal counsel dated 10 December 2024 together with an updated s32 analysis.

HEARING PROCESS

13. As the majority of submitters to PC 101 wishing to give evidence had engaged experts and identified expert representation, the Panel required the pre-circulation of expert evidence. Many witnesses also provided summaries and updates of their evidence at the hearing.

14. Prior to the hearing, all the Commissioners visited 167-173 Pilkington Road and the local surroundings including the adjacent reserve area and the Glen Innes Town Centre and railway station.

PROCEDURAL MATTERS AND LATE SUBMISSIONS

Late Submissions

15. Three late submissions were received by the Council. Pursuant to section 37 of the RMA, the time for receiving submissions was extended under delegated authority by the Council staff to accept late submissions from the following:

Submission Number	Submitter's Name	Date Received
5	Kiwi Rail	24 June 2024
8	Foodstuffs North Island Limited	25 June 2024
4	Auckland Transport	02 July 2024

16. Accordingly, we do not need to make a finding on whether the time period for receiving these submissions should be extended.

RELEVANT STATUTORY PROVISIONS CONSIDERED

17. The RMA sets out an extensive set of requirements for the formulation of plans and changes to them. These requirements are set out in the section 32 assessment that forms part of the hearing report, and we do not need to repeat these again in detail.

18. In particular, s.32(1)(a) requires an assessment of whether the objectives of a plan change are the most appropriate way to achieve the purpose of Part 2 of the RMA. Section 72 also states that the purpose of the preparation, implementation, and administration of district plans is to assist territorial authorities to carry out their functions in order to achieve the purpose of the RMA. In addition, s.74(1) provides that a territorial authority must prepare and change its district plan in accordance with the provisions of Part 2. While this is a private plan change, these provisions apply as it is the Council that is approving the private plan change, which will in turn change the AUP.

19. The Panel also notes that s.32 clarifies that analysis of efficiency and effectiveness of the plan change is to be at a level of detail that corresponds to the scale and significance of the environmental, economic, social, and cultural effects that are anticipated from the implementation of the proposed re-zoning. Having considered the evidence and relevant background documents, the Panel is satisfied that PC 101 has been developed in accordance with the relevant statutory requirements.

20. Clause 10 of Schedule 1 requires that this decision must include the reasons for accepting or rejecting submissions. The decision must include a further evaluation of any proposed changes to the plan change arising from submission; with that evaluation to be undertaken in accordance with section 32AA. With regard to Section 32AA, we note that the evidence presented by submitters and Council effectively represents this assessment, and that that material should be read in conjunction with this decision, where we have determined that a change to PC 101 should be made.

21. There are a number of provisions of National Policy Statements, National Environmental Standards and the Unitary Plan that are relevant to PC 101 and these are listed as:
    a. National Policy Statement – Urban Development 2020 (Updated May 2022)
    b. National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health.
    c. Auckland Unitary Plan - Regional Policy Statement.
        i. B2.2 Urban growth and form.
        ii. B2.3 A quality built environment.
        iii. B2.4 Residential growth.
        iv. B2.5 Commercial and industrial growth.
        v. B3.2 Infrastructure.
        vi. B3.3 Transport.
        vii. B4.3 Viewshafts.
    d. Auckland Unitary Plan – district.
        i. D14 Volcanic Viewshafts and Height Sensitive Areas Overlay.
        ii. H7.7 Open Space – Informal Recreation Zone.
        iii. H13 Business – Mixed Use Zone.
        iv. H17 Business – Light Industrial Zone.
        v. H22 Strategic Transport Corridor Zone.

NOTIFICATION PROCESS AND SUBMISSIONS

22. PC 101 was accepted by the Council pursuant to cl.25(2)(b) of Schedule 1 of the RMA on 17 April 2024. PC 101 was then publicly notified on 23 May 2024, with the submission period closing on 21 June 2024. The further submission period opened on 12 July 2024 and closed on 26 July 2024.

23. Eight submissions were received from the following persons/organisations. Three of the eight submissions were received late as noted above.
    a. Charis Charan
    b. Georgina Stewart
    c. Sibylle Van Hove
    d. Auckland Transport
    e. KiwiRail
    f. Watercare Services Limited
    g. Van Den Brink Poultry Limited
    h. Foodstuffs North Island Limited.

24. The main topics raised by submissions are summarised in the s.42A report. It is noted that no further submissions on the plan change were received.

25. Comments were also received from the Maungakiekie Tāmaki Local Board from its business meeting in September 2024. The Local Board outlined some concerns with respect to the plan change but did not speak at the hearing.

26. Direction 1 from this Panel issued on 17 September 2024 directed the Applicant to file a memorandum outlining what, if any, changes they recommend to the proposal and outline which changes were in response to which submissions. The Applicant filed a memorandum on 24 September 2024 which outlined three areas of recommended changes in respect of submissions from Auckland Transport and KiwiRail.

27. Direction 2 (issued on 26 September 2024) set out an evidence exchange timetable.

SUMMARY OF EVIDENCE

Section 42A Report

28. Ms Perwick's s.42A report was based on the plan change as notified together with an addendum report that considered the changes introduced through the Applicant's memorandum of 24 September 2024 and addressed the relevant statutory requirements, the relevant environmental effects and the issues raised by submissions. It was Ms Perwick's overall recommendation that the plan change could be approved, subject to certain recommended amendments as set out in Appendix 1 to her addendum report.

29. At the conclusion of the hearing Ms Perwick advised that she had changed her position on the request from KiwiRail in respect of the 5m setback of buildings from the railway boundary and that she now supports the setback request.

Applicant Evidence

30. The evidence presented on behalf of the Applicant followed the requirements set out in Direction 2. A number of witnesses were excused from attending as we had no questions for them and Mr Heath was unexpectedly unable to attend. We received a written response from Mr Heath to a question that arose in the hearing.

31. The evidence presented by the Applicant can be referred to as part of the online hearing record, including by reference to an 'Evidence Index' that had been prepared as part of that record (and which lists the evidence generally in the order that it was heard). That index includes reference to the witnesses' statements of evidence and the various legal submissions, communications, photographs, and other documentation that were presented to us, or tabled, during the hearing process. This evidence can be found here:

    https://onedrive.live.com/?authkey=%21AKNApbLTyuCvfo0&id=943FC6A80B823296%2138514&cid=943FC6A80B823296

32. In that light, we have not provided an exhaustive summary of the evidence presented but we set out a brief summary of the evidence in the sections that follow.

Legal Submissions

33. Legal submissions were presented by Jeremy Brabant. Mr Brabant submitted that the PC 101 gives effect to the relevant statutory documents and that the proposed rezoning and proposed provisions are the most appropriate method to achieve the purpose of the RMA.

34. Mr Brabant identified a number of matters of disagreement between the Applicant and the submitters as being the:

    a. requirement to provide a pedestrian crossing at Merton Road:
    b. management of reverse sensitivity effects being vibration and noise from the railway corridor and;
    c. inclusion of a 5 m building setback from the rail designation.

Traffic (John Parlane)

35. Mr Parlane, an experienced traffic engineer, provided evidence in support of PC 101.

36. Mr Parlane considers that the transport effects of the development can be accommodated within the existing road network and supports the wider transport goals and is likely to provide homes in a location where people will have travel options that allow them to travel not just by private car.

37. The main difference of opinion identified by Mr Parlane and the other transport engineers was whether the Applicant should be responsible for forming the cycle crossing on Merton Road to the north of the site. Mr Parlane considers that the Applicant should provide the pedestrian crossing only, but as the cycle crossing is part of a wider planned network, it should be the responsibility of AT to provide that crossing.

Urban Design (Frank Pierard)

38. Mr Pierard, an experienced urban designer, provided urban design evidence in support of PC 101.

39. Mr Pierard considers that proposal aligns with the various national and regional policy statements and that effects of the development will be acceptable. He also considers that the precinct provisions will enable a mix of residential, commercial and community uses.

40. Mr Pierard stated, in response to questioning from the Panel, that he considers that the assessment criteria provided are sufficient to ensure good urban design outcomes.

Acoustics (John Styles)

41. Mr Styles, an experienced acoustic consultant, provided evidence in support of PC 101. Mr Styles provided a verbal summary of his evidence and his response to the acoustic evidence for KiwiRail.

42. Mr Styles considers that the PC 101 provisions are adequate to ensure that noise from trains on the railway line will not have an adverse impact on noise sensitive spaces within the PC 101 land. He also considers that no vibration design standards are required to be incorporated in the Precinct standards.

43. In respect of road noise Mr Styles stated that the Precinct provisions will ensure road-traffic noise levels will be no greater than 40dB LAeq(24hr) inside any noise sensitive space in

any modern building and that rail noise does not exceed internal levels of 35dB LAeq(1 hour) for sleeping areas and 40 dB LAeq(1 hour) for all other habitable spaces.

Planning (Nicholas Roberts and Kasey Zhai)

44. Mr Roberts and Ms Zhai provided joint evidence in support of PC 101. They also provided rebuttal evidence in respect of evidence provided by KiwiRail and by Auckland Transport. They also provided a response to questions from the Panel as part of the Applicant's reply.

45. The planning evidence

    a. provided an overview of the PC 101 provisions and the amendments proposed in response to the Section 42A Report;
    b. assessed PC 101 against the relevant statutory and policy framework;
    c. assessed the environmental effects of PC 101;
    d. responded to the Section 42A Report and issues raised by submitters.
    e. set out recommended amendments to PC 101 as notified.
    f. provided a section 32AA analysis of the recommended amendments to the Pilkington Park Precinct.

Land Contamination (Claire Davies) and Civil Engineering (Sean Dickenson)

46. The evidence from Ms Davies and Mr Dickenson in support of PC 101 was taken as read.

Economics (Tim Heath)

47. Mr Heath, an experienced property consultant, market analyst and urban demographer, provided evidence in support of PC 101. Mr Heath's evidence covered industrial land issues and the economic costs and benefits of PC 101.

48. Mr Heath was unable to attend the hearing. However Mr Heath provided a written response to a query from the panel regarding the appropriateness and economic efficiency of applying the Business – Town Centre Zone (TCZ) to the PC101 site.

Submitters Evidence

KiwiRail Legal Submissions

49. Legal submissions were presented by L J E Rapley on behalf of KiwiRail.

50. While KiwiRail generally supports urban development in and around the rail network, Ms Rapley submitted that additional controls are required, including: acoustic insulation on buildings containing sensitive activities within 100m of the rail corridor boundary, the application of a vibration alert layer within 100m of the rai corridor boundary and a 5 building setback standard from the rail corridor.

KiwiRail Corporate (Matthew Paetz)

51. Mr Paetz, an experienced planner, gave corporate evidence on behalf of KiwiRail.

52. Mr Paetz described the use of the rail line in the vicinity of the PC 101 site and outlined KiwiRail's concerns with the plan change and the amendments that it seeks to PC 101.

KiwiRail Acoustics (Stephen Chiles)

53. Dr Chiles, an experienced acoustics engineer presented evidence on behalf of KiwiRail.

54. Dr Chiles evidence concerned the adverse health and amenity effects from rail corridors and the measures he recommended to protect people in any development on the plan change land from those effects. He recommended that the rail noise provisions should apply over 100 metres (rather than 60 metres), and a rail vibration alert layer should also be applied over 100 metres from the boundary of the NIMT

KiwiRail Planning (Cath Heppelthwaite)

55. Ms Heppelthwaite, an experienced planner, presented planning evidence on behalf of Kiwi Rail.

56. Ms Heppelthwaite supports changes to PC 101 as follows;
    a) addition of a vibration alert layer applied 100m from the rail designation boundary;
    b) a building setback control of 5m from the rail designation boundary to enable maintenance of buildings that otherwise could be constructed on the boundary and require access to the rail corridor for maintenance (or risk inadvertent interference with rail operations);
    c) application of the acoustic control provisions (IX.6.2) 100m from the rail designation boundary (rather than 60m); and
    d) minor technical amendments to the acoustic provisions (IX.6.2).

57. The evidence considered that the amendments sought are necessary to appropriately manage health and safety effects associated with the operation of the rail network, and to implement the RPS and Auckland-wide policy framework on the Site. She also attached Section 32 analyses prepared by KiwiRail that supports her views.

Auckland Transport Planning (Robert Lee)

58. Mr Lee, a planner at Auckland Transport, presented planning evidence on behalf of Auckland Transport.

59. Mr Lee's evidence was largely supportive of PC101. It appears that the only area of disagreement is with the Applicant's position of providing only a pedestrian crossing at the Merton Road crossing, whereas Mr Lee considers that a cycle crossing should also be provided by the Applicant at that location.

Council Response

60. We allowed the Council the opportunity to respond to the evidence presented and advise us of any changes to conclusions and recommendations. We received the following verbal responses.

Transportation (Mat Collins)

61. The Council transportation assessment was provided by Mat Collins.

62. Mr Collins identified a number of remaining issues including the need for a cycle crossing on Merton Road. Mr Collins remained of the view that a cycle crossing should be constructed by the Applicant and is required to support the development based on Mr Parlane's trip generation figures.

Planning (Michele Perwick)

63. Ms Perwick prepared the s42A report for the hearing.

64. Ms Perwick advised that she continues to support a vehicle access restriction of the southern part of the site. (This view was supported by Mr Hendra and Ms Howdle).

65. Ms Perwick also advised that she has changed her position on the 5m setback requested by KiwiRail and accordingly now supports the 5m setback.

66. Ms Perwick advised that she was recommending a number of small editorial changes to PC101 and expressed confidence that these changes were within the scope of the plan change as notified. These included a change to the Precinct description.

Landscape (Gabrielle Howdle)

67. Ms Howdle outlined how the Volcanic Viewshafts and Height Sensitive Areas Overlay standards worked and considered that the existing plan rules were sufficient to ensure that the buildings would not protrude through the volcanic viewshaft.

Urban Design (Rebecca Skidmore)

68. Ms Skidmore discussed the criteria for buildings and expressed confidence that the existing assessment criteria are sufficient to ensure that buildings facing the IRZ will address that open space and that blank walls will be avoided.

Town Centre Zoning (Susan Fairgray)

69. Ms Fairgray advised that she had considered the alternative of zoning the land as TCZ. Ms Fairgray considers that if wide ranging commercial development were allowed on the site, it would result in a dilution of demand for activity in the existing town centre.

Acoustics (Andrew Gordon)

70. Mr Gordon expressed the view that the vibration alert layer is not required, and the 60m rail noise standard is appropriate.

Applicant's Reply

71. Following the response from the Council , Mr Brabant gave a brief verbal reply statement and sought an adjournment to allow time to prepare a written reply.

72. We agreed and we received the Applicant's right of reply on 10 December 2024 together with supporting documents being a planning memo, and updated s32 evaluation, and economic response and proposed amended provisions.

73. The reply submissions reinforced that the Applicant did not consider that a cycle crossing should be required as a result if PC 101 and that it was not necessary to provide additional

rules in respect of vehicle access over the reserve at Pilkington Road as various consents are already required by the AUP.

74. Mr Brabant submitted that the urban design matters regarding building frontages have been suitably agreed between Mr Pierard and Ms Skidmore and that the plan change will not impact on the volcanic viewshafts that traverse the plan change area.

75. Mr Brabant reinforced that much of the acoustic issues would be determined by the weight of evidence but submitted that there is not a sufficient basis by reference to proper resource management considerations to impose the vibration alert layer.

76. Mr Brabant also submitted that the expert evidence clearly shows that the site should not be zoned TCZ. The reply submission also maintained that the 5m separation to the railway boundary is unnecessary.

77. After an initial assessment of this information we closed the hearing on 16 December 2024.

FINDINGS AND REASONS ON THE PLAN CHANGE REQUEST

78. The following section addresses our overall findings on PC 101 and why we have approved it; having heard and considered all of the material and evidence before us.

79. We had extensive evidence before us, with parties requesting a number of specific changes to the precinct provisions. Many of these were addressed by the Applicant's legal submissions and planners and we appreciated the input into these provisions from submitters and Council officers. At the time of writing this decision, the provisions of the proposed precinct are mostly settled between the Council and Applicant's but where there are differences, we have taken these provisions into account as part of our overall assessment and reasoning for our decision.

80. We address the submissions received to PC 101 and the relief sought in those submissions. In this respect, in accordance with Clause 10(2) of the RMA, we have grouped together those submissions under the headings that were used in the hearing report for consistency.

81. We also note that we must include a further evaluation of any proposed changes to the plan change arising from submissions; with that evaluation to be undertaken in accordance with section 32AA of the RMA. With regard to that section, the evidence presented by the Applicant , Submitters and Council officers including specific updates to the S32A report, effectively represents that assessment.

The Reason for the Plan Change

82. We accept the Applicant's rationale for seeking to change the Unitary Plan and rezoning of the site from LIZ to MUZ and the need for a Precinct to manage specific aspects of potential development on the land. This was detailed in the request, evidence and the legal submissions.

83. There were no submissions that opposed PC 101 in its entirety. Most submissions identified specific issues and changes requested to the plan change or Precinct provisions in relation to identified effects and / or related provisions.

PRINCIPAL ISSUES IN CONTENTION

84. Having considered the submissions and further submissions received, the hearing report, the submissions and evidence presented at the hearing and the Council officers' response to questions, we identified the following principal issues in contention:

- A section 32 evaluation of TCZ option.
- Whether a cycle crossing of Merton Road should be required as part of PC 101.
- Whether standard IX.6.2 "Activities sensitive to noise within 60m of the rail corridor" should be extended to within 100m of the noise corridor as requested by KiwiRail.
- Whether the Precinct should include a vibration alert layer in respect of potential vibration caused by trans on the rail corridor
- Whether the Precinct should include an additional standard that requires buildings to be set back 5m from the rail corridor boundary.
- Whether additional vehicle access controls are required in respect of vehicle access over the road from reserve.
- Whether the minor change to PC 101 provisions proposed by the Applicant and in the Councill s42A report are within scope.

Section 32 evaluation of TCZ zoning option

85. The Panel questioned whether a TCZ had been considered as an option, considering the site is immediately adjacent to the Glen Innes Town Centre. The Panel is required to adopt a Section 32 Evaluation in its decision on the Plan Change. The Applicant's planners, Mr Roberts and Ms Zhai, confirmed that a TCZ option had been considered, but had been rejected relatively early in the process, due to the urban form that would have been created and the potential adverse economic effects on the existing Glen Innes Town Centre. Ms Skidmore (Council – Urban Design) confirmed expanding the Glen Innes Town Centre across the site could have an adverse stalling effect on the intensification of the existing centre. Ms Fairgray (Council – Economics) agreed that there could be a dilution of Glen Innes activation if expansive retail occurred on the plan change site, shifting the centre of gravity. The panel's findings are that adequate Section 32 Evaluation has been undertaken, including consideration of a TCZ option.

Delivery of cycle crossing facility north of the site

86. Mr Collins (Council – Transport) considered that the Applicant should provide a cycle crossing facility across Merton Road to the north of the site. There are cycle lane extensions and pedestrian crossings proposed and funded by Auckland Transport. Mr Collins and Ms Perwick (Council – Planning) did not provide any evidence that development and use of the proposed Pilkington Park Precinct would have the effect of creating a demand for a cycle crossing facility that was not already required. The Panel's findings are that: development of the Precinct may not occur for some years and it is important that pedestrian and cycle facility improvements are not postponed to transfer their costs to the Precinct; only a minor part of the demand for pedestrian and cycle facility improvements can be attributed to future use of the Precinct; the Precinct's contribution of new eastern and northern pedestrian crossings is a fair mitigation of the proposed active mode transport demand.

Noise control layer extending 60m or 100m onto site

87. KiwiRail, as a submitter, contended that there needed to be a Noise Control Layer extending 100m onto the site from the boundary with the rail corridor. Dr Chiles (KiwiRail – Acoustics and Vibration) presented evidence that a Noise Control Layer needed to extend

100m onto the site. Mr Styles (Applicant – Acoustics and Vibration) and Mr Gordon (Council – Acoustics) agreed that there was a need for a Noise Control Layer, but both considered it need only extend 60m onto the site. Mr Styles and Mr Gordon have extensive experience managing the noise environment around rail corridors through Auckland.

88. Pilkington Road and Apirana Avenue are arterial roads and at times carry heavy commercial vehicle traffic, lying to the east of the site. The Panel's findings are that the proposed zoning will enable intensive development of the site, of a scale and bulk that will create noise screening along the western edge of the site, so that the Noise Control Layer need only extend 60m onto the site. If the proposed zoning were Residential - Mixed Housing – Urban or less intensive, then rail corridor noise would be expected to carry further across the site. In that case the noise environment of such development types would need to be investigated further to ascertain an appropriate extent of noise control layer.

Whether the Precinct should include a vibration alert layer

89. The submission from KiwiRail is that the Precinct should include a vibration alert layer to warn potential occupiers of the land within the precinct that they may experience vibration from passing trains. We note the significant difference in expert opinion on the matter with Mr Styles and Mr Gordon stating that the rail vibration at the site was very low and did not require need for specific vibration mitigation design measures or a vibration alert overlay. This was also the view of the s42A reporting officer.

90. Dr Chiles, for KiwiRail was concerned that the vibration measurements made by Mr Styles were at a single location and that vibration can be highly variable over short distances and between different foundation types with different coupling to the ground and vibration propagation paths. He was also concerned that Mr Styles' measurements were made using a parameter different to the $v_{.w95}$ parameter of the KiwiRail guideline limit, with an assumed conversion for comparison with a 0.3 mm/s $v_{.w95}$ criterion, which has reduced reported levels by more than he expected.

91. We find KiwiRail's approach to rail vibration through their submission and supporting evidence to be inconsistent. This is because although Dr Chiles' evidence stated that vibration controls are warranted, KiwiRail's submission did not request vibration controls due to "practicalities and costs associated with implementing vibration attenuation". It sought the inclusion of a vibration alert layer for information purposes to alert future landowners and occupants within the Precinct of the potential vibration from rail operations.

92. Based on the evidence and responses to our questioning of the expert witnesses we prefer the evidence of Mr Styles and Mr Gordon that the rail vibration at the site was low and did not require need for specific vibration mitigation design measures or a vibration alert overlay. We consider that if KiwiRail has significant concerns about rail vibration they should have sought implementation of vibration controls.

93. We also have some sympathy for the Applicant's legal reply submission view that while the proposed overlay does not include a vibration control, it nonetheless may have a chilling effect on development of the precinct by giving the impression there are vibration issues of significance (when the reality is that the vibration levels are very low).

Whether the Precinct should include an additional standard that requires buildings to be set back 5m from the rail corridor boundary

94. In their submission KiwiRail sought a building setback control of 5m from the rail designation boundary to enable maintenance of buildings that otherwise could be constructed on the boundary and require access to the rail corridor for maintenance (or risk inadvertent interference with rail operations); This included a proposed new standard to require all buildings and structures to be set back by at least 5m from any boundary that adjoins the rail corridor with provisions to include a corresponding objective and assessment criteria.

95. We note that Ms Heppelthwaite in her evidence acknowledged the feasibility of alternative building access systems e.g. mobile building maintenance unit, building tie-in points or roof attachment systems which would enable abseiling for maintenance.

96. Given that the proposed plan change will allow buildings of heights of 21 and 27 metres adjacent to the rail designation, it can be expected that the design of future development is likely at some locations to incorporate tilt slab walls or similar which for site utilisation purposes will be desirable to be located at the boundary. We accordingly find that requiring a 5 m set back of buildings from the designation boundary would be likely to create inefficient outcomes for development given the very long extent of the site boundary adjoining the KiwiRail boundary in comparison with the overall site area.

97. With respect to KiwiRail's concern about health and safety aspects of potential mishaps associated with incursion into the designation for maintenance of adjoining buildings we find that KiwiRail is able to adequately control this risk through their permit to enter approval processes.

98. With respect to KiwiRail's desire to avoid the need for incursion into the designation for maintenance of adjoining buildings because it takes time and resource, we consider this does not outweigh the possible reduction of useable site development area that can be expected to occur if a 5 metre setback was required.

99. We accordingly find that the setback sought in KiwiRail's submission is unnecessary.

Vehicle access restrictions (at park edge

100. The Council planner and their expert parks planner considered that specific Vehicle Access Restrictions "**VAR**") should apply along Pilkington Road and Apirana Avenue. Their motives appeared to be to make it more difficult for the Applicant to create an additional vehicle access to the site through the public open space frontages, or at least to lower expectations that such an access could be created easily.

101. Mr Roberts and Ms Zhai (Applicant – planner) in their Planning Reply Memo considered the AUP E27.6.4.1(3) Transport would apply VAR provisions to the MUZ, even though the road frontages are to IRZ land. Although this information was not refuted by the Council's planning or transport experts, the Panel is not persuaded that is the case. The Panel's findings are that while at least the wider central part of the IRZ - Pilkington Apirana Road Reserve has park-like attributes that should be protected against severance caused by a vehicle access, Council ownership of the open space land provides the best protection of those park values, and that a specific VAR is not required.

Scope of submissions to support changes to Plan Change and Precinct Provisions

102. The Panel inquired as to whether there was sufficient scope in the submissions to enable changes proposed to the plan change and precinct provisions. This was not intended to challenge the changes proposed, but to ensure the decision could record that scope was

provided within the submissions. The Reply Submissions, provided by Mr Brabant, were accompanied by a Planning Matters Memorandum from Mr Roberts and Ms Zhai which included an Attachment 1: “Recommended Precinct Provisions (track changes) identifying scope through submissions”. That document enabled the Panel to check the submissions and confirm that submissions enabled the scope of the changes proposed.

103. We also note that section 32 clarifies that analysis of efficiency and effectiveness is to be at a level of detail that corresponds to the scale and significance of the environmental, economic, social, and cultural effects that are anticipated from the implementation of the proposal.

104. Having considered the evidence and relevant background documents, we are satisfied, overall, that PC 101 has been developed in accordance with the relevant statutory and policy matters with regard to the need for the zone change and for the specific provisions. The plan change will clearly assist the Council in its effective administration of the AUP.

DECISION

105. That pursuant to Schedule 1, Clause 10 of the Resource Management Act 1991, that Proposed Plan Change 101 to the Auckland Unitary Plan (Operative in Part) be approved, subject to the modifications as set out in this decision.

106. Submissions on the plan change are accepted and rejected in accordance with this decision. In general, these decisions follow the recommendations set out in the Council’s section 42A report, response to the Panel’s memo and closing statement, except as identified above in relation to matters in contention.

107. The reasons for the decision are that Plan Change 101:

a. will assist the Council in achieving the purpose of the Resource Management Act ;

b. is consistent with the Auckland Regional Policy Statement and the National Policy Statement- Urban Development 2020 (updated 2022);

c. is consistent with the provisions of Part 2 of the Resource Management Act;

d. is supported by necessary evaluation in accordance with section 32 of the Resource Management Act and

e. will help with the effective implementation of the Auckland Unitary Plan.

David Wren

Chairperson

Date: 14 March 2025

From: Allison Tindale
To: Unitary Plan
Subject: KiwiRail submission on Plan Change 101 - Pilkington Park
Date: Friday, 21 June 2024 9:40:58 am
Attachments: KiwiRail submission on Plan Change 101 - Pilkington Park.pdf

Hello,

Please find attached KiwiRail's submission on the above plan change.

Any queries, please let me know.

Kind regards
Allison Tindale
Senior RMA Advisor
027 287 3473

ATTACHMENT B

21 June 2024

Auckland Council
Planning Technicians
Plans and Places
Private Bag 92300
Auckland 1142
Attn: Michele Perwick

By email to: unitaryplan@aucklandcouncil.govt.nz

SUBMISSION ON PUBLICLY NOTIFIED PROPOSAL FOR PLAN, CHANGE OR VARIATION (FORM 5)

Plan Change 101

NAME OF SUBMITTER:

KiwiRail Holdings Limited (KiwiRail)

ADDRESS FOR SERVICE:

Level 1
Wellington Railway Station
Bunny Street
PO Box 593
WELLINGTON 6140
Attention: Allison Tindale

Ph: 027 287 3473
Email: Allison.Tindale@kiwirail.co.nz

KiwiRail Submission on Auckland Unitary Plan Operative in Plan Change 101 (Private): Pilkington Park by Wyborn Capital Investments Limited.

KiwiRail is the State-Owned Enterprise responsible for the management and operation of the national railway network. This includes managing railway infrastructure and land, as well as rail freight and passenger services within New Zealand. KiwiRail is also the requiring authority for land designated "Railway Purposes" (or similar) in district plans throughout New Zealand.

The plan change area lies adjacent to the one of New Zealand's key main railway lines, the North Island Main Trunk line (NIMT), which carries both rail freight traffic and Metro passenger services. This rail line forms part of the golden triangle network for rail freight between Auckland, Tauranga and Hamilton. KiwiRail seeks to protect the safe and efficient operation of the railway corridor, to enable its ongoing use for operational purposes.

The scope of KiwiRail's submission relates to the safe and efficient operation of the railway corridor for both passenger and freight services. KiwiRail supports the purpose of the Plan Change and acknowledges the inclusion of provisions, intended to manage reverse sensitivity effects. However, KiwiRail seeks amendments to the proposed precinct provisions to provide a more appropriate degree of protection to the railway corridor from reverse sensitivity effects and buildings built within 5m of the rail corridor.

KiwiRail also asks that acoustic mitigation for new noise sensitive activities be applied to land within 100m of the rail corridor, rather than the proposed 60m. Attached to this submission is KiwiRail's Section 32 Assessment on Noise, which provides additional justification for the amendments requested.

KiwiRail confirms that it has no objection to the proposed zoning of approximately 600m^2 of land within the existing railway corridor to Business-Mixed Use. It is noted that this area of land sits outside the proposed precinct boundary.

KiwiRail's specific suggested wording changes to the plan change provisions are provided in the following Table.

KiwiRail could not gain an advantage in trade competition through this submission.

KiwiRail wishes to speak to our submission and will consider presenting a joint case at the hearing with other parties who have a similar submission.

If you have any queries, please do not hesitate to contact me.

Yours faithfully,

Allison Tindale

Senior RMA Advisor

KiwiRail

Proposed Amendment	Support/Oppose/ Seek Amendment	Submission/Comments/Reasons Plan Change 101: Pilkington Park	Relief Sought (as stated or similar to achieve the requested relief)	
IX.1 Precinct description	Part support Part seek amendment	KiwiRail supports the precinct description, which includes references to both high-quality mixed-use development and protecting sensitive activities from noise associated with the rail corridor. It is requested that the Precinct description be amended to include reference to potential vibration effects, in a similar manner as Plan Change 48. The associated map to go with this reference should illustrate a 'rail vibration notation' over land within 100m of the rail corridor. Although no specific rules are proposed to manage vibration effects, it is noted that the acoustic assessment by Styles Group in Section 8.3.2 measured vibration levels for freight trains which typically ranged between 0.3mm/s PPV and 0.5mm/s PPV. It is also noted that occupants of buildings can considerably vary in their ability to detect vibration. KiwiRail feels it is important that future landowners and occupants of sensitive activities are aware of any existing activities, which could have an effect on levels of amenity obtainable. An alert level is considered valuable in flagging a potential issue, and reducing the possibility of future complaints.	Retain references to high-quality mixed-use development and protecting sensitive activities from noise associated with the rail corridor. Add **An area within the Precinct which may experience vibration levels higher than would normally be expected because of proximity to the rail corridor is identified on Precinct Plan X.** Include Precinct Plan X	5.1 5.2 5.3 5.4
IX.2 Objectives	Part support Part seek amendment	KiwiRail generally supports the proposed objectives which reflect good planning principles for a town centre location close to the rail corridor. The intent of objective (3) is particularly supported as it seeks to ensure future residents and occupants experience good health and amenity, whilst protecting the North Island Main Trunk Line from reverse sensitivity effects. A new policy is also suggested which refers to the need to manage the proximity of new buildings near the rail corridor to prevent adverse effects on the existing and future operation of trains using the North Island Main Trunk Line. This complements suggested changes to Standard IX.6.4. Objectives and policies within the Pilkington Park Precinct which manage the potential for adverse effects on the North Island Main Trunk Line are consistent with the following provisions in the Operative Unitary Plan. Infrastructure B.3.2.2 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.* Transport B.3.3.2 *(5) "Improve the integration of land use and transport by:..* *(f) requiring activities adjacent to transport infrastructure to avoid, remedy or mitigate effects which may compromise the efficient and safe operation of such infrastructure.* *(6) Require activities sensitive to adverse effects from the operation of transport infrastructure to be located or designed to avoid, remedy or mitigate those potential adverse effects."*	**Retain** Objectives 1 and 2 and 3 **Add new Objective 4** ***4. The North Island Main Trunk railway line is protected from adverse effects from the construction and maintenance of new buildings and structures through the use of setbacks.***	5.5 5.6 5.7 5.8
IX.3 Policies	Part support Part seek amendment	KiwiRail generally supports the proposed policies which reflect good planning principles for a town centre location close to the rail corridor. The intent of policy (3) is particularly supported as it seeks to ensure future residents and occupants experience good health and amenity, whilst protecting the North Island Main Trunk Line from reverse sensitivity effects. It is requested that the wording of policy (3) be amended to refer to protecting amenity when indoors and the use of building setbacks. This is consistent with suggested new objective 4. Reference is made to communal outdoor play areas for consistency reasons.	Retain Policies 1 and 2 Amend Policy 3 3. Ensure that activities ~~sensitive to noise~~ adjacent to the North Island Main Trunk Line do not unduly constrain the operation of the rail corridor by: i) **the use of acoustic attenuation measures in the design of building interiors for activities sensitive to noise and communal outdoor play areas** ~~*providing for buildings and outdoor play areas to be designed with acoustic attenuation measures.*~~	5.9 5.10 5.11

3

Proposed Amendment	Support/Oppose/ Seek Amendment	Submission/Comments/Reasons Plan Change 101: Pilkington Park	Relief Sought (as stated or similar to achieve the requested relief)	
			ii) **managing the location of buildings close to the rail corridor through the use of setbacks.**	5.11
Table IX.4.1 Activity	Seek amendment	An amendment is sought to Development A2 to trigger consent as a Restricted Discretionary activity for a new proposed standard IX.6.4. to provide a setback from the rail corridor, as well as also requiring acoustic mitigation for alterations/extensions to existing buildings containing noise sensitive activities. The absence of reference to alterations to existing building is inconsistent with suggested wording for IX.6.2 Standard for activities sensitive to noise. The need for acoustic mitigation equally applies to extensions and alterations of existing buildings, as it does to new buildings. The absence of provisions for alterations/extensions to existing buildings, can create a perverse incentive to partially demolish/rebuild existing buildings, to avoid a requirement that only applies to new buildings. I450.6.9 (1) in Plan Change 48 requires *"any new building or alteration to an existing building that contains an activity sensitive to noise"* to provide noise attenuation to achieve specified internal noise levels for bedrooms and other habitable spaces.	(A2) New buildings **and alterations to existing buildings** which do not comply with standards IX.6.1 to IX.6.3**4** Restricted Discretionary	5.12
IX.5 Notification	Support	KiwiRail supports the reference in point 2 to giving special consideration to those persons listed in Rule C1.13(4) [of the Operative Plan] when deciding on who is an affected person. This rule refers to *"the network utility operator which operates that infrastructure"* in relation to development potentially affecting infrastructure.	Retain as proposed	5.13
1X.6.2 Standard	Seek amendment	KiwiRail supports the intent of the provision but seeks amendments to extend the distance to which these standards apply from 60m to 100m from the rail corridor. Rail noise effects extend approximately 100m from the railway designation. Additional reasoning for the need for a higher distance is contained in the attached Section 32 report. This assessment provides justification for applying a higher degree of acoustic mitigation for noise sensitive activities close to the rail corridor, than currently apply to this location in the Operative Unitary Plan or prior approved plan changes for the rezoning of land adjacent the rail corridor. The applicant's Assessment of Noise and Vibration Effects by Styles Group dated 28 March 2024 refers in Section 8.2.1 to the logarithmic average of the loudest 6 trains measured 15m from the track of 99.6dBA. Section 8.2.2 confirms that the acoustic consultant accepts KiwiRail's noise source level of 70 dB $L_{Aeq(1\ hour)}$ at a distance of 12 metres from the track. The acoustic consultant has effectively recognised the need for some acoustic measures within 60m of the rail corridor for the proposed mixed-use precinct. Little explanation is provided in the acoustic assessment as to why a 60m noise effects area was considered appropriate. Whilst the mixed-use precinct would be subject to existing standard E25.6.10, which may require some acoustic mitigation for noise sensitive activities, this standard is unlikely to achieve the specified noise level for bedrooms at night for properties close to the rail corridor, because noise levels in the mixed-use zone are assumed to be lower than that generated by a freight train. This is effectively acknowledged in Section 7.5 of the Section 32 report which states: "*additional requirements for acoustic treatment and/or mechanical ventilation are recommended for all activities sensitive to noise…because the AUP does not include equivalent rules or standards for sensitive activities located within close proximity to the rail corridor.* Rather than providing for alternative measurements of noise attenuation from rail over distance as a permitted activity, it is requested that variations from KiwiRail's approved method for calculating rail noise be approved through the resource consent process as a Restricted Discretionary Activity. The applicant's Section 32 report and accompanying acoustic assessment does not provide an obvious reason for the alternative method (modelling) to calculate the attenuation of rail noise over distance recommended in proposed standard IX.6.2. (1)(b)(ii). Whilst KiwiRail acknowledges the potential for actual noise levels to vary from predicted levels due to location specific factors, there are no existing or proposed features in the Precinct which are expected to significantly reduce rail noise below predicted levels, other than the possibility that a building within 100m of the rail corridor, may be built behind an existing building. Provisions suggested by KiwiRail would still allow for a resource consent to be submitted, which contains justification for not reaching the specified standard, based on location-specific factors. KiwiRail is of the view that while potential noise and vibration effects are partially addressed, the plan change does not adequately address likely noise effects from the rail corridor. The applicant's acoustic report does not prove	**IX.6.2. Standard for activities sensitive to noise within 6100m of the rail corridor** Purpose: To ensure activities sensitive to noise adjacent to the railway corridor are designed to protect people's health and amenity while they are indoors and that such activities do not unduly constrain the operation of the rail corridor. (1) Any new **building** ~~*noise sensitive space*~~ or alteration to an existing **building that contains an activity sensitive to** noise ~~*sensitive space with a façade*~~ within **6100** metres of the rail corridor, must be designed, constructed and maintained to ~~*ensure that rail noise does*~~ not exceed ~~*internal*~~ noise levels of 35 dB $L_{Aeq(1\ hour)}$ for sleeping areas and 40 dB $L_{Aeq\ (1\ hour)}$ for all other habitable spaces. **Note:** **a.** ~~*The source level for*~~ **R**railway noise is **assumed to be** 70 $L_{Aeq(1h)}$ at a distance of 12 metres from the nearest track; **and must be deemed to reduce at a rate of** ~~*b. The attenuation over distance is:*~~ ~~i.~~ 3 dB per doubling of distance up to 40 metres and 6 dB per doubling of distance beyond 40 metres~~; or~~ ~~ii. As modelled by a Suitably Qualified and Experienced Acoustic Consultant using a recognised computer modelling method for freight trains with diesel locomotives, having regard to factors such as barrier attenuation, the location of the dwelling relative to the orientation of the track, topographical features and any intervening structures.~~	5.14

Proposed Amendment	Support/Oppose/ Seek Amendment	Submission/Comments/Reasons Plan Change 101: Pilkington Park	Relief Sought (as stated or similar to achieve the requested relief)
		that the requested provisions by KiwiRail are unnecessary to achieve the desired internal noise levels for activities sensitive to noise. The increase in distance to which noise acoustic management is required from 60m to 100 from the rail corridor, is unlikely to have a significant effect on '*Table 3: Theme 3: Future development – Evaluation of Options*', particularly in terms of the costs and benefits of *'Option 2 – Proposed plan change: Apply targeted provisions to manage the development of buildings'* on pages 53 and 54 of the applicant's Section 32 Report. Existing standard E25,6.10(3)(c) specifies the need to provide mechanical ventilation for noise sensitive spaces other than residential dwellings. As the proposed Business – Mixed Use provides for a variety of uses which fit under the definition of 'activities sensitive to noise', it is relevant that this provision also apply to this precinct. KiwiRail feels that it would be more appropriate to test the acceptability of relying on any intervening buildings to achieve adequate levels of noise insulation within 100m of the rail corridor through a resource consent application. The deletion of the proposed exception would also increase consistency of provisions with those in Plan Change 48 and 50. Other minor wording amendments are suggested to increase consistency of proposed provisions with Plan Change 48. IX.6.2 Standard as proposed in the plan change documents is considered to be inconsistent with the following existing objectives and policies in the Operative District Plan, because it does not adequately protect the North Island Main Trunk Line from potential reverse sensitivity effects. This risk of reverse sensitivity effects is best prevented by requiring appropriate levels of noise mitigation for noise sensitive activities within 100m of the rail corridor, so that future occupants are not unduly disturbed by noise generated by the existing rail corridor. *"E25.2.1 Objectives* *(1) People are protected from unreasonable levels of noise and vibration* *(3) Existing and authorised activities and infrastructure, which by their nature produce high levels of noise, are appropriately protected from reverse sensitivity effects where it is reasonable to do so.* *(7) Require activities to be appropriately located and/or designed to avoid where practicable or otherwise remedy or mitigate reverse sensitivity effects on: a) existing or authorised infrastructure…* It is widely accepted that sound from rail networks has the potential to cause adverse health and amenity effects on people living nearby. Future occupants often do not appreciate the actual effects of living with 24/7 rail operations. With careful design, future occupants can be protected from the most significant adverse effects associated with railway noise. It is not possible nor appropriate to expect that the railway corridor can mitigate noise effects on new development, especially multi-storey development.	(2) If windows and doors must be closed to achieve the design noise levels in Standard IX.6.2(1), the building must be designed, constructed and maintained with a mechanical ventilation / cooling system that meets the requirements of E25.6.10(3)(b) ~~*and (d)*~~ to (f). ~~*(3) Standards IX.6.2(1) and IX.6.2(2) do not apply where:*~~ ~~*(a) The façade of any new or altered noise sensitive space is screened from all parts of the rail corridor by a proposed building(s) under the same land use consent or a building(s) existing as at XX XXX 202X; or*~~ ~~*(b) The façade of any new or altered noise sensitive space is partially screened from the rail corridor by a proposed building(s) under the same land use consent or a building(s) existing as at XX XXX 202X, and the closest viewing distance from the facade is over 100m from the rail corridor.*~~ ~~*(4) Where Standards IX.6.2(1) and IX.6.2(2) apply,*~~ **A**~~a~~ report must be submitted by a suitably qualified and experienced person to the council demonstrating compliance with Standards IX.6.2(1) and IX.6.2(2) prior to **the** construction or alteration of any building containing **an activity sensitive to** noise. ~~*sensitive space.*~~ **Note:** The design shall be based on the cumulative level of external noise from the railway corridor in IX6.2(1) and the maximum level of noise permitted by the zone or precinct standards or any adjacent zone or precinct standard **specified in** ~~*to comply with*~~ E25.6.10. Figure 1X6.2.3.1 viewing distance to the rail corridor is deleted.
IX.6.3 Standard	Part Support	KiwiRail commends the applicant for the consideration of a specific noise standard for outdoor play areas associated with early childhood centers. KiwiRail agrees that noise levels in outdoor play spaces could be above desirable levels for health and amenity, where located close to the rail corridor. KiwiRail generally supports the use of noise mitigation for a range of activities, but does not seek to prescribe noise standards for external or outdoor spaces. Nevertheless, it is recommended that the wording of this standard is consistent with the distance and wording used for activities sensitive to noise to avoid confusion.	KiwiRail does not seek a specific relief on this standard but raises this issue to ensure consistency for all noise sensitive activities within the precinct.
IX.6.4	New standard	A building setback is appropriate to reduce the potential conflict between the safe enjoyment and maintenance of buildings on adjacent properties and activities within the operational rail corridor. Providing a physical setback for buildings adjoining the railway corridor boundary, ensures that site occupants are able to carry out normal residential or business activities, including building maintenance with a reduced risk of coming into contact with railway infrastructure. The proposed 5m setback is consistent with the setback from the rail corridor specified in operative Plan Changes 48 and 50. The Proposed Plan Change enables buildings up to 27m in height along the rail corridor. When buildings are taller, they become more difficult to inspect and maintain and require additional equipment like scaffolding or cherry picker cranes for maintenance. A 5m setback provides space for the placement and dismantling of scaffolding at the base of taller buildings, as well as mechanical access. Trains travel at speed and are unable to stop quickly, with freight trains often taking one kilometre to come to a complete stop. Any person or equipment, such as poles and ladders, can all potentially be hit by an oncoming train	Add to IX.6 Standards a new standard IX.6.4: ***IX.6.4 Safe operation of the NIMT*** ***Buildings and structures must be setback at least 5 metres from any boundary which adjoins the North Island Main Trunk railway line***.

5.14

5.15

Proposed Amendment	Support/Oppose/ Seek Amendment	Submission/Comments/Reasons Plan Change 101: Pilkington Park	Relief Sought (as stated or similar to achieve the requested relief)	
		if they encroach into the rail corridor. Whilst KiwiRail acknowledges that adjacent landowners require a 'Permit to Enter" from KiwiRail to legally enter the rail corridor, this legal requirement does not prevent all unauthorised access onto the rail corridor. The most efficient and effective means of ensuring that adjacent development does not interfere with the efficient and safe operation of the rail network is to require a setback from the boundary with the rail corridor. This setback reduces the adjoining landowners' likelihood of innocently accessing the rail corridor, reduces the risk of impact by train or the need for landowners to follow the 'Permit to Enter' process to carry out standard maintenance.		
IX.8.1	Seek amendment	Consequential change to name of standard to increase noise control area from 60m to 100m from the rail corridor. It is also noted that no matters of discretion are identified for a breach of proposed standard IX.6.3. To improve consistency, KiwiRail suggests similar provisions for both IX.6.2 and IX.6.3. Matters of discretion (a) to (d) are generally supported as relevant considerations. Some small changes to the matters of discretion to improve clarity are suggested. New matter (a) is suggested to make clear, that applications which infringe the standards should include details of expected internal noise limits, to assist the judgement as to whether the proposal achieves the purpose of the standard or not. The potential for reverse sensitive effects on the rail corridor, is a more relevant consideration than 'unduly constrain the operation of the rail corridor'. If buildings close to the rail corridor do not provide a satisfactory internal noise environment for occupants, it does not immediately or directly affect the operation of the rail corridor. Rather, it increases the probability that residents will seek future restrictions on the operation of the rail corridor, which could ultimately affect its long-term viability. It is therefore easier to make a judgement on potential for reverse sensitivity effects than assess whether a development 'unduly constrains the operation of the rail network'.	**IX.8.1 Matters of discretion** The Council will…. (2) Infringement of standard IX.6.2. Activities sensitive to noise within ~~60~~**100m** of the rail corridor **(a) Measured or predicted internal noise levels within bedrooms and other habitable rooms.** **(b)** ~~**(a)**~~ **Any** ~~E~~effects on human health and amenity values **arising from non-compliance with Standard IX.6.2.** ~~*(b) The location and design of buildings*~~ (c) **Location**, topographical, building design features or other alternative mitigate that will mitigate potential adverse effects relevant to noise. (d) Whether the ~~**activity or**~~ infringement will ~~*unduly constrain the operation of the rail corridor*~~ **increase the risk of reverse sensitive effects on the existing rail corridor.** (e) **The outcome of any consultation with KiwiRail.** Noting that any consequential amendments to 1X.8.2. Assessment Criteria will follow from the above Matters of discretion are also identified for Infringement of standard IX.6.3. Outdoor play areas within 100m of the rail corridor for consistency reasons.	5.16
IX.8.1	New matters of discretion	This is sought as a consequential change to accommodate restricted discretionary status if the development does not meet proposed standard IX6.4. Setback from NIMT. These include considerations on how far removed from the rail corridor a building or structure is, the ability to maintain a building within private site boundaries, potential effects on the safety and operation of the rail corridor and whether the location and design of the building achieves the purpose the standard. Suggested matter (e) does not require pre-consultation with KiwiRail but does suggest to potential developers, that it would be advisable to consult with KiwiRail, at an early stage, for any intended building within the setback distance. Matters of consideration should refer to effects on the efficient operation of the rail corridor, as both authorised and unauthorised access to the rail corridor can have a significant effect on the efficient operation of the rail corridor, as well as rail safety.	Insert new assessment criteria IX.8.1 (4) as follows: ***(4) Infringement of standard IX.6.4. Safe operation of the NIMT Setback from NIMT*** **(a) Distance of building/structure from the rail corridor** **(b) Whether the proposal ensures that building(s) or structure(s) can be maintained within their site boundaries.** **(c) Whether the proposal is likely to affect the safe operation or operating efficiency of the North Island Main Trunk Line.** **(d) Any characteristics of the proposed building(s) or structure that makes compliance with the standard unnecessary.**	5.17

Proposed Amendment	Support/Oppose/ Seek Amendment	Submission/Comments/Reasons Plan Change 101: Pilkington Park	Relief Sought (as stated or similar to achieve the requested relief)
			(e) **The outcome of any consultation with KiwiRail.**
IX.9	Seek amendment	It is requested that a similar special information requirement be placed on non-compliance with standards relating to the rail corridor, as that contained in Plan Change 48.	**IX.9 Special information requirements** ~~There are no special information requirements in this precinct.~~ 1. **Activities sensitive to noise within 100m of the rail corridor which infringe standard IX.6.2 and/or Buildings/structures within 5m of any boundary which adjoins the North Island Main Trunk Line IX.6.4.** (a) **Evidence of consultation with KiwiRail and its response to that consultation.**

5.17

5.18

From: Allison Tindale
To: Unitary Plan
Subject: Plan Change 101 - Pilkington Park - attachment to previous email sent Friday
Date: Monday, 24 June 2024 7:56:55 am
Attachments: KiwiRail Noise and Vibration s32 2023.pdf

Hello,

I sent in Kiwirail's submission on this plan change yesterday morning.

To my consternation, I remembered, when I got home that I forgot to add the attachment referred to in the submission.

The attachment is our section 32 report regarding noise.

I am very sorry for the delay.

I am hoping that you can still accept it.

It would be better for all parties if this document was considered at an earlier, rather than later stage.

The attached report provides more supporting information for points raised in our submission, but does not itself raise any additional points.

Thank you for your time and consideration

Allison Tindale
Senior RMA Advisor
KiwiRail

Taylor. Planning

KiwiRail Holdings Limited

Standard Railway Noise and Vibration Reverse Sensitivity Provisions and Section 32 Report

16 August 2023

Report Authors: Louise Taylor and Lisa Thorne

Supporting clients to solve their resource management challenges.

Contents

KiwiRail Holdings Limited Section 32 Analysis of Rail Noise and Vibration Provisions

1. Introduction

KiwiRail Holdings Limited (**KiwiRail**) is the State-Owned Enterprise responsible for the construction, maintenance and operation of New Zealand's rail network. The rail network is critical to the safe and efficient movement of freight and passengers throughout New Zealand, and forms an essential part of the national transportation network and the wider supply chain.

KiwiRail is a network utility operator, and the Requiring Authority for railways throughout New Zealand. KiwiRail's rail network operates over 3500km of rail network and infrastructure, used by more than 900 freight trains every week, operating between Whangarei and Bluff. The rail network is utilised to carry imported and exported goods from New Zealand ports, timber and forestry products, bulk good such as dairy products and steel, domestic goods between cities, and domestic passengers, and demand for this service is expected to continue to grow. Passenger rail is also a growing source of traffic for the rail network. While passenger rail volumes are currently only located in New Zealand's main cities, expansion of passenger rail inter-regionally is a growing focus of national transport strategy.

This mix of freight and passenger rail traffic is critical to New Zealand's decarbonisation and public transport goals currently and into the future. For this reason, the rail network is recognised as nationally significant, and is often classified as regionally and/or nationally significant infrastructure in District Plans.

This report has been prepared in accordance with the requirements of s32 and Schedule 1 of the Resource Management Act 1991 (**Act**). It assesses and supports the inclusion of District Plan land use provisions to appropriately manage noise and vibration effects on sensitive activities in the vicinity of the rail network. In some cases, the provisions may require amendment to reflect the structure and style of the District Plan drafting (for example, utilising existing definitions, objectives or policies relating to the transport network or Activities Sensitive to Noise).

1.1 Value of Rail

The rail network is a significant contributor to the movement of freight within New Zealand, carrying 16% of total national freight, 25% of exports, and 18 million tonnes of freight every year. The 2021 Value of Rail in New Zealand report[1] found that the total value of rail in New Zealand was estimated to be between $1.70 billion - $2.14 billion each year, from:

- reduced greenhouse gas emissions and air pollution, by reducing 2.5 million tonnes of CO_2 emissions each year;
- time savings and reduced congestion; reducing cars and trucks on road, avoiding 26 million car trips a year in Auckland and Wellington alone, and removing 24,000 trucks from the road;
- improved road safety, including fewer injuries and fatalities, with 288 fewer injuries and fatalities each year; and
- lower road maintenance costs for taxpayers and greater fuel savings, saving between $310-$329 million each year.

Rail is an energy efficient mode of transport, and generates 70% fewer emissions than heavy road freight transport. KiwiRail is a leader in low emissions freight transport, supporting the national transition to net zero carbon by 2050. To achieve this, KiwiRail's Sustainability Strategy 2022-2025 contains specific carbon emission reduction objectives. With New Zealand's freight market projected to grow by 30% by 2030, rail will play an increasing part in handling the increase, providing greater resilience to the transport network, and reducing carbon emissions.

Acknowledging the benefits of rail (as outlined briefly above) and the role rail will play in decarbonising the freight network, the New Zealand Government has, to an extent not seen in a generation, chosen to fund, via the National Land Transport Fund, rail infrastructure, to ensure rail can scale effectively and efficiently to the needs of passengers and freight. Investment in rail (including new and improved infrastructure and rolling stock – locomotives, wagons and carriages) since 2019 now exceeds $8b.

Given the nationally significant benefits and savings to the New Zealand economy, the greenhouse gas emission reductions, and air pollution reductions associated with rail freight, the adverse effects of failing to protect the rail network from reverse sensitivity are significant. At a national

[1] Ernst and Young, The Value of Rail in New Zealand, Report for the Ministry of Transport, February 2021

scale, for illustrative purposes, every 1% reduction in rail traffic caused by reverse sensitivity may equate to costs in the range of approximately $17 to $21 million per annum.

1.2 Proposed Provisions

KiwiRail proposes to introduce a suite of provisions to the District Plan to appropriately protect the railway network from reverse sensitivity by avoiding and mitigating adverse health and amenity effects associated with railway noise and vibration where sensitive uses locate in proximity to the railway corridor[2]. As outlined in further detail below, similar provisions are already included in numerous operative plans throughout New Zealand.

These proposed provisions are provided in full in **Appendix 1** and are summarised below:

- Insert a new objective and two policies providing for the importance of the rail network and the potential for reverse sensitivity effects when activities sensitive to noise are in close proximity; [if needed, depending on nature of plan change or proposed district plan, including any existing policies which are in place regarding management of reverse sensitivity or activities sensitive to noise near infrastructure / industry]
- Insert a new definition for 'Activity Sensitive to Noise' In the Definitions Section (if required);
- Insert new vibration alert layer to District Plan maps;
- Insert new 100m rail corridor buffer to District Plan maps (called "Rail Noise Control and Vibration Alert Area") to which the rules below will apply:
- Insert new rules and standards for noise and vibration in the vicinity of the railway corridor:
    - Railway noise standards for Activities Sensitive to Noise within 100m of a rail network boundary (i.e. within the Rail Noise Control and Vibration Alert Area); and
    - Construction design standards for indoor noise control for Activities Sensitive to Noise within 100m of a rail network boundary (i.e. within the Rail Noise Control and Vibration Alert Area).
- Require resource consent for a Restricted Discretionary Activity where these standards are not met. Provide matters of discretion by which resource consent applications will be assessed against.

[2] "Railway Corridor" means the area captured within the KiwiRail designation.

- Include an advice note that applies within the Rail Noise Control and Vibration Alert Area, and which alerts the plan user that activities within this Area may be subject to vibration effects from rail activities. No standards or other rules apply in relation to vibration.

1.2 Supporting Information and Assessment

The development of these provisions and the assessment in this Section 32 Report is informed by:

- an expert Noise and Vibration Memorandum by Stephen Chiles, dated July 2023, and attached as **Appendix 2**; and
- an expert Economic Assessment of Options to Manage Rail Noise and Vibration Effects (Economic Assessment) by Insight Economics, dated July 2023, and attached as **Appendix 3**.

The Noise and Vibration Memorandum characterises the noise and vibration associated with the operation of the rail network, and analyses the adverse health effects associated with rail noise and vibration both internationally and in New Zealand. It includes an assessment of appropriate levels for exposure to railway sound and vibration in the New Zealand context to avoid or mitigate sensitivity to rail noise and vibration in proximity to the KiwiRail network. This has informed the preparation and analysis of the proposed provisions, and particularly the appropriateness of the proposed Rail Noise Control and Vibration Alert Area and associated setbacks, acoustic standards, and the consideration of vibration standards.

The Economic Assessment analyses the economic costs and benefits associated with the proposed provisions against a 'do nothing approach', and KiwiRail proposed provisions approach (being option G in this report), and a 100m setback approach (being Option E in this report). This includes the economic costs and benefits of health and amenity effects, building design/location, policy implementation, administration and compliance, opportunity costs of potentially forgoing noise sensitive development, and compromised rail operation and efficiency as a result of reverse sensitivity. The Economic Assessment quantifies an estimate of the net costs and benefits per kilometre of track, which confirms that the preferred option has the highest net economic benefit of the three options assessed.

1.3 Requirements of Section 32 of the Act

This report provides an evaluation of the proposed objective and options to achieve the objectives in accordance with section 32 of the Act. Under the Act, a section 32 evaluation must:

- Examine whether the proposed objectives of the proposal are the most appropriate way to achieve the purpose of the Act (s32(1)(a));

- Examine whether the proposed provisions are the most appropriate way to achieve the objectives by identifying other reasonably practicable options, assessing the efficiency and effectiveness of options and summarising the reasons for deciding on provisions (s32(1)(b));
- Relative to considering the efficiency and effectiveness of the provisions in achieving the objective, include an assessment of the benefits and costs of the effects anticipated from implementing the provisions (s32(2));
- Contain a level of detail that corresponds to the scale and significance of the environmental, economic, social, and cultural effects that are anticipated from implementing the proposal (s32(1)(c)); and
- Where amendments are sought to a plan change that is already proposed or a plan which already exists, evaluate the proposal against both the objectives of the proposal and the objectives of the existing plan or plan change (s32(3)). As this assessment applies to District Plans generally, additional evidence is likely to be required in terms of s32(3) for specific plans or plan changes.

Each of these matters is assessed in this report (other than s32(3)), and on that basis the proposed provisions are considered the most appropriate way to achieve the sustainable management purpose of the Act.

2. Resource Management Issue

2.1 Operational Rail Noise

Railway noise levels are dependent on the type and condition of train and traffic volumes, speeds, track geometry and condition, and terrain and other factors. When considering railway noise levels the assumed railway traffic volumes are also important. With full geospatial details and information on railway activity, various standard acoustics computer modelling packages can be used to predict railway noise levels, depending on the situation. However, there is currently no standardised approach to this modelling for railway sound in New Zealand, nor consistent use of a particular method.

In 2009 KiwiRail commissioned Marshall Day Acoustics to provide a recommended method for the prediction and control of rail noise. The recommendations of Marshall Day Acoustics have provided the basis for the methods developed and considered in this report. This is assessed and explained in greater detail in the Noise and Vibration Memorandum provided at Appendix 2 to this report.

The method proposed by Marshall Day Acoustics, and outlined in detail in the Noise and Vibration Memorandum uses a 1 hour averaging method, to appropriately capture the noise maximums likely from the rail network. Specifically, it utilises the following assumed noise levels from rail activities at certain distances:

> *The following provides an illustration of typical railway sound levels based on an assumption of approximately two freight train movements in a one-hour period, in a flat area without screening. This is based on data summarised by Marshall Day Acoustics. More recent (unpublished) measurements for various New Zealand train types confirm these sound levels are in a realistic range.*

Distance from track	Sound level
10 metres	71 dB $L_{Aeq(1h)}$
20 metres	68 dB $L_{Aeq(1h)}$
30 metres	66 dB $L_{Aeq(1h)}$
40 metres	64 dB $L_{Aeq(1h)}$
50 metres	62 dB $L_{Aeq(1h)}$
60 metres	60 dB $L_{Aeq(1h)}$
70 metres	59 dB $L_{Aeq(1h)}$
80 metres	58 dB $L_{Aeq(1h)}$
90 metres	56 dB $L_{Aeq(1h)}$
100 metres	56 dB $L_{Aeq(1h)}$

Table 1: Typical rail sound levels (Noise and Vibration Memorandum)

The Noise and Vibration Memorandum sets out that internal sound levels with windows ajar for ventilation will typically be around 15 dB less than the above external levels.

2.2 Reverse Sensitivity

Reverse sensitivity is the susceptibility of lawfully established effects-generating activities (which cannot internalise all of their effects) to complaints or objections arising from the location of new sensitive activities nearby those lawfully established activities.

In the context of the railway corridor, this can adversely affect the 3500km of rail network throughout New Zealand, where activities that are sensitive to noise and vibration establish in close proximity to the rail corridor without suitable mitigation. The rail corridor is existing, fixed in place, and actively used for rail services (freight and/or passenger).

Without appropriate land use controls in place to manage health and amenity effects and the resulting reverse sensitivity effects associated with new or altered land uses in the vicinity of the railway corridor, sensitive activities can be adversely affected by rail noise and vibration, and this has adverse reverse sensitivity effects on the efficient operation of the rail network.

The rail network is usually identified as "regionally significant infrastructure" or similar definition in District Plans, which makes clear its importance to the District, Region and in some cases Country in terms of transportation of freight, passengers and associated resilience.

The Economic Assessment quantifies the net benefits and costs on rail operations under a 'do nothing' scenario (being Option A in this report). The net costs related to impacts on rail operation are estimated as $97,000 per kilometre of track. Conversely, the Economic Assessment confirms

there will be 0$ net costs to rail operation resulting from the proposed provisions.

2.3 Health Effects of Rail Noise

Where noise effects from the railway corridor are not appropriately managed by land use controls, health and amenity effects can arise for Activities Sensitive to Noise located on land near the railway network throughout New Zealand.

It is widely accepted nationally and internationally that sound and vibration from rail networks have the potential to cause adverse health effects on people living nearby. This has been documented by authoritative bodies such as the World Health Organisation[3] (**WHO**), including a publication by WHO Europe in October 2018 (**2018 WHO Guidelines**), which set out guidelines for managing environmental noise[4]. These WHO publications are underpinned by robust scientific research.

The 2018 WHO Guidelines are based on a critical review of academic literature and followed a rigorous protocol to determine the quality of evidence of adverse effects. With respect to noise from rail networks, the 2018 WHO Guidelines note the following adverse effects: ischaemic heart disease, hypertension, high annoyance and sleep disturbance. Based on the evidence of adverse effects, WHO makes recommendations to policymakers to reduce rail noise exposure to below a range of guideline values.

The Noise and Vibration Memorandum provides an analysis of the WHO Guidelines and applicability of those guidelines to New Zealand. Research published in 2019[5] specifically addresses the applicability of international data on noise annoyance to New Zealand. For rail noise, this research was based on a survey of 244 people living in the vicinity of the North Island Main Trunk in South Auckland, including the section through Drury. The survey was based on the questions and methods set out in the international technical specification ISO/TS 15666[6], which is the same approach used in most international studies. The research found that international noise response curves are generally applicable to the New Zealand context, although potentially New Zealanders may be slightly more noise sensitive.

[3] World Health Organisation, Guidelines for community noise, 1999; World Health Organisation, Burden of disease from environmental noise, 2011.

[4] World Health Organisation, Environmental noise guidelines for the European region, 2018.

[5] Humpheson D. and Wareing R., 2019. Evidential basis for community response to land transport noise, Waka Kotahi Research Report 656. https://nzta.govt.nz/resources/research/reports/656/

[6] International Standards Organisation ISO/TS 15666:2003 Acoustics – assessment of noise annoyance by means of social and socio-acoustic surveys.

Although there is current New Zealand and international research that may further refine the understanding of health effects associated with exposure to railway noise, the memorandum sets out that the existing 2018 WHO Guidelines already establishes there are adverse health effects that warrant intervention.

KiwiRail employs various other mechanisms to reduce rail noise and vibration from the railway corridor. These include the installation of ballast mat, rail grinding and tamping, ballast cleaning and replacement, and automated monitoring of rolling stock wheel condition. In terms of track condition, KiwiRail has comprehensive procedures including measurement of track condition/ geometry with a specialist survey vehicle several times a year, and maintenance systems acting on that data.

As explained by Dr Chiles in the Noise and Vibration Memorandum, noise attenuation walls are rarely available for mitigation purposes as typically the rail corridor is elevated and therefore such a wall would need to be unreasonably high to provide benefit. Therefore, not all noise and vibration effects can be completely internalised within the KiwiRail designation boundaries. These effects are the result of normal rail operation and maintenance and cannot be solely attributed to defects in track or rolling stock, and form part of the existing environment.

For new buildings and alterations or additions to existing buildings near to the railway network, it is relatively straight-forward to control internal noise through building location, design and systems (such as using acoustic insulation and mechanical ventilation). In most cases, it is practical to achieve acceptable internal noise levels using such measures. Therefore, with careful design of building location, orientation and materials, and/or the use of new or existing barriers such as acoustic walls and/or bunds, or locating new dwellings behind existing dwellings or landforms on a site, the adverse effects of noise can be appropriately avoided and/or mitigated.

The Noise and Vibration Memorandum sets out that in the New Zealand context:

> *…railway sound level criteria of 35 dB LAeq(1h) inside bedrooms and 40 dB LAeq(1h) inside other habitable spaces have previously been applied for protection from health effects. These values are slightly higher (more lenient) than the 2018 WHO Guidelines for regular sound events but would be more stringent for infrequent events. This comparison relates only to average sound levels, but corresponding relationships with health effects for different frequencies of railway events are uncertain/unknown. Therefore, currently there is not an evidence base available that would support significantly more or less stringent railway sound criteria than 35 dB LAeq(1h) inside bedrooms and 40 dB LAeq(1h) inside other habitable spaces for*

protection of health.

The provisions proposed by KiwiRail is consistent with this approach, and adapted for the New Zealand context as an integral part of KiwiRail's broader noise management activities. The internal noise levels are therefore adopted in the proposed provisions, which provide a suite of options for compliance including building location, orientation and materials, and/or the use of barriers such as acoustic walls and/or bunds.

2.4 Effects of Rail Vibration

Norwegian Standard NS 8176[7] provides a summary of annoyance and disturbance relationships associated with vibration from land-based transport. These relationships demonstrate that adverse effects occur at vibration exposures typically found around existing rail networks. The primary issue relates to people in buildings being disturbed due to feeling vibration. Furthermore, the same vibration can cause buildings to radiate noise inside. As for managing sound, routine track and rolling stock (wheel) maintenance can contribute to reducing vibration at source.

Vibration can vary significantly depending on ground conditions and localised features such as buried services and structures. Even with 'good' ground, track and rolling stock conditions there is still inherent vibration from railways that can cause disturbance.

The Noise and Vibration Memorandum sets out that:

> *Adverse effects of railway vibration can include annoyance and sleep disturbance for building occupants and damage to buildings. Damage to buildings (even cosmetic damage) occurs at greater vibration magnitudes than those which can cause annoyance.*
>
> *Internationally, there has been less research into transportation vibration effects on people compared to research on transportation sound effects. However, the evidence that does exist on adverse health effects caused by railway vibration indicates they are material, and as such the relative paucity of research is not an indicator of the degree of effects. There is international research ongoing in this area. Research is also investigating health effects arising from the combination of railway sound and vibration.*

[7] Norwegian Standard NS 8176:2017 Vibration and shock - Measurement of vibration in buildings from land based transport. and guidance to evaluation of its effects on human beings.

In analysing the standards currently adopted nationally and internationally for assessing vibration effects, the Noise and Vibration Memorandum assesses vibration levels measured from different sources in New Zealand, and concludes that,

> *There is a knowledge gap as to the actual likelihood of cosmetic damage from railway vibration in New Zealand. However, all potential criteria for vibration effects on people are substantially more stringent, such that for buildings containing sensitive activities, cosmetic building damage might not require separate consideration.*

For new buildings and alterations or additions to existing buildings near to the railway network, as with railway noise, vibration can be controlled through building location, and design. Therefore, with careful design of building location, orientation and materials, the adverse effects of vibration can be appropriately avoided and/or mitigated.

However, the exact design requirements to ensure compliance with appropriate vibration levels depend significantly on site-specific factors, including ground condition / soil type, topography or other environmental features. The level of controls required and the associated cost of implementing such controls can therefore differ significantly on a site-to-site basis.

Without further research into the requirements and cost of implementing such controls on a district-wide basis, there is insufficient existing data to confirm appropriate district-wide provisions which require physical controls for vibration.

For this reason, KiwiRail has instead pursued a "Rail Vibration Alert Layer" be added to the District Plan maps. Such alert layers ensure landowners and occupiers are aware that vibration effects may be present in this location (100m from the rail corridor). They can then make their own design and location decisions should they wish to mitigate such effects. This enables behaviour change and appropriate notice to landowners, while avoiding uncertain costs of controls at this time.

2.4 Economic Effects

The Economic Assessment estimates the likely costs and benefits of 3 options: Option 1 to 'do nothing' (Option A in the s32 assessment below), Option 2 being the proposed provisions (Option G in the s32 assessment below), and Option 3 being a 100m setback option (per kilometre of rail track) (Option E in the s32 assessment below). The net costs and benefits of each option based on the assumptions set out in the Economic Assessment are summarised below.

Costs/Benefits per km of Track	Option 1	Option 2	Option 3
Amenity & health benefits	-$4,665,600	$0	$0
Impacts on rail operation	-$97,000	$0	$0
Policy compliance costs	$0	-$1,728,000	$0
Housing market impacts	$0	$0	-$28,800,000
Option Net Benefits/Costs	**-$4,762,600**	**-$1,728,000**	**-$28,800,000**

Table 2: Estimated net benefits and costs per kilometre of track (Economic Assessment)

The Economic Assessment notes there are different economic costs associated with the assessed options, and that when compared to a 'do nothing' or set back approach, the proposed approach has the lowest economic cost.

"Doing nothing" (Option 1/Option A) has a higher economic cost, primarily related to impacts on amenity and health, with some costs to rail operations. The Economic Assessment sets out that it is impossible to accurately assess the extent to which reverse sensitivity would disrupt the rail network and the consequential impacts on the economy. However the Economic Assessment sets out for illustrative purposes, at a national scale, "*every 1% reduction in rail traffic caused by reverse sensitivity from new Activities Sensitive to Noise establishing nearby would cost approximately $17 to $21 million per annum*".

A 100m setback (Option 3/Option E) while avoiding any economic impacts on rail and human health, "*will have the greatest impacts on housing supply because it sterilises the use of land for Activities Sensitive to Noise within 100 metres of the rail network*". The housing market costs associated with the loss of developable land are analysed in the Economic Assessment, and estimated net costs for a conservative typical mixed residential and non-noise sensitive activity scenario are approximately $28,800,000 per kilometre of track.

The proposed approach (Option 2/Option G) is assessed in the Economic Assessment as having no economic impacts associated with human health and rail operation effects. However there will be policy, administrative, and compliance costs estimated at approximately $1,728,000 per kilometre of track for a conservative typical mixed residential and non-noise sensitive activity scenario. These costs include the upfront costs to comply with the noise standards (acoustic assessment and the mitigation measures themselves), conservatively estimated as being $3000 (for an acoustic assessment), plus 3% of the building value for the associated mitigation to achieve compliance.

Although this places some cost burden on those establishing activities sensitive to noise in the vicinity of the rail network, these are largely one-off upfront costs which are a small proportion of

the total build cost. Additionally, these costs are significantly lower than the costs to health associated with no mitigation, and significantly lower still than the opportunity costs to the housing market of prohibiting the activity in the vicinity of the rail network.

2.5 Duty to Avoid Unreasonable Noise

Section 16 of the Act requires that:

> *"Every occupier of land… shall adopt the best practicable option to ensure that the emission of noise from that land or water does not exceed a reasonable level"*, and
>
> "*A national environmental standard, plan, or resource consent made or granted for the purposes of any of sections 9, 12, 13, 14, 15, 15A, and 15B may prescribe noise emission standards, and is not limited in its ability to do so by subsection*".

KiwiRail is a responsible infrastructure operator that endeavours to avoid, remedy or mitigate the adverse rail noise and vibration it produces, through its ongoing programme of upgrade, repairs and maintenance work to improve track conditions.

As discussed above, KiwiRail employs various mechanisms to reduce rail noise and vibration from the railway corridor. These include the installation of ballast mat, rail grinding and tamping, ballast cleaning and replacement, and automated monitoring of rolling stock wheel condition. KiwiRail has comprehensive procedures including measurement of track condition/geometry with a specialist survey vehicle several times a year, and maintenance systems acting on that data.

Not only is this important to KiwiRail as part of being a good neighbour, but it is also under a statutory obligation to use the best practicable option to avoid unreasonable noise (s16) and to avoid, remedy or mitigate adverse effects on the environment (s17).

The proposed provisions complement the above measures undertaken by KiwiRail in respect of its responsibilities under s 16 of the Act – to mitigate the remaining adverse effects that remain following the responsible management of noise and vibration by KiwiRail. They apply only to those developments which are bringing new or expanded sensitive activities to the existing activity operated by the KiwiRail – they do not impose new obligations on already established activities. As set out in the Economics Report, the provisions are also likely to result in a range of ancillary benefits to those dwellings where they are incorporated, including warmer, drier, and quieter homes that are also worth more.

Given the responsibility for the new activity lies with the neighbouring landowners, and the benefits

which come from the controls accrue to the new landowners, including in respect of overall property value, it is considered appropriate that the costs are assumed by those landowners. This is discussed further below in respect of Option H.

3. Approach to Issue

Mapping, land use rules and standards to avoid or mitigate adverse noise and vibration effects on sensitive activities are critical to protect sensitive activities from these effects. These standards are also fundamental to managing the potential for reverse sensitivity effects on the railway network as a result of this sensitivity. The location of incompatible sensitive activities in proximity to rail infrastructure can lead to noise and vibration effects on and complaints from sensitive users, affecting both the occupants in these areas, and affecting KiwiRail.

There are many examples in NZ district plans which seek to control the location and design of sensitive activities such as housing, healthcare and education facilities where such activities seek to locate near existing sources of noise and/or vibration. These include roads, railways, airports, ports, quarries, industrial sites, industrial and business zones, gun clubs and motorsport facilities. For sensitive activities near existing railways, examples of second-generation operative district plans containing controls include: Christchurch, Dunedin, Tauranga, Hamilton, Palmerston North and Hutt City. All these existing plans control land use standards to manage the adverse effects of noise and/or vibration.

The proposed provisions require that noise and vibration sensitive activities that may establish in proximity to the rail network are appropriately designed and sited to reduce the noise effect to an acceptable level. This will ensure that adverse effects on human health and amenity are appropriately managed, protects public health, provides certainty to those developing land adjacent to the rail corridor of the permitted standards, and protects nationally and regionally significant rail infrastructure from reverse sensitivity.

The proposed provisions are set out in full In **Appendix 1** and are summarised briefly below.

3.1 New Definitions

KiwiRail seeks the following definitions be added to the Definitions Section (if a suitably similar definition is not already in place in the District Plan):

Activity Sensitive to Noise: means any residential activity (including student or retirement accommodation), visitor accommodation, educational facility, child care facility, healthcare activity, and places of worship/marae.

3.2 New Objective and Policies

Insert a new objective and two policies providing for the importance of the rail network and the potential for reverse sensitivity effects when activities sensitive to noise are in close proximity:

- The Objective is to '*Ensure adverse reverse sensitivity, health and wellbeing effects arising from the development of Activities Sensitive to Noise adjacent to the railway network are appropriately avoided or mitigated'.*
- The policies are to:
    - '*Avoid reverse sensitivity effects on the ongoing and future operation and development of the railway network by ensuring new Activities Sensitive to Noise are designed or located to meet appropriate acoustic design standards'*; and
    - '*Manage effects on the health and wellbeing of communities through the design and location of Activities Sensitive to Noise adjacent to the railway network to meet appropriate acoustic design standards'*.

Where plans include existing objectives and/or policies which appropriately capture the matters above, or which could be amended or added to in order to integrate the objectives above, then this may be appropriate to ensure greater integration of the provisions into the particular plan.

3.3 New Rules and Standards

KiwiRail seeks the following rules and standards be added to the District Plan:

- For all zones at any point within 100 meters from the legal boundary of the KiwiRail Rail Corridor Designation (**Rail Noise Control and Vibration Alert Area**), all new buildings or alterations to existing buildings containing an Activity Sensitive to Noise, must meet:
    - Specified Internal noise standards ranging from:
        - 35 dB LAeq(1h) for sleeping spaces, lecture rooms/theatres, music studios, assembly halls, and places of worship and marae,
        - 40 dB LAeq(1h) for all other habitable rooms, and education teaching areas, conference rooms, drama studios and sleeping areas, and overnight medical care and wards, and

        - 45 dB LAeq(1h) for libraries, and health clinics, consulting rooms, theatres and nurses' stations; or

    - The nearest exterior façade of the building accommodating the activity is at least 50m from the railway network and is protected by a specified noise barrier, or

    - It can be demonstrated by way of prediction or measurement that the noise at all exterior façades of the listed activity is no more than 15 dB above the relevant noise levels; and

    - For buildings which require windows to be closed to achieve the noise standards, mechanical ventilation standards must be met; and

    - A report is submitted to the council demonstrating compliance with the above rules prior to the construction or alteration of any building containing an activity sensitive to noise using specified assumptions.

- Require resource consent for a Restricted Discretionary Activity where these standards are not met. Provide matters of discretion by which resource consent applications will be assessed against which limit the assessment of effects to the extent of non-compliance, effects on health and wellbeing, reverse sensitivity effects, and the outcome of any consultation with KiwiRail.

- Include an advice note that applies within the Rail Noise Control and Vibration Alert Area, and which alerts the plan user that activities within this Area may be subject to vibration effects from rail activities. No standards or other rules apply in relation to vibration.

4. Assessment of Objective

Section 32(1)(a) requires an assessment of whether the proposed objective is the most appropriate way to achieve the purpose of the Act. The purpose of the Act is set out in Section 5 as:

(1) The purpose of this Act is to promote the sustainable management of natural and physical resources.

(2) In this Act, sustainable management means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while—

(a) sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and

(b) safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and

(c) avoiding, remedying, or mitigating any adverse effects of activities on the environment.

An assessment of the provisions against the proposed Objective against section 5 is set out in the table, below.

Table 3: Assessment of Objective under Section 5 of the Act

Proposed KiwiRail Provisions	Reason for Objective
Objective Ensure adverse reverse sensitivity, health and wellbeing effects arising from the development of Activities Sensitive to Noise adjacent to the railway network are appropriately avoided or mitigated. Policy Avoid reverse sensitivity effects on the ongoing and future operation and	The objective and supporting policies enable communities to provide for their health and wellbeing, and protects the railway network from reverse sensitivity. Where located in close proximity to the railway corridor, activities sensitive to noise are appropriately designed and sited so that adverse effects on health and wellbeing are appropriately managed, and railway infrastructure is appropriately protected from reverse sensitivity.

development of the railway network by ensuring new Activities Sensitive to Noise are designed or located to meet appropriate acoustic design standards. Policy Manage effects on the health and wellbeing of communities through the design and location of Activities Sensitive to Noise adjacent to the railway network to meet appropriate acoustic design standards.	This enables people to provide for the economic and social use of sites adjacent to the railway corridor, and to meet the reasonably foreseeable needs of the activity, while ensuring that adverse noise and vibration effects are avoided and mitigated. It is therefore considered that the proposed objective is the most appropriate way to achieve the purpose of the Act.

5. Assessment of Proposed Noise and Vibration Provisions

Sections 32(1)(b) and 32(2) require an assessment of the proposed provisions to be undertaken to test their appropriateness and efficiency and effectiveness. This must include:

- whether the proposed provisions are the most appropriate way to achieve the objectives by identifying other reasonably practicable options, assessing their efficiency and effectiveness and summarising the reasons for deciding on provisions; and
- relative to considering the efficiency and effectiveness of the provisions in achieving the objective, include an assessment of the benefits and costs of the effects anticipated from implementing the provisions.

The cost and benefit assessment must identify and assess the costs and benefits associated with environmental, economic, social, and cultural effects including economic growth and employment that are anticipated to be provided or reduced. If practicable, the Act requires that these be quantified.

Section 32(2)(b) also requires an assessment of the risk of acting or not acting if there is uncertain or insufficient information. In this case, it is acknowledged that the costs of implementing the insultation measures will vary on a site by site basis, and the scale will depend on factors such as extent of area affected and density of housing. However, there is considered to be sufficient information about the effects of noise and vibration on health and amenity and reverse sensitivity to the rail corridor, to determine the range and nature of effects of the options. No assessment of the risk of acting or not acting is necessary.

5.1 Identification of Reasonably Practicable Options

KiwiRail have considered a range of potential options. This includes 'doing nothing', a number of existing approaches, the proposed provisions, and other regulatory methods and mechanisms available. These are summarised below:

Option A - Do nothing:
No or limited railway noise and vibration provisions in the District Plan. This may include no specific noise and vibration rules, standards or mapping overlays, but may include consideration of reverse sensitivity effects when assessing the adverse effects of any resource consent application, depending on the existing objectives, policies and rules in the District Plan.

This includes subdivision, use or development within the vicinity of the railway corridor if the District Plan provides sufficient direction to do so.

Option B – Rail operator reduces noise and vibration emissions:
The rail operator ensure that noise and vibration emissions are reduced to the extent that Activities Sensitive to Noise within 100m of the rail corridor achieve the recommended noise and vibration levels without needing to undertake any specific insulation, ventilation or construction design standards.

Option C - Noise barriers:
Acoustic walls or bunds installed by the applicant or the rail operator with no other noise or vibration management methods.

Option D - Construction design standards:
A table which specifies minimum construction materials and standards necessary to achieve internal acoustic levels within buildings, with no other noise or vibration management methods.

Option E - Setbacks:
Requiring Activities Sensitive to Noise to be set back 100m from the railway corridor with no other noise or vibration management methods.

Option F - Internal acoustic standards:
Require internal acoustic and ventilation rules and standards for noise-sensitive activities, but provide no other options to achieve compliance.

Option G – Combination of rules and standards (Proposed provisions):
Within 100m of the railway corridor, provide several options to achieve compliance with internal acoustic levels – within 50m of the rail corridor buildings are designed to meet specified Internal noise levels, or must meet a 50m setback, or where the noise at exterior façades is measured or predicted to be no more than 15 dB above the relevant noise level. Buildings must also meet mechanical ventilation standards and reporting standards. Includes an advice note to alert plan users that Activities Sensitive to Noise within the Rail Noise Control and Vibration Alert Area may be subject to vibration effects.

Option H – Proposed provisions funded by rail operator:
Within 100m of the railway corridor, via a mapped Rail Noise Control and Vibration Alert Area, the same options to achieve compliance would be available - buildings are designed to meet

specified Internal noise levels, or must meet a 50m setback, or noise at exterior façades is no more than 15 dB higher. Buildings must also meet mechanical ventilation standards and reporting standards, and there is an advice note regarding vibration effects. However, the difference is that KiwiRail would fund the achievement of these standards.

Option I - Landscaping:
Landscape planting to provide acoustic mitigation, with no other noise or vibration management methods.

Option J - National regulation:
This may include changes to the Building Act or Building Code or introduction of a National Planning Standard or National Environmental Standard. The Building Act and Code currently provides specifications to manage inter-tenancy noise (eg noise between residential apartments within the same building with shared tenancy walls). However, it does not require the management of internal noise where noise is generated from outside a building (e.g. rail noise from an adjacent rail corridor).

Option K Reverse sensitivity covenant:
A plan provision which requires a covenant whereby property owners agree not to complain about noise and vibration effects on sensitive land uses. This is often referred to as a 'no complaints' covenant.

An assessment of these options in accordance with Sections 32(1)(b) and 32(2) of the Act is provided below.

5.2 Assessment of Reasonably Practicable Options

Table 4: Assessment of Reasonably Practicable Options

Option A - Do nothing
No or limited railway noise and vibration provisions, but this option may include consideration of reverse sensitivity effects when assessing a resource consent application for subdivision, use or development within the vicinity of the railway corridor.

Effectiveness and Efficiency	Costs	Benefits
Doing nothing requires no action from the territorial authority or applicant so could be considered efficient. It is considered to be the least effective option as it will place no limit on the establishment of Activities Sensitive to Noise in the vicinity of the railway corridor. This will result in an increase in exposure of sensitive activities to the adverse effects of rail noise and vibration.	Doing nothing will result in the establishment of Activities Sensitive to Noise in the vicinity of the railway corridor without being appropriately designed and sited. This will result in an increase in exposure of sensitive activities to the adverse effects of rail noise and vibration, resulting in adverse health and amenity effects for people, and adverse reverse sensitivity effects on rail activity. These costs are analysed in the Economic Assessment, and estimated net costs to health and amenity are approximately $4,665,600, estimated net costs to rail operation is approximately $97,000, with these costs totalling approximately $4,762,600 per kilometre of track.	There will be no additional regulatory cost or costs to landowners and occupiers in terms of compliance or building cost increases. There will be no administration and regulatory costs to the territorial authority as there will be no associated resource consenting or monitoring and compliance.
Is doing noting reasonably practicable? No - it will not achieve the objective and will result in adverse health and wellbeing effects, and adverse reverse sensitivity effects.		

Option B - Rail operator reduces noise and vibration emissions

The rail operator ensure that noise and vibration emissions are reduced to the extent that Activities Sensitive to Noise within 100m of the rail corridor achieve the recommended noise and vibration levels without needing to undertake any specific insulation, ventilation or construction design standards.

Effectiveness and Efficiency	**Costs**	**Benefits**
This option would not be efficient or effective as, given mitigation measures to minimise rail noise and vibration are unable to comprehensively control these effects, this would significantly curtail the reasonable operation of the existing rail network, and would eliminate the opportunity for any growth in rail traffic over time, resulting in an inefficient use of infrastructure. This would then have consequences for the delivery of freight and passenger transport, and may compromise the achievement of emissions reduction targets by increasing the reliance on road freight.	This option would likely be cost prohibitive to KiwiRail given the impacts on its operations. There may be an environmental cost associated with an increase in emissions associated with having to rely on alternative transport methods.	There are no potential benefits to KiwiRail associated with this option. There would be health and amenity benefits associated with the reduction of rail noise and vibration for Activities Sensitive to Noise within the vicinity of the rail corridor. There may be benefits to landowners to maximise development potential for Activities Sensitive to Noise within the vicinity of the rail corridor.

Is doing noting reasonably practicable? No – this option would places significantly curtail rail the efficient use and development of rail infrastructure.

Option C - Noise barriers

Acoustic walls or bunds installed by the property owner or by the rail operator.

Effectiveness and Efficiency	Costs	Benefits
This option is effective and efficient when it integrated into the design of a new development in some instances. Acoustic walls may be able to be retrofitted in some instances. However it is not always practical because the height of the barrier required to achieve compliance would be very high (often in excess of 3.8m) and is therefore either impracticable or not consentable/difficult to consent. Most locations have practical limitations to install noise barriers. Limitations include the typical raised nature of rail lines (and train engines above these) above surrounding land, or from undesirable ground conditions and a lack of physical corridor which may necessitate property purchase due to the wider	There is a monetary cost of the installation of acoustic walls by KiwiRail. However this is not typically done by KiwiRail given the practical limitations set out in the efficiency and effectiveness review. Acoustic walls can be visually dominant and result in significant shading and shadowing, and can block view and outlook, given the heights required to achieve acoustic compliance. For these reasons the amenity and construction costs may in some circumstances be greater than the health and amenity effects they seek to mitigate. Walls and bunds also may reduce passive surveillance of surrounds and do not reduce vibration effects which would still need to be manged in a different way. If the permitted standards	Acoustic walls and bunds can provide noise reduction for single storied buildings. They also assist in visually screening development from the rail corridor, reducing the perception of noise, however they are often not practical or consentable, and can result in other health and amenity effects.

area of land required for the foundations of the noise barriers which require a wide base (which may result in the removal of adjacent activities) or for the physical space required for any bund. Whether bunds or acoustic walls are used, these may not often be effective for buildings of more than one storey.	are not met, then there will be costs borne by the applicant to prepare a resource consent application, costs to the territorial authority to assess the application, and costs to KiwiRail as a submitter to the application.	
Is the proposed approach reasonably practicable? In some circumstances acoustic walls and bunds can manage the adverse effects of noise on Activities Sensitive to Noise, and will protect KiwiRail railway infrastructure from reverse sensitivity. However, they are difficult to retrofit to existing situations, are often impractical for new situations, and can result on other adverse health and amenity effects.		

Option D - Construction design standards

A table which specifies minimum construction materials and standards necessary to achieve internal acoustic levels.

Effectiveness and Efficiency	**Costs**	**Benefits**
This option is somewhat effective and efficient. It is a relatively common approach	There will be additional compliance costs during building consent and building	Construction standards provide certainty as to outcome and design

to managing the adverse effects of noise in District Plan. However, it can have some limitations in terms of effectiveness as it essentially 'locks in' the standards to those at the time of writing the provisions. This means as construction standards improve and change over time, the standards in the plan remain static. This can result in future activities needing to obtain a resource consent where the standards are not met - even where the noise and vibration effects are appropriately managed. The Noise and Vibration Memorandum also sets out that in the Christchurch District Plan, although multiple compliance options were included for mitigating road and rail noise in buildings, including design standards, that on review of the controls the Council found that in most cases site-specific assessment associated with meeting internal acoustic standards was selected. This was presumably as despite any	construction when compared with Option A. Building and compliance design costs will be borne by the applicant and compliance confirmation costs will be borne by the territorial authority and/or the applicant. If the permitted standards are not met, then there will be costs borne by the applicant to prepare a resource consent application, costs to the territorial authority to assess the application, and costs to KiwiRail as a submitter to the application. Construction standards can often be complex, and typically require technical expertise on behalf of applicant and regulatory authority if there is any deviation from the standards in the schedule. This can Impose additional monetary and time costs. Construction standards often lack the flexibility to accommodate individual site circumstances. This may occur If the topography of the site removes or reduces the	specifications, and the associated costs can be estimated. Where compliance with the standards is demonstrated, an acoustics specialist does not need to be engaged by any party. Compliance can simply be demonstrated on building plans at the time a building consent is lodged.

specialist assessment costs the site-specific assessment provided a more efficient solution. This option is therefore considered to be less efficient than the preferred options.	need for all construction design standards to be met. As the standards are essentially 'locked in' to the plan, it requires a plan change to update them. The same requirements apply regardless of the level of external noise exposure. This means that some buildings will have more treatment and associated costs than is necessarily needed to achieve adequate indoor noise levels. Conversely, some buildings with the higher external noise exposure might not have adequate treatment.	
Is the proposed approach reasonably practicable? Somewhat - construction standards are a common regulatory approach to manage the adverse effects of noise and vibration for Activities Sensitive to Noise, and will protect KiwiRail railway infrastructure from reverse sensitivity. However, achieving compliance can be complex, and it is less preferred in practice than the acoustic standards in Option F, and there are limitations to this approach.		

Option E - Setbacks

Building or activity setback for Activities Sensitive to Noise of 100m from the railway corridor with no other noise or vibration management methods.

Effectiveness and Efficiency	Costs	Benefits
This option is effective as it is a simple method to minimise noise and vibration. However, it is not an efficient use of land. This approach is efficient for large rural sites where there is flexibility to locate Activities Sensitive to Noise away from the railway corridor.	The costs of requiring effective setbacks is the loss of developable land for Activities Sensitive to Noise within the vicinity of the railway corridor. The housing market costs associated with the loss of developable land are analysed in the Economic Assessment, and estimated net costs for a conservative typical mixed residential and non noise sensitive activity scenario are approximately $28,800,000 per kilometre of track. This also imposes a maintenance burden on the landowner as the person responsible for maintaining the large setback areas. If the permitted standards are not met, then there will be costs borne by the applicant to prepare a resource consent application, costs to	This is a simple approach that can work well for large rural sites where setback areas can continue to be used for agricultural purposes. However this approach remains open to rural sites as a method of management under other controls (including noise provisions). Setbacks effectively minimise noise, vibration and amenity effects.

	the territorial authority to assess the application, and costs to KiwiRail as a submitter to the application.	
Is the proposed approach reasonably practicable? Yes - it provides a tried and tested regulatory approach to effectively manage the adverse effects of noise and vibration on Activities Sensitive to Noise, and will protect KiwiRail railway infrastructure from reverse sensitivity. However, it is only efficient and effective for large rural sites, and there are high opportunity costs to the housing market.		

Option F – Acoustic Standards

Require internal acoustic rules and standards for noise-sensitive activities, but provide no other options to achieve compliance.

Effectiveness and Efficiency	**Costs**	**Benefits**
Acoustic standards are reasonably efficient and are common in a number of District Plans to manage noise effects of different activities including road, rail and aircraft noise. Territorial authorities typically require certification that the standard is met as part of the building consent application processing. Compliant buildings would not require a resource	There will be additional compliance costs during building consent and building construction when compared with Option A. Building and compliance design costs will be borne by the applicant and compliance confirmation costs will be borne by the territorial authority and/or the applicant. If the permitted standards are not met, then there will be	Acoustic standards which require Activities Sensitive to Noise to meet internal noise standards provide flexibility to the applicant to determine how they wish to meet the standards. This can be achieved using different options. Provides health and amenity benefits for new and expanded sensitive activities locating adjacent to the rail corridor, without unduly constraining development of

consent. Internal acoustic standards are not effective if there are opening windows. Any standards therefore require internal ventilation standards to be included alongside insulation controls.	costs borne by the applicant to prepare a resource consent application, costs to the territorial authority to assess the application, and potentially costs to KiwiRail as a submitter to the application depending on the potential level of reverse sensitivity effect. These policy, administrative and compliance costs for a conservative typical mixed residential and non noise sensitive activity scenario are analysed in the Economic Assessment, and estimated net costs are approximately $1,728,000 per kilometre of track.	Activities Sensitive to Noise near the rail corridor. Acoustic insulation also provides energy savings to occupiers and is likely to be capitalised in the value of the property. Avoids reverse sensitivity impacts on KiwiRail from increased numbers of sensitive activities locating adjacent to the rail corridor.
Is the proposed approach reasonably practicable? Yes – as addressed in full above it provides for a tried and tested regulatory approach to effectively manage the adverse effects of noise and vibration on Activities Sensitive to Noise, and will protect KiwiRail railway infrastructure from reverse sensitivity.		

Option G – Proposed Approach: Combination of new rules and standards for Activities Sensitive to Noise

Within 100m of the railway corridor, provide several options to achieve compliance with internal acoustic levels – within 50m of the rail corridor buildings are designed to meet specified Internal noise levels, or must meet a 50m setback, or where the noise at exterior façades is measured or predicted to be no more than 15 dB above the relevant noise level.

Buildings must also meet mechanical ventilation standards and reporting standards. Includes an advice note to alert plan users that Activities Sensitive to Noise within the Rail Noise Control and Vibration Alert Area may be subject to vibration effects.		
Effectiveness and Efficiency	**Costs**	**Benefits**
The provisions are effective as, depending on the activity and site circumstances, they provide several options for compliance. This option is efficient as it provides a range of options to achieve compliance. The standards are efficient as development meeting these standards will not require a require a consent and can be advanced as a permitted activity, which strikes an appropriate balance between enabling development and managing adverse effects. The standards are also efficient as they align with the rules in other District Plans - providing a nationally consistent approach and improving administration for KiwiRail and organisations operating nationally such as housing, healthcare and	There will be additional compliance costs during building consent and building construction when compared with Option A. Building and compliance design costs will be borne by the applicant and compliance confirmation costs will be borne by the territorial authority and/or the applicant. If the permitted standards are not met, then there will be costs borne by the applicant to prepare a resource consent application, costs to the territorial authority to assess the application, and costs to KiwiRail as a submitter to the application depending on the potential level of reverse sensitivity effect. These policy, administrative and compliance costs are analysed in the Economic Assessment, and for a	There will be an improvement in human health and amenity outcomes compared to Option A as there will be a reduction in the number of sensitive activities exposed to unacceptable levels of noise and vibration. It therefore enables Activities Sensitive to Noise to establish in the vicinity of the railway corridor where adverse effects can be effectively managed. This provides for the efficient use and development of land in accordance with section 7(b) of the Act. The range of permitted standards provides a flexible compliance pathway for applicants. It provides a range of potential responses to achieve compliance. This option also provides a comprehensive regulatory approach which recognises the actual spatial extent of railway corridor noise and vibration - and only limits

education providers. The noise and vibration provisions do not apply to existing activities so there are no additional constraints on developed sites where redevelopment is not anticipated. The provisions provide clear and specific matters of discretion which gives greater certainty to developers (and the Council) over the matters that will be assessed if resource consent is required.	conservative typical mixed residential and non noise sensitive activity scenario, the estimated net costs are approximately $1,728,000 per kilometre of track.	activities which are adversely affected by operating outside these parameters.
Is the proposed approach reasonably practicable? Yes - it provides for a range of tried and tested regulatory approaches to effectively manage the adverse effects of noise and vibration on Activities Sensitive to Noise, and will protect KiwiRail railway infrastructure from reverse sensitivity.		

Option H - Proposed provisions funded by rail operator

Within 100m of the railway corridor, via a mapped Rail Noise Control and Vibration Alert Area, the same options to achieve compliance would be available - buildings are designed to meet specified Internal noise levels, or must meet a 50m setback, or noise at exterior façades is no more than 15 dB higher. Buildings must also meet mechanical ventilation standards and

reporting standards, and other than an advice note, there are no vibration standards. However, the difference is that KiwiRail would fund compliance with these standards.		
Effectiveness and Efficiency	**Costs**	**Benefits**
This option is efficient as it provides a range of options to KiwiRail to achieve compliance. This option is not effective as putting the onus on KiwiRail to fund any compliance costs could perversely incentivise landowners to develop closer to the rail corridor than they would if the measures were self-funded. This could increase the costs of compliance as higher standards of insultation could be required, and it would result in more Activities Sensitive to Noise establishing in closer proximity to the rail corridor.	The policy, administrative and compliance costs are analysed in the Economic Assessment, and for a conservative typical mixed residential and non noise sensitive activity scenario, the estimated net costs are approximately $1,728,000 per kilometre of track. A large portion of these costs would be borne by KiwiRail.	The same benefit outlined in Option G apply, noting that benefits accrue to the landowner and occupier without any cost to them, despite their choice being to locate near a railway corridor.
Is the proposed approach reasonably practicable? No – this option could result in considerable cost to KiwiRail, of a level that would mean the implementation of the provisions is not feasible, and could perversely incentivise Activities Sensitive to Noise to establish in closer proximity to the rail corridor than they would otherwise.		

Option I - Landscaping Planted buffers to provide acoustic mitigation.		
Effectiveness and Efficiency	**Costs**	**Benefits**
This option is not effective or efficient, as dense landscaping in excess of tens of metres in width would be needed to provide noise reduction. Seasonal variations in terms of leaf density and weather induced variations may impact vegetation quality.	The costs of requiring effective landscape mitigation setbacks is the loss of developable land within the vicinity of the railway corridor. This also imposes a maintenance burden on the landowner as the person responsible for maintaining the large planted areas. If the permitted standards are not met, then there will be costs borne by the applicant to prepare a resource consent application, costs to the territorial authority to assess the application, and costs to KiwiRail as a submitter to the application.	Provides the benefit of added visual screening.
Is the proposed approach reasonably practicable? No – landscape planting is not an efficient or effective option.		

Option J - National Regulation

This may Include changes to the Building Act or Building Code or the introduction of a National Planning Standard or National Environmental Standard.

Effectiveness and Efficiency	Costs	Benefits
This option is likely to be the most efficient and effective compared to all other options. Unfortunately, although a nationally consistent approach would have a number of benefits, it is outside the Schedule 1 process of the Act and ultimately relies on political will.	Not applicable.	Not applicable.
Is the proposed approach reasonably practicable? No - not within scope.		

Option K - Reverse Sensitivity Covenant

A plan provision which requires a covenant requiring the property owners agree not to complain about noise and vibration effects on sensitive land uses.

Effectiveness and Efficiency	Costs	Benefits
This option is not effective and efficient, because it addresses the ability to complain about noise and vibration, rather than deal with those effects directly. Although this may avoid complaint regarding noise and vibration, Activities	There are legal costs associated with the covenant preparation and registration process. These costs will be borne by both the landowner and the territorial authority. This option provides for poor health and amenity outcomes as the actual	A covenant is a legally binding agreement between the property owner and the territorial authority, and is generally simple to understand. A covenant is likely to be a more cost effective approach compared to the other

Sensitive to Noise will still be affected by noise and vibration, resulting in adverse health and amenity effects for the occupants of these buildings and areas. A provision which requires a covenant is not efficient as it requires every individual site seeking to establish or add to a building to go through a covenant registration process against that individual parcel of land. In time, this can become difficult for a territorial authority to administer as it is not obvious whether or not a covenant applies to a record of title without searching that record of title individually.	effects of railway noise are not appropriately avoided or mitigated. If the permitted standards are not met, then there will be costs borne by the applicant to prepare a resource consent application, costs to the territorial authority to assess the application, and costs to KiwiRail as a submitter to the application.	options (excluding 'do nothing'), as It requires no additional building or design controls, or landscaping or noise barriers.
Is the proposed approach reasonably practicable? No - a reverse sensitivity covenant standard is not an efficient or effective option.		

6. Assessment Summary

Table 5: Assessment Summary

Reasonably Practicable Option	Assessment Summary
Option A - Do nothing: No or limited provisions.	Not reasonably practicable.
Option B – Rail operator reduces noise and vibration emissions: To the extent that no noise or vibration effect is generated on nearby Activities Sensitive to Noise.	Not reasonably practicable.
Option C – Noise barriers: Acoustic walls or bunds.	Not reasonably practicable.
Option D – Construction design standards: A table of minimum design requirements and construction materials to meet noise levels.	Somewhat reasonably practicable, but no favoured by plan users.
Option E - Setbacks: Building or activity setback of 100m with no other noise or vibration management methods.	Preferred methods - these methods can effectively manage the adverse effects of noise and vibration on Activities Sensitive to Noise and will protect KiwiRail railway infrastructure from reverse sensitivity. The most appropriate method to use is dependant on the site context.
Option F – Internal acoustic standards: Require internal acoustic rules and standards for noise-sensitive activities, but provide no other options to achieve compliance.	
Option G – Combination of rules and standards (Proposed provisions): New rules and standards for Activities Sensitive to Noise Within 100m of the railway corridor, provide several options to achieve compliance with internal acoustic levels – within 50m of the rail corridor buildings are designed to meet specified Internal noise levels, or must meet a 50m setback, or where	Most preferred method – Combines several of the methods above to provide options to effectively manage adverse noise effects and vibration and protect KiwiRail railway infrastructure from reverse sensitivity.

the noise at exterior façades is measured or predicted to be no more than 15 dB above the relevant noise level. Buildings must also meet mechanical ventilation standards and reporting standards. Includes an advice note to alert plan users that Activities Sensitive to Noise within the Rail Noise Control and Vibration Alert Area may be subject to vibration effects.	
Option H - Proposed provisions funded by rail operator: As above but funded by KiwiRail.	Not reasonably practicable.
Option I – Landscaping: Landscaping to provide acoustic mitigation.	Not reasonably practicable.
Option J - National Regulation: Changes to the Building Act or Code or new National Planning or Environmental Standards.	An out-of-scope potential long term solution.
Option K - Covenant: A 'no complaints' covenant provision.	Not reasonably practicable.

7. Conclusion

The operation, maintenance and development of the rail network is critical to the safe and efficient movement of freight and passengers throughout New Zealand, and forms an essential part of the national transportation network and the wider supply chain. KiwiRail's proposed provisions to the District Plan enable Activities Sensitive to Noise to be developed in the vicinity of the railway corridor where adverse noise and vibration effects can be effectively managed through a range of standards. The proposed provisions will mitigate health and amenity effects on new and altered Activities Sensitive to Noise that seek to establish within 100 metres of the railway corridor. This will ensure that the continued operation of nationally and regionally significant infrastructure of the rail corridor will be appropriately protected from reverse sensitivity, and neighbouring communities will experience positive health and amenity outcomes.

Consistent with section 32 of the Act, the proposed objective and policies have been developed and analysed against Part 2 and it is considered that the proposed objective is the most appropriate way to achieve the purpose of the Act.

The proposed provisions have been assessed against a number of alternative options in terms of their costs, benefits, and efficiency and effectiveness in accordance with the relevant clauses of section 32 of the Act.

The proposed provisions are considered to represent the most appropriate means of achieving the proposed objective. The provisions are also the most appropriate way of addressing the underlying resource management issues relating to managing the adverse effects of noise and vibration of surrounding land uses, and minimising reverse sensitivity effects to protect the railway network. Adopting the proposed provisions will maintain and enhance the continued use of Railway infrastructure while enabling the efficient subdivision, use and development of land in its vicinity, and providing for health and amenity outcomes.

Appendix 1: Proposed Provisions

Model District Plan Provisions

1. Definitions

Noise sensitive activity [if required]
Means any residential activity (including student or retirement accommodation), visitor accommodation, educational facility, child care facility, healthcare activity, and places of worship/marae.

The following provisions should be co-located together in a district -wide chapter (preferable noise and infrastructure) rather than applied on a zone by zone basis.

2. Objective

Ensure adverse reverse sensitivity, health and wellbeing effects arising from the development of noise sensitive activities adjacent to the railway network are appropriately avoided or mitigated.

3. Policies

Avoid reverse sensitivity effects on the ongoing and future operation and development of the railway network by ensuring new noise sensitive activities are designed or located to meet appropriate acoustic design standards.

Manage effects on the health and wellbeing of communities through the design and location of noise sensitive activities adjacent to the railway network to meet appropriate acoustic design standards.

4. Rules/Standards

4.1 Noise and vibration

E. Activities sensitive to noise within 100m of [KiwiRail Rail Corridor Designation]:

<table>
<tr><th></th><th colspan="2">Activity sensitive to noise near a railway network</th><th></th></tr>
<tr><td>All zones – at any point within 100 metres from the legal boundary of [KiwiRail Rail Corridor Designation] (Rail Noise Control and Vibration Alert Area)</td><td colspan="2">Activity status: Permitted

Indoor railway noise
1. Where any activity listed in Table 1 is located within the Rail Noise Control and Vibration Alert Area:
(a) the entire room or space shall be designed, constructed and maintained (including in any alterations) to achieve indoor design noise levels in Table 1; or

[RULEXX] Table 1
<table>
<tr><th>Building type</th><th>Occupancy/activity</th><th>Maximum railway noise level LAeq(1h)</th></tr>
<tr><td rowspan="2">Residential
[note definition in the plan must be broad enough to cover all types of residential activities – or other types of</td><td>Sleeping spaces</td><td>35 dB</td></tr>
<tr><td>All other habitable rooms
[note this may require the definition from the National</td><td>40 dB</td></tr>
</table></td><td>Activity status when compliance with standards 1, 2 or 3 not achieved: Restricted discretionary

Matters of discretion are restricted to:
1. The extent of non-compliance with the noise and vibration standards.
2. Effects on the health and wellbeing of people.
3. The reverse sensitivity effects on the rail network, including the extent to which the activity will unduly constrain the ongoing operation, maintenance and upgrade of the rail network.
4. The outcome of any consultation with KiwiRail.</td></tr>
</table>

residential activities not addressed within it will need to be added to this table]	*Planning Standards to be added if this is not already defined in the District Plan]*	
Visitor Accommodation	Sleeping spaces	35 dB
	All other habitable rooms	40 dB
Education Facility	Lecture rooms/theatres, music studios, assembly halls	35 dB
	Teaching areas, conference rooms, drama studios, sleeping areas	40 dB
	Libraries	45 dB
Health	Overnight medical care, wards	40 dB
	Clinics, consulting rooms, theatres, nurses' stations	45 dB
Cultural	Places of worship, marae	35 dB

(b) the nearest exterior façade of the building accommodating the activity listed in Table 1 is at least 50 metres from the legal boundary of the [KiwiRail Rail Corridor Designation], and there is a solid building, fence, wall or landform that completely blocks line-of-sight from all parts of doors and windows, to all points 3.8 metres above railway tracks; or

(c) it can be demonstrated by way of prediction or measurement that the noise at all exterior façades of the listed activity is no more than 15 dB above the relevant noise levels in Table 1.

Mechanical ventilation

2. If windows must be closed to achieve the design noise levels in clause 1(a), the building is designed, constructed and maintained with a mechanical ventilation system that:
   (a) For habitable rooms for a residential activity or visitor accommodation activity, achieves the following requirements:
      i. provides mechanical ventilation to satisfy clause G4 of the New Zealand Building Code; and
      ii. is adjustable by the occupant to control the ventilation rate in increments up to a high air flow setting that provides at least 6 air changes per hour; and
      iii. provides relief for equivalent volumes of spill air;
      iv. provides cooling and heating that is controllable by the occupant and can maintain the inside temperature between 18°C and 25°C; and

Notification:
Application for resource consent under this rule shall not be notified or limited notified unless KiwiRail is determined to be an affected person determined in accordance with section 95B of the Resource Management Act 1991 or the Council decides that special circumstances exist under s 94A(4) of the Resource Management Act 1991.

	v. does not generate more than 35 dB $L_{Aeq(30s)}$ when measured 1 metre away from any grille or diffuser. (b) For other spaces, is as determined by a suitably qualified and experienced person. **Report required** 3. A report is submitted to the council demonstrating compliance with clauses (1) to (2) above (as relevant) prior to the construction or alteration of any building containing an activity sensitive to noise. Compliance with 1(a) and (c) must be confirmed by a Registered Acoustician and when doing so railway noise must be assumed to be 70 $L_{Aeq(1h)}$ at a distance of 12 metres from the track, and must be deemed to reduce at a rate of 3 dB per doubling of distance up to 40 metres and 6 dB per doubling of distance beyond 40 metres. Note: The Rail Noise Control and Vibration Alert Area identifies the vibration-sensitive area within 100metres each side of the [KiwiRail Rail Corridor Designation]. Properties within this area may experience rail vibration effects. No specific district plan rules or notification requirements apply in relation to vibration controls as a result of this Rail Noise Control and Vibration Alert Area.	

Insert mapping overlay which identifies a 100m buffer on each side of the [KiwiRail Rail Corridor Designation] called “Rail Noise Control and Vibration Alert Area” to which the above rules will apply.

Appendix 2: Acoustics Advice

Chiles Ltd

Project:	**Land use controls for railway sound and vibration**
Report:	**Acoustics advice**
Client:	KiwiRail
Reference:	130418h
Date:	19 July 2023
Author:	Stephen Chiles

Contents:

1. Introduction

1.1. KiwiRail is undertaking an analysis of potential controls for existing/permitted railway sound and vibration from its national network, affecting new and altered sensitive land uses nearby. Chiles Ltd has been engaged by KiwiRail to provide advice on associated acoustics details to inform that analysis. This report sets out: effects of sound and vibration on people and buildings, indicative sound and vibration levels at different distances from railway tracks, methods to reduce sound and vibration, and recommendations for land use controls.

1.2. In normal acoustics usage the term "noise" describes unwanted airborne "sound", although some people use the words interchangeably. However, under the Resource Management Act (RMA) "noise" is defined as including vibration; presumably ground-borne. Notwithstanding that in practice "noise limits" in rules and conditions under the RMA refer exclusively to airborne sound. The term sound has been used in this report to distinguish airborne sound from ground-borne vibration in an RMA context where both are defined as noise.

1.3. A fundamental input when assessing railway sound and vibration is the type, volume and timing of railway traffic to be assumed on a particular section of the network. For comparison, when considering roads in New Zealand, road traffic volumes often gradually increase or remain steady, such that acousticians can sometimes use existing measured road traffic volumes as a reasonable baseline for future design. However, for railways in New Zealand, railway traffic volumes and times can change significantly, such that existing railway traffic may not be a reliable baseline when considering effects associated with new neighbouring houses that will exist for many decades. Therefore, appropriate assumptions for railway traffic types, volumes and times are an essential input that should be considered alongside the following acoustics information in this report.

1.4. Both sound and vibration have complex varying characteristics which are only approximated by metrics representing levels as a single number. There are compromises with whichever metrics are used. In the case of railway sound and vibration in New Zealand the choice of metrics is particularly challenging because often there are a relatively small number of intense events. In this situation, use of average values might under-represent adverse effects and use of maximum values might over-represent effects. The extent of under or over representation varies depending on the rail traffic in any location, which in turn relates to the comment above on railway traffic volumes. Metrics and objective analysis can still be valuable to focus interventions in the most effective places, but the limitations of the metrics require consideration when evaluating potential land use controls. This issue is discussed further in section 4.

2. Effects of sound

2.1. The World Health Organisation ("WHO") has periodically reviewed and collated evidence of health effects caused by environmental sound including from railways.[1] The most recent publication was by WHO Europe ("2018 WHO Guidelines"),[2] which was based on systematic

[1] World Health Organisation, Guidelines for community noise, 1999; World Health Organisation, Burden of disease from environmental noise, 2011.
[2] World Health Organisation, Environmental noise guidelines for the European region, 2018.

reviews of a large number of published studies. There have been numerous other discrete studies of these issues, but the 2018 WHO Guidelines provides a robust synthesis of available information and its findings with respect to railway sound appear to be widely accepted.

2.2. From preceding studies, the 2018 WHO Guidelines found moderate quality evidence that railway sound causes adverse health effects in that it increases the risk of annoyance and sleep disturbance in the population. Various other potential health effects were examined but evidence was not available to determine a relationship for them with railway sound. Based on the information available the 2018 WHO Guidelines made "strong" recommendations that external railway sound levels should be reduced below 54 dB L_{den} and 44 dB L_{night}. The 2018 WHO Guidelines found there was insufficient evidence to recommend one type of intervention over another to reduce levels.

2.3. The above 2018 WHO Guidelines recommendations are in terms of long-term (annual) average sound levels. One of the metrics relates just to the night period (L_{night}) and the other (L_{den}) is for a 24-hour average including penalties for sound occurring in the evening (+5dB) and at night (+10dB). By necessity, this use of long-term averages is a pragmatic approach given that potential health effects generally relate to exposure over extended periods and are determined from consideration of the community/population rather than specific individuals. Other research into health effects, such as relating to awakenings from sleep, has previously referenced maximum sound levels, but sleep disturbance as a health effect is only assessed in terms of average levels in the 2018 WHO Guidelines.

2.4. The 2018 WHO Guidelines were based on international research from a wide range of countries. There was no available data from New Zealand at that time. Subsequent research published in 2019 specifically addressed the applicability of international data on railway sound annoyance of the New Zealand population.[3] This included a survey of people living in the vicinity of the North Island Main Trunk line in South Auckland, using the same general methodology as most international studies. The research found that international noise annoyance response curves are generally applicable for the New Zealand population.

2.5. There is current New Zealand and international research that may further refine the understanding of health effects caused by railway sound. However, the existing 2018 WHO Guidelines already establishes there are adverse health effects that warrant intervention.

2.6. In New Zealand, railway sound criteria have commonly been defined in terms of one-hour average levels (see section 4). Values of 35 dB $L_{Aeq(1h)}$ inside bedrooms and 40 dB $L_{Aeq(1h)}$ inside other habitable spaces have previously been applied for protection from health effects. Accounting for the different metrics, these values are slightly higher (more lenient) than the 2018 WHO Guidelines for regular sound events but would be more stringent for infrequent events. This comparison relates only to average sound levels, but corresponding relationships with health effects for different frequencies of railway events are uncertain/unknown. Therefore, currently there is no evidence base available that would support significantly more or less

[3] Humpheson D. and Wareing R., 2019. Evidential basis for community response to land transport noise, Waka Kotahi Research Report 656. https://nzta.govt.nz/resources/research/reports/656/

stringent railway sound criteria than 35 dB $L_{Aeq(1h)}$ inside bedrooms and 40 dB $L_{Aeq(1h)}$ inside other habitable spaces for protection of health.

2.7. There is a lack of information on the combination of indoor and outdoor living conditions in relation to health effects. Even if indoor conditions are controlled, there may still be residual health effects arising from outdoor conditions. In a New Zealand context, based on criteria applied for other sources, reasonable conditions in outdoor living spaces might be achieved with railway sound levels of 55 dB $L_{Aeq(1h)}$.

3. Effects of vibration

3.1. Adverse effects of railway vibration can include annoyance and sleep disturbance for building occupants and damage to buildings. Damage to buildings (even cosmetic damage) occurs at greater vibration magnitudes than those which can cause annoyance.

3.2. Internationally, there has been less research into transportation vibration effects on people compared to research on transportation sound effects. However, the evidence that does exist on adverse health effects caused by railway vibration indicates they are material, and as such the relative paucity of research is not an indicator of the degree of effects. There is international research ongoing in this area. Research is also investigating health effects arising from the combination of railway sound and vibration.

3.3. Norwegian Standard NS 8176[4] summarises research of human response to transportation vibration and provides exposure response curves in terms of the percentage of people who would perceive or experience degrees of annoyance from vibration. The current version of the standard (2017) discusses the inherent uncertainty in the data, including that it does not account for varying traffic volumes, although notes no other studies addressing that factor were found.

3.4. NS 8176 defines four categories of vibration exposure in residential buildings, with Class A representing the best vibration conditions and Class D (or below) representing the worst. The Class C criterion has previously been applied in New Zealand for habitable spaces in new buildings. This corresponds to a vibration level at which about 20% of people would be expected to be highly or moderately annoyed by vibration. The Class C criterion is defined as a $v_{w,95}$ of 0.3 mm/s (vibration metrics are explained in section 4).

3.5. For vibration effects on buildings, a ppv criterion of 5 mm/s is often used in New Zealand as a threshold at which there is potential for cosmetic damage to new buildings. While the 5 mm/s ppv criterion has been taken from guidance in an overseas standard, it does not relate specifically to railway vibration and is generally regarded as a cautious value. There is a knowledge gap as to the actual likelihood of cosmetic damage from railway vibration in New Zealand. However, all potential criteria for vibration effects on people are substantially more stringent, such that for buildings containing sensitive activities, cosmetic building damage might not require separate consideration.

[4] Norwegian Standard NS 8176:2017 Vibration and shock - Measurement of vibration in buildings from land-based transport, vibration classification and guidance to evaluation of effects on human beings

4. Methods

Sound level metrics

4.1. As discussed in section 1, for railway lines with intermittent traffic in New Zealand, use of an average sound level over any time period can cause inconsistencies between the level and the corresponding human response or health effect.

4.2. The noise provisions which have been sought by KiwiRail in plan changes around New Zealand to date have adopted a one-hour average ($L_{Aeq(1h)}$) for railway sound in their standards. This approach was initially proposed by Marshall Day Acoustics in a review undertaken in 2009 of appropriate noise criteria for district planning rules.[5] This report considered the utilisation of one-hour averaging as against broadscale setbacks and average / maximum or day / night averages. The one-hour average allows for a degree of averaging compared to single events, but still represents periods of activity when disturbance from railway sound is occurring. In the New Zealand context an alternative metric with longer averaging times (e.g. L_{den}/L_{night}) would be likely to significantly under-represent adverse effects from maximum/event sound levels over much of the network.

4.3. Neither one-hour averages or maximum levels however have an established, researched relationship with the health effects correlated to the external long term average sound level criteria recommended by the 2018 WHO Guidelines. This represents a knowledge gap and currently necessitates a broad judgement to determine criteria using the one-hour average (or another metric like maximum levels).

4.4. As set out in section 2, the 2018 WHO Guidelines recommend annual average criteria of 54 dB L_{dn} and 44 dB L_{night} applying outside buildings. These values assume windows may be open, resulting in internal sound levels around 15 dB lower than the criteria (with windows ajar for ventilation): 39 dB L_{den} and 29 dB L_{night}. In a situation where there are regular railway sound events, it could be appropriate to directly take the long-term average L_{den} and L_{night} criteria to apply as one-hour criteria (the L_{den} would also need a -10dB adjustment if applying at night). However, for irregular or infrequent events a higher one-hour criterion could be appropriate. It might also be appropriate to adjust criteria if there are no events at night.

Vibration level metrics

4.5. Internationally there are a range of different metrics used to quantify vibration affecting humans, with no accepted standardisation for this application. The "statistical maximum value of weighted velocity" ($v_{w,95}$) metric has been used previously in New Zealand for both road and railway vibration affecting people, and has the advantage that is corresponds to the exposure response curves in Norwegian Standard NS 8176.

4.6. For vibration effects on buildings and structures, the "peak particle velocity" (ppv) metric is in widespread use in New Zealand. This metric is mandated by the Noise and Vibration Metrics National Planning Standard for construction vibration affecting structures.

[5] Marshall Day Acoustics, *Ontrack rail noise criteria reverse sensitivity guidelines*, 22/10/09

4.7. In this report, vibration is presented in terms of the $v_{w,95}$ with respect to effects on people, and in terms of the ppv with respect to effects on buildings/structures.

Railway traffic characteristics

4.8. The above railway sound levels and effects depend on the timing, type and frequency of train movements at a particular location. As discussed in section 2, the proposed one-hour average sound criteria are generally less stringent than international daily average values for lines with more frequent movements. This was acknowledged by the original Marshall Day Acoustics report, which noted the application of one-hour averages are likely insufficient for lines with greater than 20 train movements a day, and the use of day / night averages or maximum levels would be more protective.

4.9. At the other end of the spectrum, for lines with very infrequent movements the proposed one-hour average criteria might be considered too stringent. With the numerous factors involved and the underlying knowledge gaps relating to sound effects, it is not possible to precisely define a lower railway traffic volume at which one-hour average sound criteria might become unwarranted. Any such consideration should not just include current rail volumes, but potential future rail volumes to which newly established activities may be subject to in the future.

4.10. Railway vibration levels and effects also depend on the traffic characteristics. However, the vibration criteria discussed in section 3 relate to levels from individual events rather than average levels. As such, the criteria are independent of the number of movements. Under the specified standard (NS 8176) the vibration criteria relate to the type of train at a particular location that generates the highest vibration levels, which will generally be freight trains. Therefore, the proposed criteria could be applied to all lines regardless of traffic characteristics.

5. Sound levels

5.1. Different options for sound level metrics are discussed in section 4 with respect to effects and criteria. In this section, example railway sound levels are presented in terms of average values over one hour ($L_{Aeq(1h)}$).

5.2. Railway sound levels are dependent on train types/condition, traffic volumes, speeds, track geometry/condition, terrain and various other factors. As discussed above, when considering average levels the assumed railway traffic volumes are a critical input.

5.3. With full geospatial details and information on railway activity, various standard acoustics computer modelling packages are available to predict railway sound levels for a specific situation. There is currently no standardised approach to this modelling for railway sound in New Zealand or consistent use of a particular calculation algorithm. Consequently, even with the same input data, predictions are likely to vary when made by different practitioners.

5.4. The following provides an illustration of typical railway sound levels based on an assumption of approximately two freight train movements in a one-hour period, in a flat area without screening. This is based on data summarised by Marshall Day Acoustics.[6] More recent

[6] Marshall Day Acoustics, *Ontrack rail noise criteria reverse sensitivity guidelines*, 22/10/09

(unpublished) measurements for various New Zealand train types confirm these sound levels are in a realistic range.

Distance from track	Sound level
10 metres	71 dB $L_{Aeq(1h)}$
20 metres	68 dB $L_{Aeq(1h)}$
30 metres	66 dB $L_{Aeq(1h)}$
40 metres	64 dB $L_{Aeq(1h)}$
50 metres	62 dB $L_{Aeq(1h)}$
60 metres	60 dB $L_{Aeq(1h)}$
70 metres	59 dB $L_{Aeq(1h)}$
80 metres	58 dB $L_{Aeq(1h)}$
90 metres	56 dB $L_{Aeq(1h)}$
100 metres	56 dB $L_{Aeq(1h)}$

5.5. In the Marshall Day Acoustics report which generated the above levels, this sound level assumption of 2 freight train movements in a one-hour period was originally proposed as being approximately equivalent to the sound level from lines with regular passenger trains. It was not intended to apply in settings which actually experienced two freight train movements per hour across a day (as noted in section 4 above, where there were more than 20 movements a day, a one-hour average was considered inadequate to address the likely effects). Instead the intention of the average is to provide an approximation of both the effects of a single event, and a generalised average of noise from the corridor. The report considered a single measurement would enable simpler application of the rule framework by landowners (compared to an average/maximum approach which was considered to add extra complication without significant benefits in effects management given the variability of single train pass-bys).

5.6. Based on this assumption the proposed sound criteria are likely to be appropriate for all urban lines with passenger trains and any lines with at least say six daily freight movements and/or freight movements at night (including where this level of activity may be required in future). This threshold of six freight movements is tentatively suggested based on a hypothesis that the one-hour average criteria would not be unduly stringent at this frequency of effect.

5.7. Internal sound levels with windows ajar for ventilation will typically be around 15 dB less than the external levels set out above. As such, at 100 metres from a track with 56 dB $L_{Aeq(1h)}$ outside, there is still potential to exceed internal criteria of 35 and 40 dB $L_{Aeq(1h)}$ (section 2). A 35 dB internal criterion in particular could be exceeded significantly beyond 100 metres from the track, potentially to around 200 metres. However, at progressively further distances from the track the actual sound level is more likely to be affected by topography and localised screening such that there will be greater variability in sound levels.

5.8. For land use controls, the appropriate method to determine railway sound levels for a particular site (specified values, modelled, measured) depends significantly on the approach to information on train types, volumes and times. This is discussed further in section 9 with respect to recommended controls.

6. Vibration levels (ground-borne)

6.1. The following table summarises various railway vibration measurements (and associated predictions) in New Zealand from a range of sources, generally ordered from lowest to greatest magnitude (other than the first row which uses the ppv metric rather than $v_{w,95}$). Where the data relates to a private development or complaint, a generic source reference is given. Not all measured values are directly comparable due to issues such as differences in measurement positions (ground/building) that would require adjustments.

Data source	Vibration levels
Marshall Day Acoustics, *Ontrack rail noise criteria reverse sensitivity guidelines*, 22/10/09 *(secondary reporting of Marshall Day Acoustics 2006 assessment for Marsden Point)*	Based on measurements: 2 to 3 mm/s ppv at 30m 0.5 to 1 mm/s ppv at 60m
AECOM, *Bayfair to Bayview – Rail Relocation Post Construction Noise and Vibration Monitoring*, 6/3/17	Measured: 0.56 mm/s $v_{w,95}$ at 7m From measurement and distance correction: 0.19 mm/s $v_{w,95}$ at 100m 0.26 mm/s $v_{w,95}$ at 50m 0.37 mm/s $v_{w,95}$ at 25m
Marshall Day Acoustics, *Wiri to Quay Park third main rail line noise and vibration assessment*, 10/7/20	Measured: 0.6 mm/s $v_{w,95}$ at 9.5m
URS, *Maunganui-Girven Road Intersection -Rail Vibration Assessment*, 14/4/14	Measured: 26.5 mm/s^2 $a_{w,95}$ at 17m *(this $a_{w,95}$ value has different units and is not directly comparable to a $v_{w,95}$ value)* From measurement and distance correction: 0.34 mm/s $v_{w,95}$ at 100m 0.47 mm/s $v_{w,95}$ at 50m 0.67 mm/s $v_{w,95}$ at 25m
URS, *Operational noise and vibration assessment Peka Peka to North Ōtaki Expressway Project*, 12/2/13	Measured: 0.58 mm/s $v_{w,95}$ at 60m
Marshall Day Acoustics, *assessment in relation to a complaint near Hamilton*, 28/11/12	Measured (on a deck structure): 0.42 mm/s $v_{w,95}$ at 140m
Marshall Day Acoustics, *assessment for development in Napier*, 6/2/20	Measured: 1.2 mm/s $v_{w,95}$ at 10m
URS, *Ground-borne vibration measurements at Hornby, Christchurch,* 12/9/14	Measured before renewal: 2.2/2.9 mm/s $v_{w,95}$ at 8.4m Measured after renewal: 0.5/0.4 mm/s $v_{w,95}$ at 8.4m

6.2. The data in the above table illustrates the significant variation that is inherent in railway vibration. Vibration levels often vary even within a localised area and cannot be reliably predicted, such as in the same manner as airborne sound. Hence, measurements are generally required to assess ground-borne vibration.

6.3. With respect to effects on people, a vibration criterion of 0.3 mm/s $v_{w,95}$ is discussed in section 3. The measurement data shows that this criterion can routinely be exceeded at over

100 metres from railway tracks in New Zealand, but there is significant variation. Vibration levels exceeding this criterion occur beyond at least 50 metres from the track in most cases.

6.4. With respect to effects on buildings, a vibration criterion of 5 mm/s ppv is discussed in section 3. The vibration measurement data indicates that vibration levels might exceed this criterion within approximately 20 metres of the track. The implications of this are discussed further with respect to recommended controls in section 9.

7. Approaches to manage effects of railway sound

Source

7.1. Routine rolling stock and track maintenance undertaken by KiwiRail contributes to reducing sound at source. There might be incremental improvements if more stringent maintenance service standards were adopted.

7.2. Locomotives can be designed with sound reducing features, such as attenuators and silencers. Generally, these need to be integrated at the time of initial design/manufacture. Retrofitting measures to existing locomotives may be constrained and would be likely to constitute a major rebuilding. Locomotives with alternative power systems such as battery power can have reduced sound, although significant sound still arises from the track/wheel interface. Unpublished research[7] included measurements that show the sound levels set out in section 5 remain representative for the current locomotive fleet, including the newer DL class locomotives. It is understood that KiwiRail has existing workstreams to renew its rolling stock (including the locomotives) overtime. This workstream is focused on alternative power systems, and as a multi-year project to explore (and where supported) upgrades/renewals of its stock, as opposed to retrofitting of existing or old stock.

7.3. Specific sound sources such as wheel squeal, can sometimes be reduced through treatment of rolling stock.

7.4. If older track is not continuously welded, implementing this measure can reduce sound.

Pathway

7.5. Barriers such as formed by earth bunds or walls can reduce railway sound. A barrier providing effective screening could typically reduce railway sound levels by around 5 dB. However, this is often impracticable because any noise barrier would typically need to be in the order of 5 metres high to achieve effective screening of locomotive sound sources that are several metres above the tracks, which in turn are often raised above local ground level. Sound screening might also be provided by intervening buildings or the terrain. As barrier performance is limited by sound passing over the top, typical barriers generally do not provide sufficient sound reduction for receivers close to the railway (within around 50 metres).

[7] Waka Kotahi research programme. Social cost (health) of land transport noise exposure, https://www.nzta.govt.nz/planning-and-investment/research-programme/current-research-activity/active-research-projects/

7.6. Increasing the distance of the pathway reduces sound levels: i.e. separating the receiver from the source by a greater distance. As discussed previously, this measure in isolation may require separation of 100 to 200 metres.

Receiver

7.7. If habitable/sensitive spaces are orientated with no opening windows with exposure to railway sound then internal levels will be reduced. Hence the layout of a building can be used to manage railway sound. A practical approach can be to locate only ancillary, non-sensitive spaces such as garages and bathrooms on the side of the building facing the railway.

7.8. Where windows do have exposure to railway sound, closing those windows reduces internal sound levels. This typically provides a reduction in the order of 10 dB compared to when windows are open ajar for ventilation. However, if windows are required to be closed to reduce sound then an alternative (i.e. mechanical) ventilation and temperature control method is needed for occupants to maintain thermal comfort such that they have a genuine choice to leave the windows closed. For two older roading projects (SH20 Mt Roskill and SH1 Plimmerton) Waka Kotahi installed ventilation systems in 35 and 57 houses respectively with the intention that it would allow windows to be kept closed to reduce road-traffic noise.[8] However, those systems only provided ventilation and not temperature control (e.g. cooling) and for both projects residents reported the temperature being uncomfortable with windows closed. Therefore, if closed windows are to be considered as a noise reduction measure, temperature control should be included in any alternative ventilation system.

7.9. If greater reductions are required than can be achieved just by building layout or closing windows, then the building fabric can be upgraded. This typically requires thicker and/or laminated glazing of windows and in some cases additional/thicker layers of plasterboard wall/ceiling linings.

8. Approaches to manage effects of railway vibration

Source

8.1. As for managing sound, routine track and rolling stock (wheel) maintenance contributes to reducing vibration at source. Again, there might be incremental improvements if more stringent maintenance service standards were adopted. It is understood based on evidence previously provided by KiwiRail that it endeavours to undertake current maintenance best practice where practicable, and continues to invest in ongoing upgrades of its maintenance abilities. This includes the recent commissioning of a new wheel maintenance facility at its Hutt Workshops, which should contribute to improved wheel servicing and repair. In terms of track condition, KiwiRail has comprehensive procedures including measurement of track condition/geometry with a specialist survey vehicle several times a year, and maintenance systems acting on that data.

8.2. There are several different methods to treat railway track to reduce vibration. These include resilient clips fastening the rails to sleepers, resilient material under the sleepers or ballast, and

[8] Waka Kotahi, State highway guide to acoustic treatment of buildings, 2015

tracks directly or on ballast on concrete slabs, "floating" on resilient or spring vibration bearings. These vibration treatments are generally "built into" the overall track formation, particularly for the better performing options. Some treatments can increase the height of the track, having implications on clearances from bridges and overhead structures. As such, these measures are most commonly used for new tracks when the treatments can be integrated into and constructed as part of the overall design (e.g. on the Auckland City Rail Link). Retrofitting treatments over a wide area would require a major rebuilding of the tracks, beyond standard upgrading or maintenance.

Pathway

8.3. There are no standard pathway controls to reduce vibration. In some instances, depending on the dominant propagation route in the specific location, in-ground barriers can reduce vibration propagation. In addition to practical/space constraints (where the corridor is too narrow to construct an in-ground barrier), this is generally not something that could be applied broadly along a rail corridor as it would require analysis and design for specific locations.

8.4. Again, increasing the distance of the pathway reduces vibration levels: i.e. separating the receiver from the source by a greater distance.

Receiver

8.5. Depending on the specific propagation paths, use of different building foundation types (e.g. pile/pad) can result in reduced vibration entering a structure. Likewise, propagation through a structure will alter depending on its design (e.g. concrete/steel).

8.6. Buildings can be built on vibration bearings to reduce vibration from the foundations entering the building. (Some types of vibration bearing are similar to earthquake bearings.) Individual spaces within a building could be constructed as separate structures mounted on vibration isolators, but this is unlikely to be a practical solution in most cases compared to isolating the entire building.

9. Recommended land use controls

Form of controls

9.1. Extensive and widespread mitigation at source would generally only give relatively small incremental improvements and/or would require renewal/replacement of a substantial proportion of track and rolling stock. While (as set out at 7.2 above) there are programmes being undertaken by KiwiRail to renew its existing rolling stock, this confirms any improvements are likely to be incremental as fleets are gradually renewed. There are therefore unlikely to be practicable options for extensive mitigation at source to address sound and vibration effects on new and altered sensitive land uses seeking to establish near existing railways.

9.2. In terms of sound and vibration affecting people, the most robust control would be avoidance of effects by separating sensitive activities from railways. This could be achieved by defining an area around railways where new noise sensitive activities are not allowed. However, in addition to any non-acoustic impacts of such a control, if it contributed to larger and/or more dispersed urban areas then it might in itself cause increased transportation sound and vibration as the

overall population travels greater distances. The following recommendations are therefore made on the assumption that avoidance of effects by separation alone is not a practicable option.

9.3. If new and altered sensitive activities are allowed near railways, then to manage potential health effects, controls are needed to result in appropriate design of buildings or effective screening and separation of those buildings from the railway.

9.4. Several different methods have previously been used in RMA plans. Two common approaches are:

a) setting internal sound and vibration limits; or

b) specifying building constructions directly or in terms of sound reduction performance.

9.5. The first approach requires a site-by-site assessment and tailored mitigation for each development, whereas the second approach requires the same mitigation for all developments. The first requires specialist acoustics expertise whereas the second does not if specifying building constructions directly.

9.6. The potential health effects discussed above have been shown to occur (or be more likely) above certain sound and vibration threshold levels inside buildings. As discussed previously, there are a large number of variables that determine external railway sound and vibration exposure and there are nuances with building siting/layout and design that affect the internal levels. Controls that require the same mitigation for all developments result in excess treatment in many cases and inadequate treatment for those developments most exposed (nearest to the railway). Technically, setting internal sound and vibration criteria and requiring a site-by-site assessment should be the most efficient and effective approach.

9.7. In the Christchurch District Plan, multiple compliance options were included for mitigating road and rail noise in buildings for new sensitive activities. On review of the controls the Council found that in most cases site-specific assessment was selected by developers rather than fixed mitigation (i.e. following a standard building design schedule or fixed sound reduction performance).[9] This was presumably as despite any specialist assessment costs the site-specific assessment provided a more efficient solution.

9.8. It is recommended that any land use controls should be based on achieving internal sound and vibration criteria and allowing for requirements for each site to be determined through individual assessment.

Sound and vibration criteria

9.9. For the reasons discussed previously, the following criteria are recommended to manage potential health effects. A range of sensitive activities have been included in this table, extending from the primary issue of residential units.

9.10. For all these building types the vibration criterion relating to health effects is more stringent than any separate control that might relate to building damage. For other building types a

[9] Christchurch District Plan, Plan Change 5E

separate vibration criterion is included in the table, which could be used to avoid potential building damage.

Building type	Occupancy/activity	Sound criterion $L_{Aeq(1h)}$	Vibration criterion
Residential	sleeping spaces	35 dB	0.3 mm/s $v_{w,95}$
	all other habitable rooms	40 dB	
Visitor accommodation	sleeping spaces	35 dB	
	all other habitable rooms	40 dB	
Education	lecture rooms/theatres, music studios, assembly halls	35 dB	
	teaching areas, conference rooms, drama studios, sleeping areas	40 dB	
	libraries	45 dB	
Health	overnight medical care, wards	40 dB	
	clinics, consulting rooms, theatres, nurses' stations	45 dB	
Cultural	places of worship, marae	35 dB	
All	All occupancies/activities not specified above	-	5 mm/s ppv

9.11. As discussed in section 2, reasonable conditions should be achieved in outdoor living spaces if they are subject to a sound criterion of 55 dB $L_{Aeq(1h)}$.

9.12. The sound level criteria are based on intermittent rail activity. For the assumed rail activity discussed in sections 4 and 5, controls should specify that criteria are to be achieved for external railway sound of 70 $L_{Aeq(1h)}$ at a distance of 12 metres from the track, reducing at a rate of 3 dB per doubling of distance up to 40 metres and 6 dB per doubling of distance beyond 40 metres.

Extent of controls

9.13. Setting a distance for application of controls that includes most land affected by railway sound and vibration would extend for say 200 metres from railways, and would include a substantial area towards the periphery where on closer examination of specific developments no building treatments would be required. Previously, a distance of 100 metres has been used for the application of controls for railway sound. Technically this represents a reasonable compromise if the aim is to capture the most affected sites without requiring assessment where building treatment is less likely to be required. This aligns with the assumed sound levels applied for the rail volumes and one-hour average discussed at section 5 above.

9.14. For vibration, a distance of 60 metres has been used for controls previously. On the basis of the measurement data presented above, I have recommended this be increased to 100 metres consistent with the distance used for sound.

Ventilation

9.15. Where windows are required to be closed it is recommended that a mechanical system be required to provide thermal comfort so there is a genuine choice to leave windows closed. Ventilation is outside the expertise of Chiles Ltd, but on the basis of work published by Waka Kotahi[10,11] the following system specification for residential and visitor accommodation habitable rooms may be appropriate:

i. provides mechanical ventilation to satisfy clause G4 of the New Zealand Building Code; and

ii. is adjustable by the occupant to control the ventilation rate in increments up to a high air flow setting that provides at least 6 air changes per hour; and

iii. provides relief for equivalent volumes of spill air;

iv. provides cooling and heating that is controllable by the occupant and can maintain the inside temperature between 18°C and 25°C; and

v. does not generate more than 35 dB $L_{Aeq(30s)}$ when measured 1 metre away from any grille or diffuser.

Alternative compliance pathways

9.16. Existing controls in district plans based on internal sound and vibration criteria, often include alternative compliance pathways that can be used in some cases to demonstrate that appropriate sound and vibration conditions will be achieved, without requiring specialist assessment or only requiring a reduced assessment. Essentially, these pathways allow for sites and buildings that are likely to have lower sound exposure, or that adopt conservative building designs, to face reduced assessment requirements. Alternative pathways have included:

a) Compliance with internal sound criteria demonstrated by external levels not exceeding the internal criteria by more than 15 dB (reduced assessment needed for external levels).

b) Compliance with internal sound criteria demonstrated by the building being at least 50 m from the railway and screened by a solid barrier, from all points up to 3.8 m above the tracks.

c) Compliance with internal sound criteria demonstrated by using prescribed building constructions.

d) Compliance with internal vibration criterion demonstrated by use of prescribed building base isolation system.

9.17. Technically, the alternative pathways are valid as they result in compliance with the sound and vibration criteria, albeit generally not in the most efficient manner. As discussed above, in the case of the Christchurch District Plan alternative pathways provided were generally not used and were found to make the plan more confusing for users and harder to administer for the Council.

[10] Acoustic Engineering Services, NZTA Ventilation specification review, 30 June 2020
[11] Beca, Ventilation systems installed for road-traffic noise mitigation, 26 June 2014

Appendix 3: Economic Assessment

INSIGHT | ECONOMICS

Final Report: 16 August 2023

Economic Assessment of Options to Manage Adverse Rail Noise Effects

Prepared for: **KiwiRail Holdings Limited**

Authorship

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1. Executive Summary

Introduction

The rail network is an integral part of New Zealand's transport infrastructure and is estimated to generate nearly $2 billion of value annually (via reduced traffic). To ensure that it is free to grow and operate as needed, and to protect the health and amenity of people, KiwiRail promotes the inclusion of District Plan provisions that require new buildings and/or alterations to existing ones, for noise sensitive activities to mitigate the effects of rail noise. To assist decision-makers, this report assesses the likely high level economic costs and benefits of three options for managing such effects.

Options Analysed

The three options analysed are:

1. Do nothing – where the adverse effects of rail noise are not managed (Option A in the s32 report);

2. KiwiRail's proposed provisions – which apply within 100 metres of the rail network (Option G in the s32 report); and

3. No noise sensitive development within 100 metres of the rail network (Option E in the s32 report).

Option Costs and Benefits

The main costs and benefits of the options relate to:

1. Adverse health and amenity effects from prolonged exposure to rail noise.

2. Costs of changing building designs and/or locations to mitigate effects.

3. Policy implementation, administration, and compliance costs.

4. The opportunity cost of potentially foregoing noise sensitive development near the network.

5. Compromised rail operation and efficiency due to potential reverse sensitivity issues (complaints, changes in operating regime).

Worked Example

The likely costs and benefits of each option are area- and context-specific because they depend on a range of factors that are fluid through both time and space. To demonstrate how the approach can be applied in each territorial authority where Kiwirail's preferred provisions are sought, we derived a model that can be applied on a case-by-case-basis. It contains nearly 20 inputs and assumptions that can be populated with figures that match the circumstances of each district at that time to provide timely and reliable insights to the likely costs and benefits of the three options evaluated herein.

Table 1 below shows the various inputs and parameters in the model, which are populated here with a set of hypothetical values purely for illustration.

Table 1: Model Parameters for Assessing Option Costs and Benefits (Hypothetical Example)

Area of Land Affected & Likely Dwelling Yield	**Values**
Control Area (Buffer) start distance in metres from edge of rail network	10
Control Area (Buffer) end distance in metres from edge of rail network	100
Share of land within proposed buffer otherwise available for development	80%
Residential development density - dwellings/ha (gross)	10
Metres per kilometre	1,000
Square metres per hectare	10,000
Land Values for Noise Sensitive and Non-Sensitive Activities	**Values**
Value of land zoned for residential & other noise sensitive activities ($/m2)	$400
Value of land zoned for non-noise sensitive activities ($/m2)	$200
Health & Amenity Benefits	**Values**
Average dwelling price	$540,000
Mitigation Impact (dB of noise reduction)	5
Mitigation benefits (as a % of property value) per 1 dB improvement	1.20%
Policy Compliance Cost Parameters	**Values**
Average dwelling build cost	$300,000
Mitigation fixed costs per dwelling	$3,000
Mitigation variable cost (as a % of construction cost)	3%
Impacts on Rail Operation	**Values**
Annual value of rail to New Zealand (from Deloitte Study)	$1,900,000,000
Impact of new noise sensitive activities on value of rail (as a %)	2%
Total length of NZ railway track (km)	3,700
Financial Parameters	**Values**
Time Period of Analysis (years)	30
Discount Rate	10%

Finally, Table 2 shows the corresponding option costs and benefits for this specific example, where KiwiRail's proposed provisions generate the lowest net cost and hence are the preferred option.

Table 2: Estimated Net Costs/Benefits per Kilometre of Track (Hypothetical Example)

Costs/Benefits per km of Track	**Option 1**	**Option 2**	**Option 3**
Amenity & health benefits	-$4,665,600	$0	$0
Impacts on rail operation	-$97,000	$0	$0
Policy compliance costs	$0	-$1,728,000	$0
Housing market impacts	$0	$0	-$28,800,000
Option Net Benefits/Costs	**-$4,762,600**	**-$1,728,000**	**-$28,800,000**

2. Introduction

2.1 Context & Purpose of Report

KiwiRail is responsible for the development and operation of New Zealand's rail network. To ensure that the rail network is free to grow and operate as needed to meet ever-evolving needs, KiwiRail promotes the inclusion of District Plan provisions that require new buildings, and/or alterations to existing ones, for noise sensitive activities to mitigate the effects of rail noise. To assist, this high-level report assesses the likely key economic costs and benefits of three options for managing such effects, including KiwiRail's proposed provisions.

2.2 Steps in Assessment & Report Structure

Below are the key steps in our assessment and the sections of this report where each is addressed.

1. Understand the strategic context (section **3**)
2. Identify options to manage rail noise effects (section **4**)
3. Identify option effects and key stakeholders (section **5**)
4. Assess the impacts of each option on stakeholders (sections **6 to 9**)
5. Identify the best/preferred option (section **10**)

The rest of this report works through each step.

3. Strategic Context

3.1 About the New Zealand Freight Task

New Zealand, like all developed nations, is highly dependent on domestic and international trade. This trade creates a massive freight task, with approximately 280 million tonnes moved around NZ annually.[1] While rail plays a key role in the freight sector, particularly for certain goods like timber, dairy, and meat[2], most of the national freight task is performed by diesel trucks. These generate harmful emissions, including CO_2, and are therefore the target of a concerted effort to decarbonise the transport fleet. For example, the New Zealand freight and supply chain strategy seeks to move 20% more freight by 2035 while generating 25% lower emissions, including via modal shifts to rail.

3.2 Rail for Passengers

Rail is not just a freight mode, either, and also plays an increasingly important role in keeping people moving in and around our largest metropolitan areas, particularly Auckland and Wellington. As those cities continue to intensify with more people living in and around centres serviced by the rail network, the share of passenger journeys taken by rail will also naturally increase too. The potential for to reconnect large metropolitan centres through inter-regional passenger rail is also an increasing focus, building on pilot programmes like the Te Huia connection between Auckland and Hamilton.

3.3 The Future Role of Rail

In parallel, the New Zealand Government has recognised the need to maximise the value of its existing investments in the rail network, including making rail a more attractive mode for freight and expanding the passenger rail network. Previously, investment in the rail network lacked a long-term view about its role in the transport system. This caused short-term thinking and investment decision-making, so a new approach was needed.[3]

The New Zealand Rail Plan[4] was developed in 2021 to articulate the Government's vision and priorities for rail to 2030, and to identify the investment needed to achieve it. In June 2021, the Rail Network Investment Programme (RNIP) was created to fund various planks of the Rail Plan that will help renew the network, restore it to a resilient and reliable state, and support freight and passenger rail growth and productivity.[5]

3.4 The Value of Rail to New Zealand

The New Zealand rail network delivers significant value to its freight and passenger customers, and also generates significant benefits for all New Zealanders. These wider benefits are far-reaching, but the most significant are lower road congestion, fewer road accidents, and lower carbon emissions that result from less road traffic.

[1] https://www.transport.govt.nz/assets/Uploads/Freight-and-supply-chain-issues-paper-full-version.pdf
[2] https://www.kiwirail.co.nz/our-business/freight/
[3] https://www.transport.govt.nz/area-of-interest/infrastructure-and-investment/the-new-zealand-rail-plan/
[4] ibid
[5] ibid

In 2021, Ernst & Young were commissioned by the Ministry of Transport to evaluate the value of rail to New Zealand.[6] Their study built on an earlier analysis from 2016 and considered the benefits of (i) national freight rail, and (ii) passenger rail in Auckland and Wellington.[7] Two scenarios were modelled. The first assumed that all rail services were cancelled, with all rail freight and passengers shifted to the road network. The second scenario also assumed that all rail services were cancelled and shifted to the road network, but with 20% higher rail traffic to capture the impacts of projected future growth. For both scenarios, the value of rail equals the costs of road traffic avoided.

The table below summarises the study's estimates of rail's benefits for the first scenario, where rail volumes match today. In short, the value of rail is estimated to be $1.7 to $2.1 billion per annum.

Table 3: Estimated Annual Value of Rail to New Zealand

Benefit	**Low Estimate**	**High Estimate**
Time (congestion) savings	$939	$1,054
Reduced air pollution	$170	$474
- NOx emissions	$92	$394
- SOx emissions	**<$1**	<1
- Brake & tire (PM10)	$21	$22
- Exhaust (PM2.5)	$57	$58
Reduced fuel use	$211	$222
Reduced GHG emissions	$178	$182
Maintenance benefits	$104	$107
Safety	$94	$98
- Death	$63	$65
- Serious injuries	$25	$27
- Minor injuries	$5	$6
Totals	**$1,695**	**$2,137**

In the words of the Ernst & Young study, as demonstrated above, rail transportation provides the largest benefits to the road sector and society through:

- Time and congestion savings (49% - 55% of benefits)
- Reduced air pollution (10% - 22% of benefits)
- Reduced fuel use and maintenance costs (14% of benefits)
- Reduced greenhouse gas (GHG) emissions (9% to 10% of benefits).

The report also notes that the second scenario, where rail volumes are 20% higher, generates higher benefits than the scenario summarise above, but the difference is not linear with rail volumes. Specifically, the second scenario generates benefits that are about 10% higher than scenario one.

[6] Ernst & Young, the Value of Rail in New Zealand, 2021.

[7] i.e. it excluded inter-island ferries and long-distance passenger rail services, which are also operated by KiwiRail.

3.5 Need for Operational Freedom & Flexibility

To continue realising rail's substantial value to New Zealand, as per above, and to maximise its potential to limit growth in road traffic over time, the rail network must be available for operations 24/7 just like the road network. Reverse sensitivity from nearby sensitive receivers risks undermining that flexibility.

3.6 Summary and Conclusion

Rail is an important part of New Zealand's current transport mix. It provides significant value to New Zealand. It is necessary to protect that critical role to enable rail traffic to grow over time alongside population and economic growth. It is on this basis that KiwiRail seeks the inclusion of District Plan provisions which manage the risk to its operations and future growth that reverse sensitivity poses.

4. Policy Options

This section identifies three policy options to manage the adverse effects of rail noise. These were considered the most plausible/workable options from the long list shown in the appendix.

4.1 Option 1: Do Nothing (option A in the s32 report)

The first option is to "do nothing" with the adverse effects of rail noise not managed, either in the District Plan, or via other means. This forms the baseline (or counterfactual) against which the impacts of the other options are assessed.

4.2 Option 2: KiwiRail Proposed Provisions (option G in the s32 report)

The next option is KiwiRail's proposed provisions. These require new buildings for noise sensitive activities, or alterations to existing ones, within 100 metres of the railway network boundary to mitigate the effects of noise. Specifically, affected buildings must either:

(a) be designed, constructed and maintained to achieve indoor design noise levels resulting from the railway not exceeding the maximum values in the following table; or

Building Type	Occupancy or Activity	Max Railway Noise LAeq(1h)
Residential	Sleeping spaces	35 dB
	All other habitable rooms	40 dB
Visitor Accommodation	Sleeping spaces	35 dB
	All other habitable rooms	40 dB
Education Facility	Lecture rooms/theatres, music studios, assembly halls	35 dB
	Teaching & sleeping areas, conference rooms, drama studios	40 dB
	Libraries	45 dB
Health	Overnight medical care, wards	40 dB
	Clinics, consulting rooms, theatres, nurses' stations	45 dB
Cultural	Places of worship, marae	35 dB

(b) be located at least 50 metres from any railway network, and is designed so that a noise barrier completely blocks line-of-sight from all parts of doors and windows, to all points 3.8 metres above railway tracks, or

(c) it can be demonstrated by way of prediction or measurement that the noise at all exterior façades of the listed activity is no more than 15 dB above the relevant noise levels in Table 1 (above).

If windows must be closed to achieve the design noise levels in (a), mechanical ventilation must be designed, constructed, and maintained. Finally, a report must be submitted to the Council demonstrating compliance with the proposed provisions prior to the construction or alteration of any building containing a noise sensitive activity.

We note the assessment of the costs of Option 2 may also be helpful in assessing a scenario where KiwiRail adopts the funding of the various mitigation measures. This scenario is not assessed

separately below, but we note from an economics assessment, the feasibility of implementing these provisions drops rapidly should KiwiRail adopt both its internal (eg track maintenance and noise reduction costs) and the cost of implementing the provisions. Given the benefits of the provisions also attribute the benefits of the costs of implementation (via warmer, drier, and quieter homes that are also worth more) solely to the landowner, this further reduces the burden of the costs of those provisions sitting with the landowner, rather than KiwiRail.

4.3 Option 3: No Noise Sensitive Development within 100 Metres (option E in the s32 report)

The final option is to prevent new buildings for noise sensitive activities, or alterations to existing ones, occurring within 100 metres of the railway network to avoid adverse noise effects. For clarity, this option does not preclude activities that are not noise-sensitive (eg commercial, industrial or rural activities) from establishing there.

5. Option Impacts & Key Stakeholders

This section identifies likely option impacts and key stakeholders affected.

5.1 Option Costs

The main costs of the options are likely to be:

1. Adverse **health and amenity effects** from prolonged exposure to rail noise. These impacts will vary with several factors, including distance from the network, the design and orientation of buildings, the extent of outdoor activity, plus the health and resilience of affected people.

2. Costs of **changing building designs and/or locations** to mitigate effects. These costs result directly from the need to mitigate effects within the 100-metre buffer area (where deemed necessary by a suitably-qualified noise/acoustic expert).

3. Policy **implementation (ie construction), administration, and compliance** costs. While KiwiRail is seeking the inclusion of provisions only during District Plan review processes, rather than via its own plan change processes (which helps minimise implementation costs), the proposal will still have ongoing administration and compliance costs. These include costs borne by Councils as the administrators of District Plans, plus costs incurred by affected landowners, such as the engaging a noise/acoustic expert to assess the extent of mitigation required, if any.

4. Potential **impacts on housing supply**. If affected properties cannot mitigate the adverse effects of rail noise in a financially feasible manner, there may be a reduction in the quantity of new housing built. This, in turn, could affect the wider housing market and may affect the ability of some Councils to meet their obligations under the National Policy Statement on Urban Development 2020 (NPSUD).

5. **Compromised rail operation and efficiency** due to potential reverse sensitivity. Finally, for options that do not properly manage the adverse effects of rail noise on nearby noise sensitive activities, there may be potential risks to the ongoing operation and efficiency of the rail network.

5.2 Option Benefits

The main benefits of the options are likely to be:

- Improved **health and amenity effects** from properly managing exposure to rail noise. In many cases, these measures will also result in **warmer, drier, healthier homes** that are cheaper to run.

- For options that properly manage the adverse effects of noise, there will be **benefits from the ongoing, unconstrained operation of the rail network**. To the extent that rail can attract a larger share of the national freight task, as sought by several policy initiatives, all new Zealanders will benefit from **lower congestion, accidents, and harmful emissions**.

- Compared to options that effectively sterilise development (for noise sensitive activities) near the rail network, those that enable it will **allow affected land to be put to higher and better uses** than they likely would to otherwise.

- Finally, to the extent that options avoid investments that would otherwise be needed, there will be benefits in the form of **avoided costs saved**.

5.3 Key Stakeholder Groups

Our analysis considers the extent to which option costs and benefits affect the following key stakeholder groups:

- **Affected property owners** – this group will be directly affected in several ways. First, if they develop their land to accommodate noise sensitive activities near the railway line and no mitigation measures are adopted, future occupants may experience adverse effects from prolonged exposure to rail noise. Conversely, affected property owners may face provisions that either (i) limit their ability to develop their land for certain activities, and/or (ii) which impose additional costs to enable noise sensitive activities to establish there.

- **Rail network customers** – this group could be adversely affected if growth in noise sensitive activities near the rail network causes reverse sensitivity, which in turn reduces the frequency, reach, and/or availability of the rail services upon which they rely.

- **KiwiRail and the NZ Government** – As the rail network operator and funder, respectively, KiwiRail and the New Zealand Government will also be affected by the presence or absence of provisions to manage the adverse effects of rail noise. For example, if such effects are left unmanaged, these groups may be negatively impacted by potential constraints arising from reverse sensitivity, which would undermine the operation of – and investment in – the rail network.

- **Territorial authorities** – to the extent that provisions are included in District Plans, territorial authorities will bear the costs and responsibility of incorporating and administering them. While these costs are unlikely to be significant over and above those already associated with their day-to-day functions, they are still an important consideration.

- **NZ's people and its economy** – finally, we note that provisions to manage adverse rail noise, or the absence thereof, may have far reaching effects. For example, if such effects are not properly managed leading to reverse sensitivity that curtail rail operation or availability, any consequent increases in road freight traffic will have negative effects on all of New Zealand. In addition, New Zealanders will bear some of the costs of treating adverse health effects via the tax-funded public health system.

6. Health and Amenity Impacts

This section considers the health and amenity impacts of each option.

6.1 Option 1: Do Nothing[8]

Under this option, the District Plan does not contain provisions that manage the adverse health and amenity impacts of rail noise. Accordingly, it exposes proximate noise sensitive activities to potential adverse health and amenity effects from the rail network.

6.2 Option 2: KiwiRail Proposed Provisions[9]

By design, KiwiRail's proposed provisions directly manage the adverse effects of proximity to the rail network and therefore create ongoing benefits for affected landowners and their tenants (if any). In addition, this option will have wider benefits on the increased warmth, energy efficiency and dryness of homes due to the kinds of mitigation measures imposed (see further discussion re these benefits in the report of Dr Chiles).

However, the true impacts of this option on health and amenity depend fundamentally on the extent to which any proposed mitigation measures would be required anyway, for example to meet the New Zealand Building Code. As the code (likely) continues to strengthen over time, or as developers voluntarily include such measures anyway to keep pace with consumer preferences, the marginal benefits of complying with these provisions will decline. So too, however will the costs, which we return in section 8 below.

To the extent that KiwiRail's proposal does cause some buildings to install design features or elements that they would not have otherwise, there will be health and amenity benefits. First, and most foremost, the adverse effects of rail noise will be properly managed. While it is difficult to accurately quantify such benefits, a recent report for Christchurch City Council (CCC) estimated the health and amenity benefits of noise attenuation to be approximately 1.2% of property value per decibel of road noise reduction.[10]

We consider it unlikely that health and amenity effects accrue linearly with property value, as suggested by the CCC estimate. This would imply, for example, that a $1 million house receives double the benefits of a $500,000 one. Instead, there are likely to also be lump-sum (per-property) elements. That said, these estimates are the best currently available, so below we use them to show the potential benefits for different combinations of property values and noise level reductions.

Table 4: Health & Amenity Benefits by Property Value and Size of Noise Reduction in dB ($000s)

Property Value (000s)	Noise Reduction dB									
	1	2	3	4	5	6	7	8	9	10
$250	$3	$6	$9	$12	$15	$18	$21	$24	$27	$30
$500	$6	$12	$18	$24	$30	$36	$42	$48	$54	$60
$750	$9	$18	$27	$36	$45	$54	$63	$72	$81	$90

[8] Option A in the s32 report

[9] Option G in the s32 report

[10] Formative, Christchurch Plan Change 5E Noise Sensitive Activities Near Road and Rail Corridors, 30 September 2022.

$1,000	$12	$24	$36	$48	$60	$72	$84	$96	$108	$120
$1,250	$15	$30	$45	$60	$75	$90	$105	$120	$135	$150
$1,500	$18	$36	$54	$72	$90	$108	$126	$144	$162	$180
$1,750	$21	$42	$63	$84	$105	$126	$147	$168	$189	$210
$2,000	$24	$48	$72	$96	$120	$144	$168	$192	$216	$240

Table 4 shows that heath and amenity benefits could be substantial, especially if they accrue linearly with property value as assumed/modelled. For example, a 5dB reduction could translate to a $30,000 benefit for a $500,000 home, or $60,000 for a $1 million home.

In addition, measures adopted to comply with KiwiRail's proposed provisions, such as double glazing and/or mechanical ventilation, are likely to make homes warmer, healthier, and drier. For example, a 2022 interim report by EECA[11] found that 62% of families who were provided heat pumps reported being in very good or excellent health, compared to only 46% before installation. Further, EECA's final report from December 2022[12] noted that electricity use (through winter) falls in a house fitted with a heat pump by an estimated 16% relative to a house without a heat pump installed.

Thus, not only do heat pumps make homes warmer, drier, and healthier, but they also save on energy costs. Over time, these savings will add up and help offset the initial costs of purchase and installation.

6.3 Option 3: No Noise Sensitive Development within 100 Metres[13]

This option also (largely) avoids the adverse effects of rail noise but does not deliver the additional benefits resulting from building improvements associated with the KiwiRail proposal.

[11] Motu report for EECA, Warmer Kiwis Study: Interim Report: An impact evaluation of the Warmer Kiwi Homes programme

[12] Motu report for EECA, Warmer Kiwis Study: Final Report: An impact evaluation of the Warmer Kiwi Homes programme

[13] Option E in the s32 report

7. Impacts on Rail Uptake & Operation

This section considers impacts of each option on rail network uptake and operation.

7.1 Option 1: Do Nothing[14]

Because this option does not manage adverse rail noise effects, it can cause reverse sensitivity that gradually undermines the future uptake and operation of the rail network. This, in turn, would erode the value created by rail (as summarised above) and limit rail's ability to attract market share from the road freight sector. In addition, it can affect the ability of passenger rail services to shift people out of single occupancy vehicles during rush hour, which are a major contributor to congestion and delay on the road network as well as emissions.

Unfortunately, it is impossible to accurately assess the extent to which reverse sensitivity resulting from this option would disrupt the rail network and the consequential impacts on the economy. However, for the sake of illustration, we note that every 1% reduction in rail traffic caused by reverse sensitivity from new noise sensitive activities establishing nearby would cost the broader economy approximately $17 to $21 million per annum (based on the annual values shown in section 3.3 above).

7.2 Option 2: KiwiRail Proposed Provisions[15]

By design, KiwiRail's proposed provisions would directly manage the adverse effects of new noise sensitive activities establishing in proximity to the rail network which would help it become an increasingly credible alternative to road transport for freight and passenger movements. However, that said, we acknowledge that reverse sensitivity may still arise from existing proximate activities.

7.3 Option 3: No Noise Sensitive Development within 100 Metres[16]

This option also (largely) avoids the adverse effects of rail noise and therefore should result in the same outcomes for the rail network as KiwiRail's proposed provisions.

[14] Option A in the s32 report

[15] Option G in the s32 report

[16] Option E in the s32 report

8. Policy Administration/Compliance Costs

8.1 Option 1: Status Quo[17]

The status quo does not incur any administrative or compliance costs because it is (assumed to be) devoid of such provisions.

8.2 Option 2: KiwiRail Proposed Provisions[18]

KiwiRail's proposed provisions will have one-off costs to the Council of including them in the District Plan. However, because KiwiRail is proposing their introduction only during District Plan review or Plan Change processes, where changes to plans are occurring anyway, the marginal costs to Councils of including the proposed provisions is likely to be negligible. Further, while there will be ongoing costs from administering the provisions once operative, these are not expected to be material in the context of functions ordinarily carried out by Councils.

The greatest administrative and compliance costs associated with this option are those that fall on affected landowners. First, affected properties must commission a noise/acoustic expert to identify the need for, and optimal types of, mitigation to manage rail noise. We understand that these are likely to cost about a few thousand dollars.

Where buildings cannot be situated on a site or designed to locate sensitive activities away from the rail corridor, installing insulation, double glazing, mechanical ventilation, and other mitigation features will be the major cost felt by affected landowners. Again, unfortunately, it is difficult to provide reliable generalised estimates of these features because they are context-specific, and depend on the particular design choices of each landowner and their preferred use of their site. In addition, as noted earlier, the true cost of complying with these provisions will depend on the extent to which such measures would have been included in the building design anyway (either due to Building Code requirements and/or because the developer chose to adopt them).

Another complication is that the nature and cost of mitigation works will differ with several variables, including building height and distance from the rail network. For example, the following table from a recent report by Chiles Limited indicates the general relationship between distance from the rail network and the level of noise experienced.[19]

[17] Option A in the s32 report

[18] Option G in the s32 report

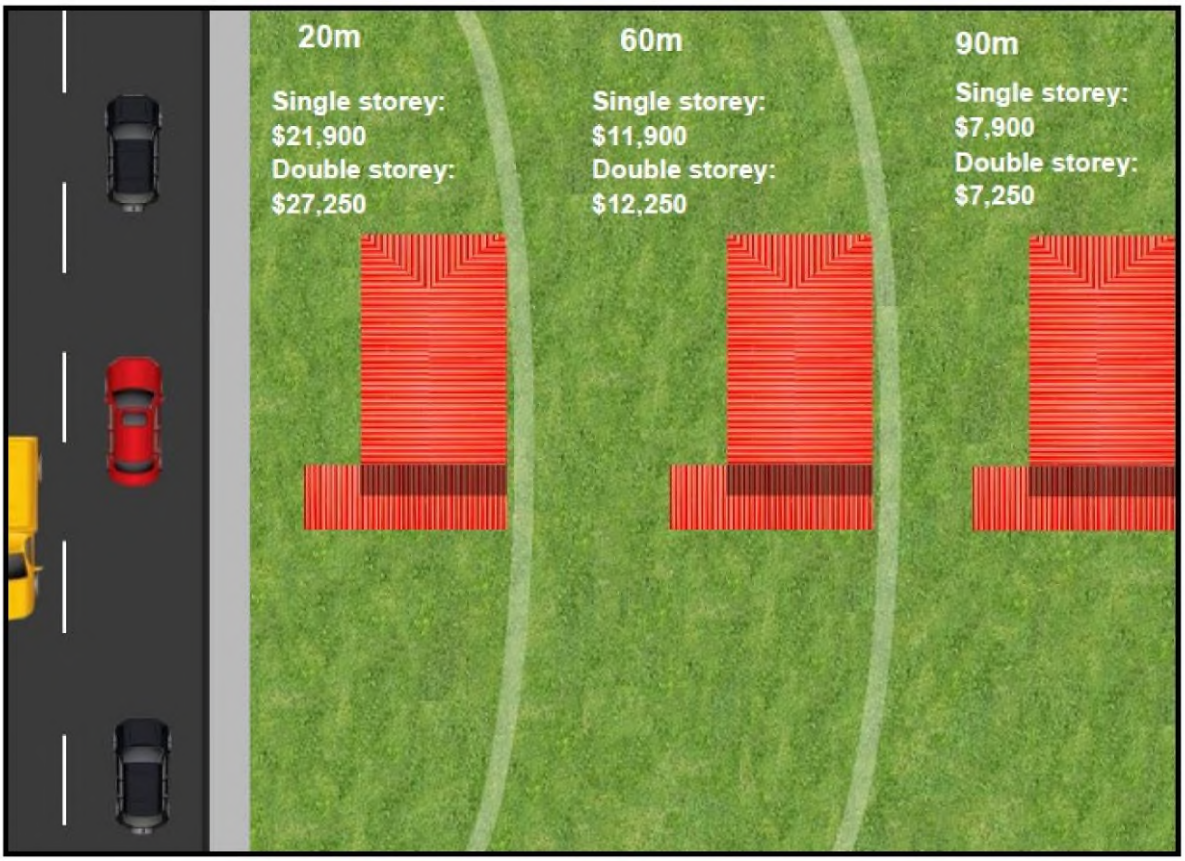
[19] Chiles Limited, Land use controls for railway sound and vibration, March 2023.

Table 5: Relationship Between Distance and Sound Levels

Distance from Track	Sound Level $L_{Aeq(1h)}$
10 metres	71 dB
20 metres	68 dB
30 metres	66 dB
40 metres	64 dB
50 metres	62 dB
60 metres	60 dB
70 metres	59 dB
80 metres	58 dB
90 metres	56 dB
100 metres	56 dB

To advance the analysis, and for the sake of illustration, we draw on work completed by Beca for Waka Kotahi in 2013[20], which estimated the cost of mitigating road noise for dwellings located at different distances from the state highway network. The excerpt below summarises their key findings.

Figure 1: Beca Estimate of Mitigation Costs by Distance from Road Network (2013 $)



A more recent estimate of likely costs was provided by AES for Christchurch City Council, which suggested that they may be about 1 to 2% of construction costs. Thus, the expense for a dwelling that costs $300,000 to build may be $3,000 to $4,000, while the cost for a $500,000 dwelling would be around $5,000 to $10,000. Again, however, we emphasise that the true cost of complying with the

[20] New Zealand Transport Agency Building Acoustic Mitigation Case Study, prepared for NZTA, 2013

provisions depends fundamentally on the extent to which any of the design features or building elements required would have been provided anyway.

It is also important to acknowledge that these costs will be offset by potential energy savings over time, as noted in the previous section. Plus, as set out in the table at 6.2 above, more importantly, they will likely be capitalised in the value of the property. Even setting aside that direct research, houses with double glazing and/or heat pumps are generally worth more than those without. Thus, while this option imposes upfront costs on homeowners, these will not be lost and instead could be better described as investments in the quality and future marketability of properties.

8.3 Option 3: No Noise Sensitive Development within 100 Metres[21]

This option is unlikely to impose any notable administrative or compliance costs.

[21] Option E in the s32 report

9. Housing Market Impacts

9.1 Option 1: Status Quo[22]

The status quo will not affect the quantity of housing supplied in each district.

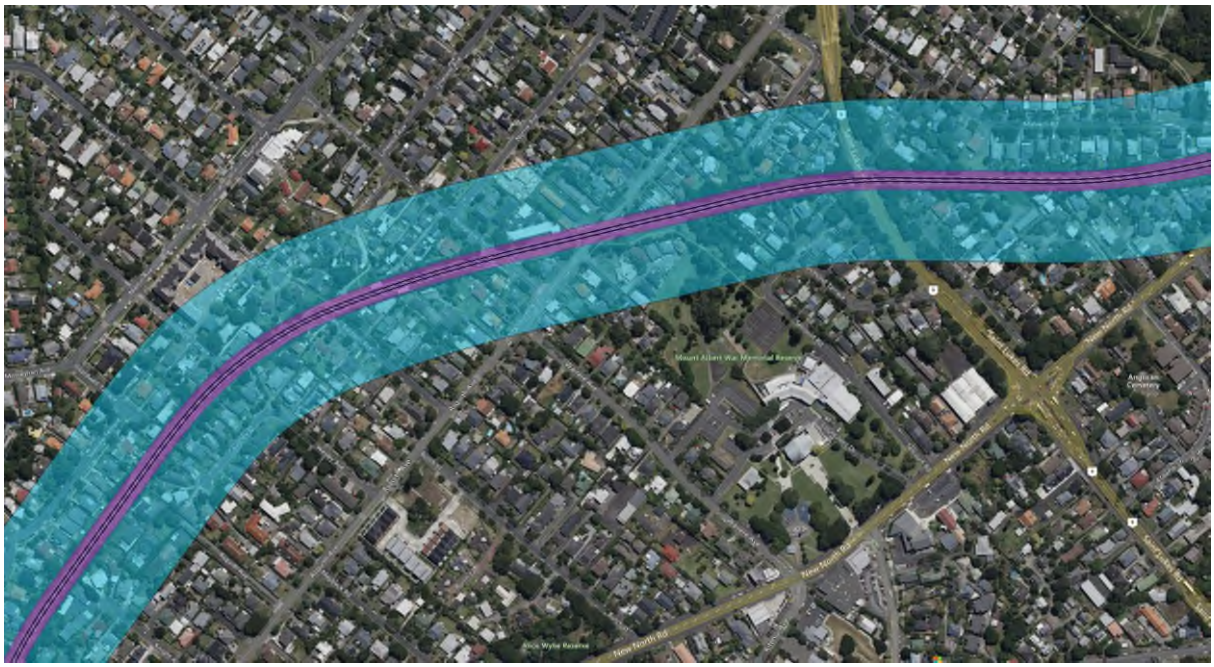
9.2 Option 2: KiwiRail Proposed Provisions[23]

KiwiRail's proposed provisions may have small impacts on housing supply at the margin if the costs of mitigation are considered prohibitively expensive. However, this seems unlikely given the quantum of costs estimated by AES for Christchurch City Council, as per the previous section.

9.3 Option 3: No Noise Sensitive Development within 100 Metres[24]

This option will have the greatest impacts on housing supply because it sterilises the use of land for noise sensitive activities within 100 metres of the rail network. To broadly quantify this impact, we used GIS to inspect the proximity of existing noise sensitive activities to the rail network in built-up areas, particularly Auckland. To that end, the figure below draws 10 and 100 metre buffers around the rail network in pink, and blue, respectively, to investigate how close existing homes are to the tracks.

Figure 2: Proximity of Noise Sensitive Activities to the Rail Network in Mt Albert, Auckland



This map shows there is very little development within 10 metres of the network, although the edges of some buildings are close. Conversely, there are large swathes of development within the 100-metre

[22] Option A in the s32 report

[23] Option G in the s32 report

[24] Option E in the s32 report

buffer. Accordingly, per kilometre of track, this option may prohibit noise sensitive development that would have otherwise likely occurred on approximately 180,000m^2 (or 18 hectares) of land.[25]

The cost of this prohibition will depend on several factors, including the zoning of affected land, the extent to which it is already developed or not, the presence or absence of other binding constraints on development, the underlying value of land, and the scope for accommodating non-noise sensitive activities instead.

Below, we estimate the value of land foregone for noise sensitive development per kilometre of track based on (i) the proportion of land that is developable for any purpose, and (ii) the incremental value of developing land for noise sensitive activities vs other activities. Table 5 presents the results.

Table 6: Value of Land Foregone for Noise Sensitive Activities by 100-Metre Setback per Kilometre of Track ($ millions)

Developable Land %	Incremental Value of Using Land for Noise Sensitive Activities per m^2							
	$50	**$100**	**$150**	**$200**	**$250**	**$300**	**$350**	**$400**
0%	$0	$0	$0	$0	$0	$0	$0	$0
10%	$1	$2	$3	$4	$5	$5	$6	$7
20%	$2	$4	$5	$7	$9	$11	$13	$14
30%	$3	$5	$8	$11	$14	$16	$19	$22
40%	$4	$7	$11	$14	$18	$22	$25	$29
50%	$5	$9	$14	$18	$23	$27	$32	$36
60%	$5	$11	$16	$22	$27	$32	$38	$43
70%	$6	$13	$19	$25	$32	$38	$44	$50
80%	$7	$14	$22	$29	$36	$43	$50	$58
90%	$8	$16	$24	$32	$41	$49	$57	$65
100%	$9	$18	$27	$36	$45	$54	$63	$72

To summarise: the opportunity cost of precluding noise sensitive development within the 100-metre buffer depends critically on the proportion of such land that is developable in the first place, and the difference in land value between noise sensitive activities and all others.

For example, suppose that the current value of residential land is $200 per square metre but (say) $100 for industrial, and that 50% of land within the buffer is available for some form of development. According to the table above, the cost per kilometre of track is $9 million.[26]

In more extreme cases, say where residential land values are $300 higher than industrial and the full buffer area is available for development, the opportunity cost per kilometre is $54 million.

[25] This equals one kilometre of track (1,000 metres) multiplied by 90 metres of developable land between the 10- and 100-meter buffers, which is then multiplied by two because the buffer extends in both directions on both sides of the tracks.

[26] This can be found by subtracting the value of land for industrial from the value for residential (which is $100 per m^2) and scanning down that column to the row labelled as 50% developable.

10. Calculating Option Net Benefits

10.1 Introduction

The likely costs and benefits of each option are area- and context-specific because they depend on a range of factors that are fluid through both time and space. To demonstrate how the approach can be applied in each territorial authority where Kiwirail's preferred provisions are sought, we derived a model that can be applied on a case-by-case-basis. It contains nearly 20 inputs and assumptions that can be populated with figures that match the circumstances of each district at that time to provide timely and reliable insights to the likely costs and benefits of the three options evaluated herein.

10.2 Worked (Hypothetical) Example

Table 7below shows the various inputs and parameters in the model, which are populated here with a set of hypothetical values purely for illustration.

Table 7: Model Parameters for Assessing Option Costs and Benefits (Hypothetical Example)

Area of Land Affected & Likely Dwelling Yield	**Values**
Control Area (Buffer) start distance in metres from edge of rail network	10
Control Area (Buffer) end distance in metres from edge of rail network	100
Share of land within proposed buffer otherwise available for development	80%
Residential development density - dwellings/ha (gross)	10
Metres per kilometre	1,000
Square metres per hectare	10,000
Land Values for Noise Sensitive and Non-Sensitive Activities	**Values**
Value of land zoned for residential & other noise sensitive activities ($/m2)	$400
Value of land zoned for non-noise sensitive activities ($/m2)	$200
Health & Amenity Benefits	**Values**
Average dwelling price	$540,000
Mitigation Impact (dB of noise reduction)	5
Mitigation benefits (as a % of property value) per 1 dB improvement	1.20%
Policy Compliance Cost Parameters	**Values**
Average dwelling build cost	$300,000
Mitigation fixed costs per dwelling	$3,000
Mitigation variable cost (as a % of construction cost)	3%
Impacts on Rail Operation	**Values**
Annual value of rail to New Zealand (from Deloitte Study)	$1,900,000,000
Impact of new noise sensitive activities on value of rail (as a %)	2%
Total length of NZ railway track (km)	3,700
Financial Parameters	**Values**
Time Period of Analysis (years)	30
Discount Rate	10%

Finally, Table 2 Table 8shows the corresponding option costs and benefits for this specific example, where KiwiRail's proposed provisions generate the lowest net cost and hence are the preferred option.

Table 8: Estimated Net Costs/Benefits per Kilometre of Track (Hypothetical Example)

Costs/Benefits per km of Track	**Option 1**	**Option 2**	**Option 3**
Amenity & health benefits	-$4,665,600	$0	$0
Impacts on rail operation	-$97,000	$0	$0
Policy compliance costs	$0	-$1,728,000	$0
Housing market impacts	$0	$0	-$28,800,000
Option Net Benefits/Costs	**-$4,762,600**	**-$1,728,000**	**-$28,800,000**

11. Appendix: Long List of Options

Below is the long list of options from which the three analysed in this report were drawn.

Option A - Do nothing:
No or limited railway noise and vibration provisions in the District Plan. This may include no specific noise and vibration rules, standards or mapping overlays, but may include consideration of reverse sensitivity effects when assessing the adverse effects of any resource consent application, depending on the existing objectives, policies and rules in the District Plan. This includes subdivision, use or development within the vicinity of the railway corridor if the District Plan provides sufficient direction to do so.

Option B – Rail operator reduces noise and vibration emissions:
The rail operator ensure that noise and vibration emissions are reduced to the extent that Activities Sensitive to Noise within 100m of the rail corridor achieve the recommended noise and vibration levels without needing to undertake any specific insulation, ventilation or construction design standards.

Option C - Noise barriers:
Acoustic walls or bunds installed by the applicant or the rail operator with no other noise or vibration management methods.

Option D - Construction design standards:
A table which specifies minimum construction materials and standards necessary to achieve internal acoustic levels within buildings, with no other noise or vibration management methods.

Option E - Setbacks:
Requiring Activities Sensitive to Noise to be set back 100m from the railway corridor with no other noise or vibration management methods.

Option F - Internal acoustic standards:
Require internal acoustic and ventilation rules and standards for noise-sensitive activities, but provide no other options to achieve compliance.

Option G – Combination of rules and standards (Proposed provisions):
Within 100m of the railway corridor, provide several options to achieve compliance with internal acoustic levels – within 50m of the rail corridor buildings are designed to meet specified Internal noise levels, or must meet a 50m setback, or where the noise at exterior façades is measured or predicted to be no more than 15 dB above the relevant noise level. Buildings must also meet mechanical ventilation standards and reporting standards. Includes an advice note to alert plan users that Activities Sensitive to Noise within the Rail Noise Control and Vibration Alert Area may be subject to vibration effects.

Option H – Proposed provisions funded by rail operator:
Within 100m of the railway corridor, via a mapped Rail Noise Control and Vibration Alert Area,

the same options to achieve compliance would be available - buildings are designed to meet specified Internal noise levels, or must meet a 50m setback, or noise at exterior façades is no more than 15 dB higher. Buildings must also meet mechanical ventilation standards and reporting standards, and there is an advice note regarding vibration effects. However, the difference is that KiwiRail would fund the achievement of these standards.

Option I - Landscaping:
Landscape planting to provide acoustic mitigation, with no other noise or vibration management methods.

Option J - National regulation:
This may include changes to the Building Act or Building Code or introduction of a National Planning Standard or National Environmental Standard. The Building Act and Code currently provides specifications to manage inter-tenancy noise (eg noise between residential apartments within the same building with shared tenancy walls). However, it does not require the management of internal noise where noise is generated from outside a building (e.g. rail noise from an adjacent rail corridor).

Option K Reverse sensitivity covenant:
A plan provision which requires a covenant whereby property owners agree not to complain about noise and vibration effects on sensitive land uses. This is often referred to as a 'no complaints' covenant.

RELEVANT NAMES AND ADDRESSES OF PERSONS TO BE SERVED

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