

## 2.43 – Land transport noise - section 32 evaluation for the Proposed Auckland Unitary Plan

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## 1 Overview and Purpose

This evaluation should be read in conjunction with Part 1 in order to understand the context and approach for the evaluation and consultation undertaken in the development of the Proposed Auckland Unitary Plan (the Unitary Plan).

### 1.1 Subject Matter of this Section

The subject matter of this report is the High Land Transport Noise Overlay which aims to identify and protect noise sensitive land uses which are likely to be subject to high levels of land transport noise. These high noise levels are likely to affect people's ability to sleep, to enjoy their accommodation or learn in a class room.

The overlay is applied 40m on both sides of the boundary of roads and rail corridors that have, or are likely to have over the next 10 years, traffic volumes of more than 20,000 vehicles per day or in the case of rail corridors more than 12 day time or six night time train movements. *Note the 40 metres is measured from the legal boundary of the road and from the boundary of the rail designation.*

In built up areas of the region, the background noise environment (the noise environment in the absence of specific activities) is most often dominated by traffic noise. Generally the higher the traffic volumes nearby, the higher the background noise level. Conversely in areas of low traffic levels the background noise level can be quiet low, but there may be other naturally occurring noise that appear relatively noisy, e.g. waves breaking, the noise from high winds, cicadas, farm animals etc. Generally speaking the community will tolerate noise levels that might be twice as loud (i.e. 10dB higher) as the background noise level except if those noise levels will adversely affect sleep (e.g. high noise levels between 10pm to 7am) or are completely out of character with the area, such as a noisy party or commercial activity in a residential area.

People are likely to tolerate higher noise levels when they are at work than when at home. There is a limit to this however, and research indicates that an outdoor level of 55dBA is the threshold level at which significant annoyance of the community begins when they are in their homes. These levels of noise are likely to occur next to busy roads, motorways and rail lines because of the noise of motor vehicles and trains, but would not be expect to be found in residential or rural areas where traffic volumes are low or in the absence of rail lines.

The sections of State Highway 1 that are nearest the CBD are the noisiest in the Auckland region with 120-135,000 vehicles per day and ambient noise levels of 54-74dB  $L_{Aeq(24hrs)}$  at the façade of the most exposed buildings. In comparison, State Highway 20 between Hillsborough Road and Dominion Road is expected to carry 60,000 vehicles per day (vpd) and produce ambient noise levels of 52-69db  $L_{Aeq(24 hrs)}$ .

The New Zealand Transport Agency (NZTA formerly Transit NZ) is responsible for the planning, management and operation of the state highway network. The 2008 Transit New Zealand Environmental Plan (environmental plan) and previous Transit documents recognise that outdoor noise levels above 65dB  $L_{Aeq(24 hr)}$  are unacceptable. Section 2.1 of the environmental plan notes that if noise levels are above this threshold a noise improvement programme is available to fund retrofitting of road noise mitigation. The fund for this is limited however.

### 1.2 Resource Management Issue to be Addressed

The World Health Organisation (WHO) guidelines for community noise (Berglund et al 1999) recommend that levels of 30-35  $L_{Aeq}$  are required in bedrooms to protect sleep disturbance and 35-40  $L_{Aeq}$  in other habitable spaces to protect indoor amenity. The bedrooms/sleeping areas and other habitable room of residential uses and other noise sensitive activities in close proximity to high use roads and rail lines are likely to be exposed to higher levels than

those recommended in the WHO guidelines if no measures are undertaken to reduce exposure to these high levels of noise. Most of the legacy district plans do not provide methods to reduce the exposure of noise sensitive activities to high levels of road or rail noise in a comprehensive manner.

### **1.3 Significance of this Subject**

This is a significant subject because it seeks to introduce a new requirement for noise sensitive activities to protect themselves from high levels of road or rail noise. The rules will impose costs on new or altered noise sensitive activities near noisy roads and rail lines, but will also bring benefits to the users of those noise sensitive activities and to road or rail providers. The cost of this requirement will vary depending on the level of noise that a particular noise sensitive activity is exposed to and the types of noise reduction methods that will be needed to achieve suitable internal noise levels to protect sleep and indoor amenity. The provisions will also ensure that high levels of land transport noise do not adversely affect teaching in poorly designed classrooms. The scale of the effect of this requirement is difficult to determine because the overlay will apply to many existing residential uses which will not be affected by these rules unless new habitable rooms are constructed. In many areas existing natural barriers or other buildings may remove or lessen the cost of noise mitigation.

Section 1.6 below outlines some of the health costs of high levels of noise and section 3 outlines the construction costs of mitigating high levels of noise. The proposed rules are of significance to road and rail providers because they should decrease the risk of reverse sensitivity.

### **1.4 Auckland Plan**

The proposed provisions are consistent with the following directives from the Auckland Plan:

- Improve the health of all Aucklanders' (Ch 1, Directive 1.7)
- Improve the quality of existing and new housing and require new housing to be sited and designed to meet best practice urban design and sustainable housing principles (Ch 11, priority 3, directive 11.4)
- Integrate transport planning and investment with land use planning (Ch 13, Priority 2)

### **1.5 Current Objectives, Policies, Rules and Methods**

There are inconsistencies and anomalies in the existing (legacy) district plans when they are compared to each other. A few of the legacy plans do not have any provisions requiring residential uses near busy roads to protect themselves from the noise arising, whilst other plans only require it in certain parts of their area. The standards of protection also vary and, in some places, are applied based on road classification. In some areas the land transport noise levels could be relatively low despite the classification of the road. With the exception of Waitakere none of the legacy plans provide standard to protect noise sensitive uses near rail corridors. Maintaining the existing approaches misses an opportunity to develop a more consistent and rationalised set of policies and rules.

Section 2.4.5 (Issues) of the Auckland Council Regional Policy Statement 1999 also notes that:

*Regionally significant physical resources, including infrastructure, are essential for the community's social and economic well-being. The location, development and redevelopment of infrastructure is of strategic importance in its effects on the form and growth of the region. However, the long-term viability of regionally significant infrastructure and physical resources can be compromised by the adverse effects, including cumulative effects, of other activities. These regionally significant resources can equally give rise to adverse effects, including cumulative effects on the*

*environment, and on communities. They can be adversely affected by conflicts if sensitive uses are allowed to develop near them or if they are inappropriately located.*

Section 2.6.1 (Strategic Objectives) of the Auckland Council Regional Policy Statement 1999 (RPS 1999) has two relevant objectives:

*16. To improve the overall health, well being and quality of life of the people of the Region*

*17. To enable the redevelopment, operation and maintenance of existing and provision of new regionally significant infrastructure*

Section 4.2.2 (Transport Issues) of the RPS 1999 notes that:

*The transport system has adverse effects on the environment*

Section 4.3 (Transport objectives) has an objective:

*To avoid, remedy, or mitigate the adverse effects of transport on the environment and, in particular:*

*(iii) to avoid, remedy, or mitigate the adverse effects of the transport system on community well-being and amenity.*

As can be noted from the review of the legacy district plan controls in Appendix 3.43.1 there is some protection of existing roads across the region but these control are inconsistent and not necessarily effects based. It appears that the Waitakere District Plan is the only legacy district plan to protect existing rail corridors from possible reverse sensitivity problems.

## **1.6 Information and Analysis**

The World Health Organisation (WHO) guidelines for community noise (Berglund et al 1999) recommend that levels of 30-35  $L_{Aeq}$  are required in bedrooms to protect sleep disturbance and 35-40  $L_{Aeq}$  in other habitable spaces to protect indoor amenity. The joint Australian and New Zealand Standard AS/NZS 2107:2000 : Acoustics – ‘Recommended design sound levels and reverberations times for building interiors’ recommends design criteria for the conditions affecting the acoustic environment within occupied spaces. The standard recommends that levels of 30 (satisfactory) to 40 dB  $L_{Aeq}$  (maximum) are required in sleeping areas and 35-45dB  $L_{Aeq}$  in living areas near major roads to protect indoor amenity. It also recommends levels of 30-45dB in teaching spaces. The New Zealand Standard NZS 6806:2010 ‘Acoustics –Road traffic noise – new and altered roads’ recommends an internal level of 40dB  $L_{Aeq(24h)}$  in habitable spaces affected by road traffic noise.

WHO guidelines also suggest that to avoid sleep disturbance, indoor guideline values for bedrooms are 30db  $L_{Aeq}$  for continuous noise and 45dB  $L_{Amax}$  for single sound events, particularly when the background noise is low. Hence at night-time, WHO recommends that outside sound levels about 1 metre from facades of living spaces should not exceed 45 dB  $L_{Aeq}$ , so that people may sleep with bedroom windows open. This value was obtained by assuming that the noise reduction from outside to inside with the window partially open is 15 dB. More recent WHO guidelines developed for Europe recommends a value of 40dB  $L_{night outside}$  which is the value of noise exposure averaged over a year.

Other research (Huybregts and Marks) suggests that sleep is disturbed by 10-15 events per night at a maximum level of 50-55dB  $L_{Amax}$  indoors. As most homes provide approximately 25 decibels of sound attenuation with windows shut, an external noise level of 75-85dB  $L_{Amax}$  is suggested. Many countries specify a maximum limit of 80dB  $L_{Amax}$ , while some parts of Australia recommend a limit of 85dB  $L_{Amax}$ . Note that these levels are higher than the WHO recommendations but are for short duration noise events. In New Zealand 75dB  $L_{Amax}$  is

typically used to control loud noise of short duration at night time. Motor vehicles typically produce noise between 80 and 95dBA  $L_{Amax}$  when measured 10m from a vehicle accelerating from 50km/h.

Research in the United Kingdom (published in 2009) by the Department for Environment, Food and Rural Affairs into the links between noise and health found that several key findings emerged:

- Strong empirical evidence was identified linking noise to acute myocardial infarction (AMI) (heart attacks) and other cardiovascular illnesses
- Some evidence was found between noise and other health effects, including annoyance, mental health, hypertension (high blood pressure), sleep disturbance, cognitive development in children and hearing impairment. However, evidence around the monetary valuation of these impacts found in these studies was not judged to be sufficiently robust to be directly used to monetise noise impacts
- The review has also highlighted a number of non-health impacts that may arise from noise. For example, sleep disturbance/loss caused by excessive noise may have negative impacts on both productivity and amenity.

### **1.7 Consultation Undertaken**

The proposed overlay has been discussed in several meetings with KiwiRail, NZTA and Auckland Transport in late 2011 and 2012 and with the Unitary Plan Political Working Party prior to the release of the March 2013 consultation draft. The Ministry of Education was also advised of the proposed changes before the March draft was released. Feedback from these organisations and other submitters to the March 2013 draft was considered in refining the objectives, policies and rules for the overlay.

### **1.8 Decision-Making**

The consideration of these provisions began in early 2011 with a review of the issues associated with noise and vibration arising from land transport activities. This included a review of overseas research and of New Zealand and overseas standards that are used to control or reduce external sound. This including the Government of South Australia's draft Minister's Specification SA8 'Construction requirements for the control of external sound' and proposed draft amendments to Clause G6 of the New Zealand Building Code. The review included recent decisions on the mitigation of noise and vibration for new roads and rail lines, a review of existing district plan provisions and a review of NZTA publications. Discussions occurred with a number of noise consultants and with internal noise control staff. The issues were discussed with KiwiRail, NZTA and Auckland Transport at several meetings in late 2011 and during 2012. The Ministry of Education was also advised of the proposed changes.

The issue of protecting noise sensitive activities from high levels of transport noise was considered by the Unitary Plan Political Working Party on 31 October 2012. The Working Party resolved that new or altered indoor areas of sensitive activities near high noise routes should be protected from high levels of noise but the protection of outdoor areas was not supported. The Working Party did not support the proposal of prohibiting outdoor living areas within 10m of a rail corridor or a road with more than 50,000 vehicles per day.

### **1.9 Proposed Provisions**

It is proposed that new noise-sensitive land uses within these areas will have to protect themselves from high transport noise levels. Noise sensitive land uses are proposed to be defined as activities sensitive to high levels of noise and include:

- dwellings
- visitor accommodation
- boarding houses

- retirement villages
- supported residential care
- care centres
- classrooms in education facilities
- hospital night wards.

These are very similar to the protected premises and facilities recommended in NZS 6806:2010 'Acoustics –Road traffic noise – new and altered roads'to be protected from road traffic noise when new roads are built or when roads are significantly altered.

Protection measures that might be used to protect noise sensitive land uses could include physical barriers, such as fences or earth bunds, locating noise-sensitive rooms away from the noise source, closing windows and using alternative ventilation options or, in very high noise areas using double glazing and/or wall insulation. Ventilation standards are included if windows or doors are to be shut to meet the internal noise standards.

The proposed High Land Transport Noise Overlay aims to identify land that is likely to be adversely affected by high levels of transport noise and the rules for the overlay will require new and altered noise sensitive land use activities in that overlay area to protect/insulate themselves against the transport noise if this is necessary to obtain suitable indoor noise environments conducive for sleeping and learning and normal indoor residential activities.

#### **1.10 Reference to other Evaluations**

This section 32 report should be read in conjunction with the following evaluations:

- 2.3 Residential zones
- 2.4 Business
- 2.6 Business building, form and design
- 2.8 Sustainable design
- 2.20 Conversion of dwellings
- 2.22 Future urban zone
- 2.23 Greenfield urban precinct
- 2.35 Rural subdivision
- 2.37 Schools
- 2.39 Traffic in centres and ITA
- 2.41 Strategic transport corridor
- 2.44 Air quality buffers – major roads
- 2.46 City centre precincts

## 2 Objectives, Policies and Rules

### 2.1 Objectives

The following proposed objectives are relevant to the topic:

#### Under Chapter C, 1.1 –Infrastructure:

5. Auckland's significant infrastructure is protected from reverse sensitivity effects and incompatible subdivision, use and development .development.

#### Under Chapter D, 7 - Strategic Transport Corridor:

4. Potential reverse sensitivity adverse effects are managed where non-transport related activities are established on adjoining residential zoned land.

#### Under Chapter E, 1.5 - Infrastructure, High Land Transport Noise:

1. Strategic land transport infrastructure is protected from reverse sensitivity effects associated with surrounding noise sensitive land uses.
2. New and altered noise-sensitive land uses, such as places where sleep or teaching normally occurs, are protected from:
  - a. high levels of land transport noise
  - b. unreasonable or excessive levels of noise arising from the operation and maintenance of strategic land transport infrastructure.

These objectives are consistent with S.31 which includes in the functions of territorial authorities the control of the emission of noise and the mitigation of the effects of noise.

### **Appropriateness**

#### **Relevance**

##### Relevance – Addressing the key Unitary Plan issues

The objectives address the following issues identified in Chapter B of the Unitary Plan which contains the Regional Policy Statement:

- 2: Enabling quality urban growth
- 3: Enabling economic well being

##### Relevance - Achieving the purpose of the Resource Management Act

*Section 5 - 5(1) states that the purpose of the Act is:*

*'to promote the sustainable management of natural and physical resources'.*

The objectives are in accordance with this purpose. The transport system is a physical resource which needs to be sustainably managed and protected from reverse sensitivity issues which may arise if noise sensitive activities establish near noisy land transport infrastructure. In accordance with s.5(2), the objectives seeks to protect the transport system 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. The objectives also seek to avoid, remedy and mitigate any adverse effects of noise sensitive activities locating themselves in areas subject to high land transport noise. The objectives seek to sustain the potential of the transport system to meet the reasonably foreseeable needs of future generations.

*Section 6 - of the Act identifies the matters of national importance which need to be recognised and provided for in achieving the purpose of the Act. None of the s.6 matters are of specific relevance to the objectives.*

Section 7 - of the Act identifies 'other matters' which need to be given particular regard to in achieving the purpose of the Act. The matters of particular relevance to the objectives are:

- (aa) The ethic of stewardship
- (b) The efficient use and development of natural and physical resources
- (c) The maintenance and enhancement of amenity values
- (f) Maintenance and enhancement of the quality of the environment
- (g) Any finite characteristics of natural and physical resources

The overlay objectives seek to enhance indoor amenity values and to protect the physical resources and development of land transport infrastructure and the indoor amenity of noise sensitive land uses near that infrastructure.

Section 8 - requires the principles of the Treaty of Waitangi (Te Tiriti O Waitangi) to be taken into account in achieving the purpose of the Act. The objectives need to be considered in the context of the Unitary Plan as a whole. When viewed within that context, the objectives do not require amendment to reflect the principles of the Treaty of Waitangi (Te Tiriti O Waitangi).

Section 31 - includes in the functions of territorial authorities:

- (d) the control of the emission of noise and the mitigation of the effects of noise

The objectives seek to mitigate the effects of high levels of land transport noise.

### **Usefulness**

The objectives will be useful for assisting decision-making when assessing resources consents involving the alteration to, or building of, noise sensitive land uses near high noise land transport infrastructure.

### **Achievability**

The objectives are in accordance with the council's functions as a territorial authority under s31(1)(a) of the RMA i.e.:

*'The establishment, implementation, and review of objectives, policies and methods to achieve integrated management of the effects of the use, development, or protection of land and associated natural and physical resources of the district'*

The Unitary Plan will contribute to the achievement of these objectives by policies and rules which:

- Require noise sensitive land uses near high noise land transport infrastructure to meet suitable indoor amenity standards
- Avoid reverse sensitivity issues arising when new noise sensitive land uses establish near land transport infrastructure or when existing noise sensitive land uses are altered.

### **Reasonableness**

The proposed rules are considered to be reasonable because they only seek to require those buildings most adversely affected by road or rail noise to be protected from that noise. The rules will require homes, apartments, visitor facilities, retirement and care centres and other areas where sleeping is likely to occur to be protected from high levels of land transport noise so that sleep is not affected by this noise and pleasant indoor environments are provided. The provisions will also ensure that high levels of land transport noise do not adversely affect teaching in poorly designed classrooms.

The outcomes proposed are expected to have greater benefits than costs. The costs to achieve adequate noise insulation are estimated to be 1-8% of the total cost of construction



for a new building, depending on the method and the amount of noise reduction/insulation required and whether or not mechanical ventilation or air conditioning will be required to meet the proposed internal noise levels. Ventilation or air conditioning may be required if windows and/or doors have to be shut to meet the proposed indoor noise level standards. The costs to adequately protect new habitable rooms of an existing building are harder to determine but are thought to be in the same order as a new building. The costs will depend on the simplicity of the noise reduction method/s and how difficult it will be to retrofit a ventilation or air conditioning system if this is required.

### **2.1.1 Policies**

The following policies are relevant to the objectives proposed above:

Under Chapter B, 3.3 - Transport which includes the following policy:

3. Require noise sensitive activities to be located or designed to avoid, remedy or mitigate potential adverse effects arising from the use and operation of strategic transport infrastructure.

Under Chapter C, 1.1 - Infrastructure which includes the following policy:

2. Prevent reverse sensitivity effects from inappropriate subdivision, use and development which may compromise the operation, and capacity of existing or approved significant infrastructure.

Under Chapter D, 7 - Strategic Transport Corridor which includes the following policy:

4. Provide for works and measures such as noise mitigation, landscaping and artworks that enhance existing infrastructure and minimise its adverse effects on adjoining development.

Chapter E, 1.5 - Infrastructure, High land transport noise which includes the following policies:

1. Require new noise-sensitive land uses, and alterations to existing noise-sensitive land uses, to be designed and constructed so that occupants are not exposed to levels of transport noise above World Health Organisation guidelines, particularly in bedrooms and other noise-sensitive rooms.
2. Encourage transport agencies to maintain, manage and operate their existing transport infrastructure to minimise and where practicable, reduce the adverse effects of land transport noise on noise-sensitive activities.
3. Allow noise-sensitive activities near strategic land transport infrastructure only where they do not compromise or limit the existing or future operation of strategic land transport infrastructure

### **2.1.2 Rules and other methods**

The proposed provisions are summarised in 1.1 and 1.9 above. The efficiency and effectiveness of the proposed provisions are summarised in section 3 below.

The proposed rule applies to new or altered bedrooms, sleeping areas and other habitable rooms and classrooms in noise sensitive land uses (see section 1.9) that are located within the high land transport noise overlay. The overlay applies to a distance of 40 metres from the legal boundary of a road with or predicted to have over a 10 year period more than 20,000 vehicles per day or from the boundary of rail corridor designation that has (or is predicted to have over a 10 year period) more than 6 night time or 12 day time train movements. Whilst there is no exact science to the width of a corridor because so many variables can affect noise exposure over distance, a distance of 40 metres was chosen for the extent of the high land transport noise overlay because in most urban areas noise sensitive activities further away from this are likely to be protected by existing buildings and structures (within the 40 metre area) that will shield these buildings and reduce the level of exposure to road or rail

noise. In rural areas with large minimum lot sizes there will be more freedom for noise sensitive rooms of buildings to be located in positions away from the road or rail corridors, reducing the noise to those rooms. The traffic volumes and hence noise levels in rural areas are also likely to be a lot less than those on motorways in the centre of Auckland where traffic volumes may be 60-140,000 vehicles per day and noise levels are likely to be 55-72dB  $L_{Aeq(24hrs)}$  at the façade of the most exposed buildings.

The rules require a 1 hour measurement of the existing noise environment at peak traffic times and the addition of 1 or 2 decibels for traffic growth on the road or rail line to determine the noise reduction needed to meet maximum internal noise levels 35dB  $L_{Aeq(1\ hour)}$  in bedrooms and in sleeping areas and 40dB  $L_{Aeq(1\ hour)}$  in other habitable rooms and classrooms. Adequate ventilation must be maintained if the doors or windows to those rooms have to be shut to meet these internal noise levels. Proposed standards for adequate ventilation are included.

The proposal rules should be effective in ensuring the noise environment in bedrooms and sleeping areas and in other habitable rooms of new or altered sensitive land uses protects sleep at any time and ensures reasonable levels of indoor amenity. The rules should also ensure that the noise levels found in new classrooms are suitable for teaching.

The efficiency of the proposed is difficult to determine as a whole as the costs and benefits of protecting each noise sensitive land use will vary depending on its location and the amount of noise attenuation that will be required. However, overall the benefits to sleep protection, indoor amenity and teaching are assumed to significantly outweigh the costs.

The following methods, which occur outside the Unitary Plan, also contribute to the achievement of these objectives:

NZS 6806:2010 'Acoustics –Road traffic noise – new and altered roads' recommends noise criteria to be applied to road traffic noise from new or altered roads when the noise is received at noise sensitive buildings (protected premises and facilities-PPFs). The New Zealand Transport Agency applies NZS 6806:2010 to its roading work. Auckland Transport has not reached a formal position on the use of this standard.

Protected premises and facilities include buildings used for residential activities including boarding establishments, homes for elderly persons, retirement villages, in house aged-care facilities, temporary accommodation such as hotels and motels, marae, night wards in hospitals, and teaching and sleeping areas in educational facilities.

The standard does not apply to existing roads or new and altered roads predicted to carry less than 2000vpd. A new road is any road which is to be constructed where no previously formed road existed. An altered road is an existing road that is subject to alterations of the horizontal (e.g. widening) or vertical alignment subject to certain thresholds. Noise mitigation is only required by the standard if the alteration will increase the noise at PPFs by 3dB or more – note that a doubling of the daily traffic volume will only increase the traffic noise by 3dB. An altered road does not include resurfacing, surface treatment or rehabilitation / maintenance.

The standard notes that the preferred approach to noise control is to implement structural mitigation measures within the road reserve or within areas adjacent to, or in close proximity to, the new or altered roads. The standard suggest that building modification measures should only be considered as a means of mitigating the noise effects of new or altered roads where it is not reasonable or feasible for structural mitigation measures to achieve the noise criteria. The standard includes noise mitigation and assessment examples for alterations to roads, new roads and special cases.

NZS 6806 therefore is not likely to apply to most existing roads where existing high traffic noise is an issue unless there are major alterations to the road that significantly affect the existing noise levels. The standard will however be of high benefit to existing homes when a new road is made by NZTA.

### **2.1.3 Costs and Benefits of Proposed Policies and Rules**

The costs and benefits of the proposed policies and rules are outlined in the consideration of the alternatives in section 3 of this report. The total cost of construction for a new or altered building to achieve the prescribed internal noise levels will depend on method of noise reduction that can be used, which will depend on the location and the height of the building, and the amount of noise reduction/insulation required and whether or not mechanical ventilation or air conditioning of the building or affected rooms will be required to meet the internal noise levels. In some circumstances a solid fence or wall may be all that is required to achieve the noise reduction required to meet the performance standards specified for habitable rooms and in classrooms in single story buildings. Additional costs will be required to have an acoustic specialist certify compliance with the development controls of the overlay.

The benefits of this option are difficult to monetise but will lead to enhanced indoor acoustic privacy/amenity for new or altered noise sensitive land uses so that sleep is not disturbed by land transport noise, and residents can enjoy their living and dining areas without noise significantly affecting their indoor amenity. The improvement in the indoor amenity in classrooms should also be of assistance to learning. The health risks associated with exposure to high levels of noise are also reduced if sleep disturbance is minimised.

The benefits may also be realised when the noise sensitive land use is sold. It is expected that well insulated noise sensitive land uses especially those that are located near public transport networks will sell at a higher price than poorly insulated noise sensitive land uses where sleep disturbance and a lower quality of amenity will have a negative impact on the value of the property.

### **2.1.4 Adequacy of Information and Risk of Not Acting**

It is considered that there is sufficient information on which to base the proposed policies and methods.

## **3 Alternatives**

The proposed preferred alternative (number 2) is discussed in 1.1 and 2.1.2 above. The other alternatives are to retrain the approaches of the legacy district plans (alternative 1) or to use education and publicity to encourage property owners to voluntarily insulate their buildings against high levels of land transport noise. The table below discusses each alternative compared to the proposed alternative

	<b>Alternative 1: Retain the approaches of the legacy district plans</b>	<b>Alternative 2 – preferred option Description</b> Apply standards for the noise levels to be achieved in bedrooms, sleeping areas, habitable rooms and classrooms for new or altered noise sensitive land uses within 40 metres of land transport infrastructure expected to produce high levels of noise [roads with (or predicted to have over a 10 year period) more than 20,000 vehicles per day or rail corridors that have (or predicted to have over a 10 year period) more than 6 night time or 12 day time train movements.]	<b>Alternative 3 Description</b> Using education and publicity to encourage property owners to voluntarily insulate their buildings against high levels of land transport noise.
<b>Appropriateness</b>	Some of the existing legacy provisions support the objectives in part but other legacy plans provisions do not support the proposed objectives of the Unitary Plan	The provisions are reasonable, achievable, and support the objectives to protect places where sleeping or teaching occurs and to protect the indoor amenity of residential uses from high levels of land transport noise. The provisions will also protect land transport infrastructure from reverse sensitivity effects associated with noise sensitive land uses locate near their infrastructure.	The provisions will do not adequately support the proposed objectives of the Unitary Plan because education/publicity may have limited effectiveness and there would be no statutory requirement to effectively protect the sleep and indoor amenity of people who wish to live or stay near noisy land transport infrastructure. Poorly protected residential uses will not mitigate the health effect costs arising from exposure to high levels of land transport noise.
<b>Effectiveness</b>	<p>Because of deficiencies in the existing provisions this proposal is not effective because it may adversely affect the operation and expansion of land transport infrastructure. It is also not effective in protecting the sleep and indoor amenity of many people who may live or stay near noisy land transport infrastructure. It also fails to protect teaching environments subject to high levels of land transport noise.</p> <p>The benefits of this alternative do not outweigh the risks to land transport infrastructure or the negative effects on people near living/staying near this infrastructure.</p>	The proposal is effective at achieving reasonable levels of noise reduction in new or altered sensitive land uses.	<p>To be effective, mass media campaigns must be noticed (using appropriate media channels and placement to reach the target group), perceived as persuasive (experienced by the target group as engaging, relevant and/or emotionally affecting) and remembered (seen often enough for them to be recalled and acted upon). Advertising research reveals that the effects of advertising linger over the days and weeks after broadcast ends, but are unlikely to linger over weeks to months. The costs of an effective campaign to encourage noise protection could therefore become very expensive because of the need to keep the issue in the eye of the target audience.</p> <p>This proposal is therefore not considered effective because education and publicity may have limited effect in encouraging noise sensitive land uses to protect themselves from high levels of transport noise. It subsequently is unlikely to be effective in protecting the sleep and indoor amenity of people who live or stay near noisy land transport infrastructure. It could also fail to protect teaching rooms subject to high levels of land transport noise.</p> <p>This proposal may subsequently adversely affect the operation and expansion of land transport infrastructure if there is not a significant move to voluntary protection/insulation of noise sensitive activities near high noise roads and rail lines.</p> <p>The benefits of this alternative do not outweigh the risks to land transport infrastructure or the negative effects on people near living/staying near this infrastructure</p>
<b>Efficiency</b>	The efficiency of this proposal is low as the costs to noise sensitive land uses and the potential costs to land transport infrastructure providers outweighs the benefits of this proposal in areas where the legacy district plans do not provide protection for noise sensitive land uses.	<p>The efficiency of the proposal is difficult to determine as a whole as the costs and benefits of protecting each noise sensitive land use will vary depending on its location and the amount of noise attenuation that will be required. However overall the benefits are assumed to significantly outweigh the costs.</p> <p>The development of suitably insulated residential land uses near land transport infrastructure will encourage more use of public transport and increase its efficiency.</p>	The efficiency of this proposal is estimated to be low as education/publicity may have limited benefits and the health and amenity costs to people in noise sensitive land uses may be very high. The potential costs to land transport infrastructure providers is also believed to outweigh the benefits of this proposal.

<p><b>Costs</b></p>	<p>In this alternative (status quo -retaining existing legacy approaches) there would be no requirement for noise sensitive land use activities to protect themselves from high levels of land transport noise in those parts of the council area where the legacy plans does not require protection, and consequently there would be no required costs to building owners in those areas. The noise from high use roads and rail lines would continue to disturb the sleep and amenity of a large number people in close proximity to these transport lines. This has potential costs in lost productivity and absenteeism. Even during the daytime the noise may be annoying and interfere with the comfort and enjoyment of indoor activities. Students in poorly designed classrooms might struggle to hear the material presented by teachers/tutors.</p> <p>Research in the United Kingdom (published in 2009) by the Department for Environment, Food and Rural Affairs estimated the annual cost of urban road noise alone in England was in excess of £9 billion. This places it at a similar magnitude to road accidents in England (£9 billion). This estimate comprises about £5-9 billion in annoyance costs, health costs of around £2 billion, and productivity losses costing another £2 billion</p> <p>This status quo approach does not support the regional policy statement objective of enabling quality urban growth or the Auckland Plan priorities to:</p> <ul style="list-style-type: none"> <li>• <i>Improve the quality of existing and new housing</i></li> <li>• <i>Integrate transport planning and investment with land use development</i></li> </ul> <p>Residential development that is not adequately insulated against road or rail noise will be less attractive to buyers of those developments.</p> <p>This approach also does not also give effect to directive 1.7 of the Auckland Plan which seeks to ‘improve the health of all Aucklanders’</p> <p>In this alternative, non-voluntary mitigation of the noise would only occur in areas where the legacy plans do not set standards if the road controlling authority agreed to mitigate the road traffic noise. This would depend on when or if it decided to mitigate the noise and whether or not it would apply standards such as NZS 6806:2010 to that mitigation. It would also be up to the road controlling authority or Kiwi Rail to determine whether it would mitigate the noise if the road or rail corridor was new or it was altered as defined by a standard such as NZS 6806. Only if a new or altered designation was required would there be an opportunity for the council to have an input on noise mitigation through the RMA process.</p> <p>No equivalent standard to NZS 6806 exists for the mitigation of rail noise for new or altered rail corridors.</p> <p>Section 16 of the RMA requires every occupier of land to adopt the best practicable option to ensure that the emission of noise from that land or water does not exceed a reasonable level. Complaints to transport agencies about the noise their infrastructure makes from noise sensitive land uses might require those agencies to undertake costly or difficult mitigation work or to defend themselves against litigation. In some instances the ability of land transport infrastructure providers to reduce the noise to levels that some neighbouring properties would consider acceptable might be very difficult.</p>	<p>The costs to achieve adequate noise insulation to meet the proposed are estimated (from other sources such as Wellington City Council) to be 1-8% of the total cost of construction for a new building depending on method and the amount of noise reduction/insulation required and whether or not mechanical ventilation or air conditioning of the building or affected rooms will be required to meet the internal noise levels. In some circumstances a solid fence or wall may be all that is required to achieve the noise reduction required to meet the performance standards specified for bedrooms, sleeping areas, living and dining rooms (habitable rooms) and in classrooms in single story buildings.</p> <p>Table D4 of NZS 6806 2010 (Acoustics – road traffic noise – new and altered roads) has indicative 2008 costs for noise barriers, acoustic insulation and ventilation systems for buildings exposed to high levels of road traffic noise e.g. \$480 per metre for a 3m high concrete barrier; \$15,000 of acoustic double glazing, floor ceiling and wall cladding/fill, lining and door seals etc and \$10,000 for a ventilation system. The cost of a ventilation / air conditioning system will depend on its size, complexity and ease of instillation.</p> <p>Additional costs will be required to have an acoustic specialist determine the noise reduction required and to certify compliance with the development controls of the overlay.</p>	<p>The costs of this option to most land owners would be low as it only encourages voluntary noise protection. The costs would be limited to the cost of producing educational material to encourage land owners to protect themselves from high land transport noise. This educational material could be provided by the council and land transport infrastructure providers. Building owners who wanted to insulate their buildings from high levels of noise would still need some professional advice on the level of noise that they might be exposed to and the methods to be used to ensure suitable indoor noise levels were achieved. Those that volunteered to provide noise reduction would expect to pay the same costs as those in alternative 2.</p> <p>This option may apply high costs to land transport infrastructure providers as it could adversely affect the operation and expansion of land transport infrastructure if significant numbers of noise sensitive buildings are not insulated against high levels of land transport noise. It also fails to protect teaching environments that may be subject to high levels of land transport noise.</p> <p>This option is potentially not effective in protecting the sleep and indoor amenity of people who live or stay near noisy land transport infrastructure and does not mitigate the health effect costs arising from exposure to high levels of land transport noise.</p> <p>The costs of retrofitting noise protection to existing buildings is higher than including noise protection when the building is first constructed.</p>
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	<p>This option is arguably not consistent with the council's obligations under section 31 of the RMA to control the emission of noise and the mitigation of the effects of noise.</p> <p>As can be seen from the legacy provisions in appendix 3.42.1 there are some potential unforeseen costs in the existing legacy plans such as the cost of requiring noise mitigation based solely on the roading hierarchy. In some rural areas the level of noise produced by state highways, by regional arterial roads or district arterial roads may be low because of low traffic volumes. Requiring noise mitigation based on traffic flows rather than roading hierarchy better addresses the adverse noise effects arising from the use of roads.</p> <p>In parts of the former North Shore City Council area there is a potential cost of determining the existing noise environment on high noise routes or potential high noise routes. This is required by the district plan to determine whether or noise mitigation/insulation work is required.</p> <p>Except for the Waitakere plan the legacy provisions do not address the adverse effects of noise arising from rail corridors on residential activities.</p>		
<b>Benefits</b>	<p>The benefits of the do nothing/status quo is no monetary costs to those noise sensitive activities that wish to locate next to high noise land transport infrastructure in areas where there are no existing district plan provisions.</p>	<p>The benefits of this option are enhanced indoor acoustic privacy/amenity for new or altered noise sensitive land uses so that sleep is not disturbed by land transport noise, and residents can enjoy their living and dining areas without land transport noise significantly affecting their conversation, their ability to listen to music or watch television. Insulating a building to reduce noise also produces small benefits in reducing heat loss and the cost of heating or cooling the building. People living in well insulated homes also have fewer sick days and less trips to the doctor. The health risks associated with exposure to high levels of noise are also reduced.</p> <p>The benefits may also be realised when the noise sensitive land use is sold. It is expected that well insulated noise sensitive land uses especially those that are located near public transport networks will sell at a higher price than poorly insulated noise sensitive land uses in the same area, where sleep disturbance and a lower quality of life will have a negative impact on the value of the property.</p>	<p>The benefits of this option is that there are no monetary costs to those noise sensitive activities that wish to locate next to high noise land transport infrastructure because there would be no statutory requirement for them to undertake any noise reduction work.</p>
<b>Risks</b>	<p>The risks with this proposal is there are inconsistencies with the desire to increase the density of residential development in neighbourhoods which are close to a rapid and frequent public transport network and the desire to improve the overall health, well-being and quality of life of the people of the region.</p> <p>This alternative also provides a potential conflict with the objective of having "a well developed, operated and maintained transport system that manages potential adverse effects on the natural environment and the health, safety and amenity of people and communities" if residential development is not adequately insulated against high road or rail noise in all of the region.</p> <p>A report published by the World Health Organisation in March 2011 identified environmental noise as the second largest environmental risk in the developed world. This proposal does not adequately address the environmental risks or the health risks of high noise levels.</p>	<p>There are risks that the standards proposed for noise sensitive land uses will not achieve the indoor noise levels sought by some members of the public who are located near land transport infrastructure and who are particularly sensitive to noise.</p> <p>For existing buildings there are no proposed requirements to meet the new standards and consequently no requirement to retrofit existing bedrooms, sleeping areas and other habitable rooms or classrooms with insulation to decrease land transport noise. These land uses will continue to be subject to high levels of noise unless the building owner take some action to reduce indoor noise levels or the infrastructure owner takes some action to reduce the noise affecting those properties</p> <p>The proposal does not propose to protect the outdoor amenity of noise sensitive land uses and the risk remains that this will be an issue of complaint by some land owners. Physical barriers such as solid walls and fences which may improve indoor acoustic amenity may also</p>	<p>This proposal may not adequately address the environmental risks or the health risks of being exposed to high levels of land transport noise.</p> <p>The risks with this proposal is that if the voluntary insulation of buildings against high levels of transport noises is not widely taken up there will be inconsistencies with the desire to increase the density of residential development in neighbourhoods which are in areas close to the frequent public transport network and a desire to improve the overall health, well-being and quality of life of the people of the region</p> <p>This proposal might also fail to give adequate effect to the proposed policies to 'prevent reverse sensitivity effects from inappropriate subdivision, use and development which may compromise the operation and capacity of existing or approved significant infrastructure' and to:</p> <p><i>'Require new noise-sensitive land uses, and alterations to existing noise-sensitive land uses, to be designs and constructed so that</i></p>

		<p>reduce the noise affecting outdoor areas of noise sensitive land uses. There will be many sites however where physical barriers will not improve either the indoor or outdoor amenity. Buildings may also act as effective physical noise barriers and shield some outdoor areas from high levels of transport noise.</p> <p>This option does not address or require mitigation at source – this will rely on the infrastructure provider to reduce noise levels to reasonable levels by adequate maintenance of the infrastructure, by providing acoustic barriers where appropriate or by protecting existing noise sensitive land uses when new infrastructure is created or significantly modified. The surface used on roads can also make significant changes to the amount of noise produced by that road. All Auckland motorways have asphaltic surfaces that reduce the level of tyre noise from those roads, but some roads in the overlay may have surface finishes that are noisier.</p> <p>Operational noise issues such as excessive stopping and starting, unwarranted horn use, poorly maintained or muffled motor vehicles or rail stock and very loud level crossing bells are not, or can not be addressed by the proposed provisions and will have negative noise impacts on adjacent noise sensitive land uses.</p> <p>Because the proposal does not include standards to limit vibration affecting noise sensitive land uses, there are also risks that some noise sensitive land uses will experience vibration particularly from rail lines that adjacent occupants may find annoying.</p>	<p><i>occupants are not exposed to levels of transport noise above World Health Organisation guidelines, particularly in bedrooms and other noise-sensitive rooms.</i></p>
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#### **4 Conclusion**

Based on the above discussion, the following conclusions are drawn:

Because of the adverse effects associated with exposure to high levels of noise, it is appropriate to require noise sensitive activities in close proximity to busy roads and railway lines to be protected from that noise. Therefore alternative two, which applies standards for the noise levels to be achieved in bedrooms, sleeping areas, habitable rooms and classrooms for noise sensitive land uses within 40 metres of land transport infrastructure that is expected to produce high levels of noise, is recommended. The High Land Transport Noise overlay applies to roads with (or predicted to have over a 10 year period) more than 20,000 vehicles per day or rail corridors that have (or predicted to have over a 10 year period) more than 6 night time or 12 day time train movements.

The following alternatives are therefore not recommended:

- Alternative one: Status quo – retain the approach of the legacy district plans
- Alternative three: Using education and publicity to encourage property owners to voluntarily insulate their buildings from high levels of land transport noise

In conclusion from the preceding discussion, the following are the recommended objectives and policies:

##### Recommended objectives:

##### Under Chapter C, 1.1 –Infrastructure:

5. Auckland's significant infrastructure is protected from reverse sensitivity effects and incompatible subdivision, use and development .development.

##### Under Chapter D, 7 - Strategic Transport Corridor:

4. Potential reverse sensitivity adverse effects are managed where non-transport related activities are established on adjoining residential zoned land.

##### Under Chapter E, 1.5 – Infrastructure, High Land Transport Noise:

1. Strategic land transport infrastructure is protected from reverse sensitivity effects associated with surrounding noise sensitive land uses.
2. New and altered noise-sensitive land uses, such as places where sleep or teaching normally occurs, are protected from:
  - a. high levels of land transport noise
  - b. unreasonable or excessive levels of noise arising from the operation and maintenance of strategic land transport infrastructure.

##### Recommended policies:

##### Under Chapter B, 3.3 - Transport the following policy:

3. Require noise sensitive activities to be located or designed to avoid, remedy or mitigate potential adverse effects arising from the use and operation of strategic transport infrastructure.

##### Under Chapter C, 1.1 - Infrastructure the following policy:

2. Prevent reverse sensitivity effects from inappropriate subdivision, use and development which may compromise the operation, and capacity of existing or approved significant infrastructure.'

##### Under Chapter D, 7 - Strategic Transport Corridor the following policy:

4. Provide for works and measures such as noise mitigation, landscaping and artworks that enhance existing infrastructure and minimise its adverse effects on adjoining development.



Chapter E, 1.5 – Infrastructure, High land transport noise the following policies:

1. Require new noise-sensitive land uses, and alterations to existing noise-sensitive land uses, to be designs and constructed so that occupants are not exposed to levels of transport noise above World Health Organisation guidelines, particularly in bedrooms and other noise-sensitive rooms.
2. Encourage transport agencies to maintain, manage and operate their existing transport infrastructure to minimise and where practicable, reduce the adverse effects of land transport noise on noise-sensitive activities.
3. Allow noise-sensitive activities near strategic land transport infrastructure only where they do not compromise or limit the existing or future operation of strategic land transport infrastructure

## **5 Record of Development of Provisions**

### **5.1 Information and Analysis**

The information used in the preparation of these objectives, policies and rules can be found in:

- Appendix 3.43.1: Existing legacy plan provisions
- Appendix 3.43.2: References for research on land transport noise

### **5.2 Consultation Undertaken**

The proposed overlay has been discussed at several meetings with KiwiRail, NZTA and Auckland Transport in late 2000 and during 2012 and at a meeting with the Unitary Plan Political Working Party on 31 October 2012. Discussions also occurred with noise consultants and internal council staff who regularly deal with noise issues. The Ministry of Education was also advised of the proposed changes.

### **5.3 Decision-Making**

The issue of protecting noise sensitive activities from high levels of transport noise was considered by the Unitary Plan Political Working Party on 31 October 2012. The Working Party resolved that new or altered indoor areas of sensitive activities near high noise routes should be protected from high levels of noise but the protection of outdoor areas from that noise was not supported. The Working Party did not support the proposal of prohibiting outdoor living areas within 10m of a rail corridor or a road with more than 50,000 vehicles per day.