Selwyn District Plan Review: Noise Economic Assessment

March 2020

m.e consulting

Prepared for

Selwyn District Council

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1 Background

Market Economics (M.E) has been engaged by Selwyn District Council (SDC) to undertake an economic assessment of a number of aspects of the proposed noise provisions within the District Plan Review (the Plan), which have been developed as part of the District Plan Review process (the Review).

From an economist perspective, noise from urban and rural activities can have negative impacts on the wider community, both directly to adjacent landholders and to the wider public via diminished amenity values. Negative costs, such as unwanted noise, that accrue to others are referred to as externalities in economics. It is well established in economic theory that markets will fail to produce an optimal outcome in the presence of externalities. In the case of noise, free markets will result in an outcome where too much noise is generated. In many cases, local governments will impose rules on activities that generate noise to assist the market to produce an optimal outcome.

While it is recognised that imposing rules on noise will generate benefits to the community, it is also important to acknowledge that the rules will result in the reduction of some activities or additional costs to the community. For example, some noise rules will impose greater costs on developers in terms of building requirements (e.g. noise reducing insulation). Alternatively, other rules may reduce the time period when an activity can occur – as an example restriction on building construction (use of power tools) in residential areas during weekends and evenings.

Our brief is to consider the costs and benefits associated with the key items relating to the noise provisions in the Plan. The following key noise provisions have been considered in this report,

- Generic rules for land use activities across the zones (Noise-R1),
- Construction (Noise-R2),
- State Highway and Railway Network (Noise-R3),
- Christchurch International Airport (Noise-R4),
- Inland Ports (Noise-R5),
- Dairy Factories in the Dairy Processing Zone (Noise-R6), and
- West Melton Rifle Range (Noise-R7).

The scope of work for this report is based on the following:

- Email sent by Justine Ashley titled SDC DPR Economic Analysis - Noise provisions, sent on 26th of March 2019 (including attached documents).
- Email sent by Vicki Barker of Barker Planning titled FW: Dairy Processing Management Activities (DPMA) - Noise, sent on the 13th of April 2019 (including attached documents).
- Email sent by Vicki Barker of Barker Planning and final provisions sent on 3 March 2020.

We note that there are other noise (and vibration) rules in the Plan, which are not assessed in this report. During the scoping stage of this report it was noted by the client that the remaining rules did not require economic assessment. There are rules in the Plan that implement national standards that are governed by other legislation - Noise-R14 and Noise-R15 implement standard aviation rules and Noise-R18 implement vibration rules. The remaining rules are not changing significantly compared to the Operative Plan or relate

to activities that are not prevalent in the District (frost fans Noise-R13 and wind turbines Noise-R10). As such these other rules are likely to have minimal impacts.

The aim of this report is to cover the specific scope requested. Also, the results from this report will be used to inform s32 assessment of the proposed noise provisions in the Plan to assist in the District Plan Review hearing processes.

2 District Plan – Noise

The following section briefly outlines the noise provisions in the Operative District Plan (ODP) and the Proposed District Plan (PDP). This section draws from the 2017 technical study conducted by Acoustic Engineering Services (AES)[1], the 2018 Preferred Options Report to the SDC District Plan Committee[2] and the latest draft provisions document as at March 2020[3]. The reader should refer to these documents to gain a more detailed understanding of the noise provisions in the Plan. This section has also relied on Council Officers to provide notice of the revisions of the noise provisions that have occurred during the internal council planning and wider engagement processes.

2.1 Operative District Plan

According to AES report, the noise provisions in the ODP are separated into two 'Volumes' – Township and Rural. In the context of noise provisions, the zones in the Township section are divided into two categories – Living (residential) and Business. Generally, noise levels which are permitted in the Living zones are lower than the Business zones. The provisions for both categories apply to all non-residential activity. Any non-residential activity that breaches the prescribed noise provisions requires a resource consent (i.e. discretionary activity), while all other activities are permitted.[4]

In all the zones the levels of noise allowed during day times (0730 – 2000 hours) are generally louder than the evenings/mornings (2000 – 0730 hours). The Business zones have a wider range of restrictions, which applies to the business properties that border on Living, Rural or more sensitive Business zones. There is also an exception for louder noise generated during temporary military training activities.

The Rural zone has noise provisions that apply to "any activity" near a Living zone or a notional dwelling. Any activity that breaches the prescribed noise provisions requires a resource consent (i.e. discretionary activity), while all other activities are permitted.[5] The noise levels permitted in the rural zones are generally louder than the Living zone. There are a number of exceptions for specific rural activities, for example sounds that relate to normal primary production activity.

[1] AES (2017) Selwyn District Plan Review: DW005 Noise.

[2] Barker, V. (2018) Preferred Options Report for Noise (DW005) and Vibration (DW006) – DPC Meeting, 25 July 2018.

[3] SDC (2020) Noise and Vibration – Draft Provisions – 3 March 2020

[4] See AES report, pages 2 and 3 for detail on the technical definitions of the limits.

[5] See AES report, pages 4 for detail on the technical definitions of the limits.

There are also noise provisions to avoid reverse sensitivity from specific existing activities, Christchurch International Airport, State Highways (1, 73 and 77) and the railways. The rules require buildings to be designed to meet specific internal noise levels.

The AES report made a number of findings about the ODP,

- uses outdated noise standards from the 90s,
- no consideration of construction noise,
- day/night time hours are inconsistent with other Districts,
- inconsistency in the cross-zone applications of the noise limits,
- Living zone night time noise limit is below ambient level, so is difficult to enforce,
- Rural zone day time noise limit is above other Districts, national and international standards,
- A number of issues associated with the exemptions, reverse sensitivity etc.

The Council Officers Preferred Option report to the District Plan Committee provides more detail on these findings (Section 3 Issues). The report also notes that the Ministry for the Environment (MFE) is developing a National Planning Standard, which have now been published (November 2019).[6] The National Planning Standards require that Councils adopt the latest version of relevant acoustical New Zealand Standards and technical methods for assessing noise.[7]

2.2 Proposed District Plan

The following discussion of the Proposed District Plan noise policy and rules is drawn from the draft provisions in the documents "Noise and Vibration - Draft Provisions - 3 March 2020" and discussions with council officers.

The following tables outline the proposed noise rules and notes the changes compared to the existing ODP. The first table provides a summary of the key noise provisions that have greater implications for activity in the District (Table 2.1) and the second table provides a brief summary of the rules that relate to activities that are temporary or relatively confined (Table 2.2).

Table 2.1 includes notes on the proposed changes to the rules 1-7.

- First, the general land use noise rules that are proposed in the Plan (Noise-R1) apply to most of the land in the District. This means that the rules in Noise-R1 will have important implications for the types of economic activity that can occur in the District. In summary, the proposed changes for Noise-R1 are set to match national standards and the rules applied in adjoining Districts. The changes have reduced the complexity of policy implementation and in some cases relaxed the noise provisions. The rural day-time limit is proposed to decrease; however this change only applies to non-rural production activity. The majority of Noise-R1 provisions are not that dissimilar to the ODP.

[6] Note that the bulk of this project was conducted in early 2019, before the MFE National Planning Standards were released.

[7] MFE (November 2019) 15. Noise and Vibration Metrics Standard

- Second, the Plan introduces specific noise rules for construction activities in Noise-R2. These rules are based on national standards that are applied in other Districts. However, these rules represent a new set of noise provisions which will have implications for construction in the District.
- The remaining rules in the table are related to reverse sensitivity issues associated with existing infrastructure (state highways, rail lines, airports, ports) and special purpose activities in the rural zones (dairy factories and military rifle range). In some cases, the spatial extent of the existing rule is proposed to increase (Noise R3, Noise-R4 and Noise-R6) or a new overlay is being created (Noise-R5 and Noise-R7), which will impact more properties. Some of these noise rules in the Plan are more restrictive than the ODP.

Table 2.1: Key Noise Provisions in the Proposed District Plan

Rule	Activity/Use	Status	Notes
Noise-R1	Land use activities not otherwise specified	P or RD	Changed to match other districts and National standards. • Test at 'receiving' site, rather than boundary of 'emitting' site. • Extension of day-time hours, additional half hour in the morning and two hours in the evening. • Night-time noise limit in Living zones has been increased. • Rural day-time noise limit decreased. • Status relaxed to RD if activity breaches limits.
Noise-R2	Construction activities	P or RD	Change to require compliance with the NZ Standard relating to construction noise which is mandatory in accordance with the National Planning Standards (no existing rules). Will affect all construction in the District.
Noise-R3	Noise sensitive activity within the State Highway and Railway Network Noise Control Overlays	P or RD	Change to existing rules to extend overlay out to 100m in relation to state highways and the railway network. Will affect more properties seeking to develop noise sensitive activities within the Overlay as the proposed rule application extends to 100 metres.[8]
Noise-R4	Noise sensitive activity within the Christchurch International Airport Noise Control Overlay	P or NC	Only a few properties currently affected in the noise contours (55 dBA).[9]
Noise-R5	Noise sensitive activity within the Port Zone Noise Control Overlays	P or NC	New rules similar to dairy factories which avoids noise sensitive activities establishing within an inner noise contour (55 dB) and requires acoustic insulation within an outer contour (45 dB).[10]
Noise-R6	Noise sensitive activity within the Dairy Processing Zone Noise Control Overlays	P or NC	Extending the boundaries of existing overlay and increasing restriction from D to NC.
Noise-R7	Noise sensitive activities within the NZDF West Melton Rifle Range Noise Control Overlays	P or NC	A number of properties affected. New rules similar to the ports which avoids noise sensitive activities establishing within an inner noise contour (65 dB) and requires acoustic insulation within an outer contour (55 dB).

The maps below show the extent of the noise overlays in the Plan, Noise-R3 (Figure 2.1 and Figure 2.2), Noise-R4 Christchurch International Airport (Figure 2.3), Noise-R5 Port Zone (Figure 2.4), Noise-R6 Dairy

[8] The draft Plan rules state that construction of noise sensitive buildings in an area where the outside noise level exceeds 57 dBA is Restricted Discretionary. This rule applies at the "notional boundary", which is 20 metres from the façade of the building.

[9] However, council officers have advised that the noise contours may change

[10] This report has used the noise survey data provided by Metroport Christchurch and Lyttelton Port Company to establish 45 dBA and 55 dBA overlays.

Processing Zone Noise Control (**Error! Reference source not found.**), and Noise-R7 NZDF West Melton Rifle Range(**Error! Reference source not found.**).

First, the following two figures show an example of the overlay areas that are associated with Noise-R3. The maps shows Rolleston, which has a number of properties that are impacted by the overlay for the State highway and railway. This example shows that a number of residential and business zoned parcels in Rolleston are covered by the overlays. Given the relative size of Rolleston and the nature of the transport network which cuts through the town, this example shows the urban area that is most heavily impacted by the overlay.

Figure 2.1: Noise Overlay Maps - Noise-R3 State highways

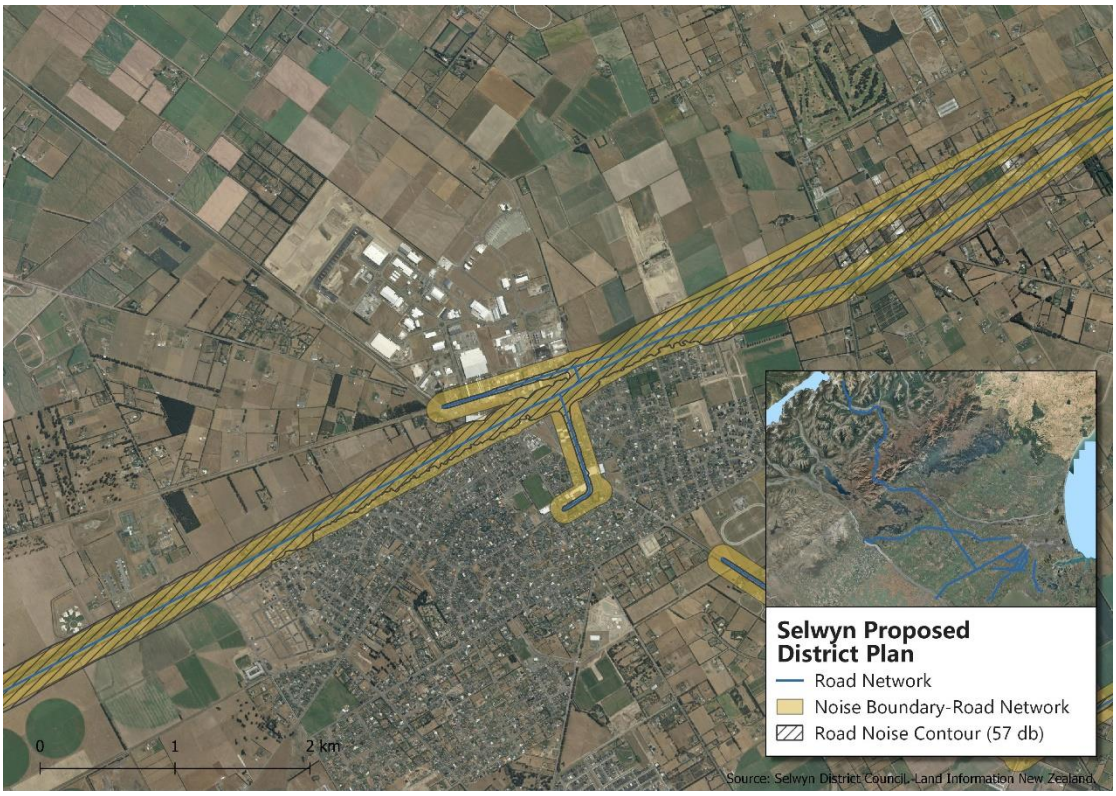


Figure 2.2: Noise Overlay Maps - Noise-R3 Railways

Figure 2.3: Noise Overlay Maps - Noise-R4 Christchurch International Airport

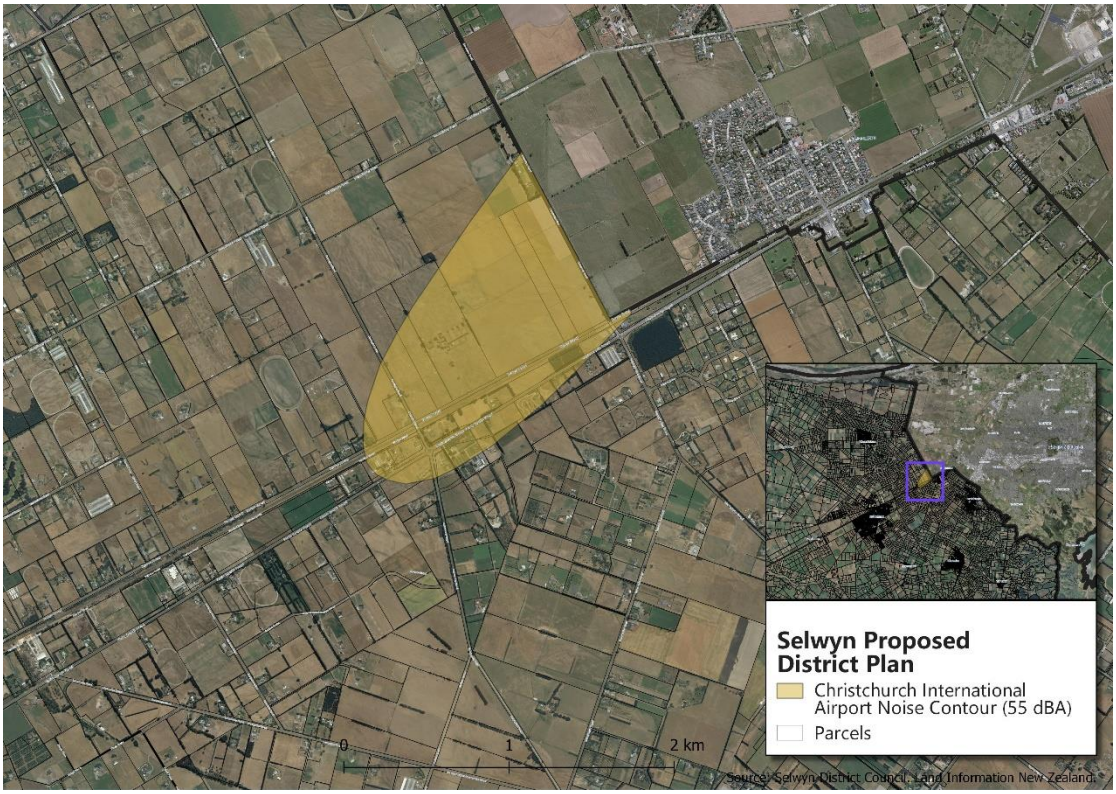


Figure 2.4: Noise Overlay Maps - Noise-R5 Port Zone

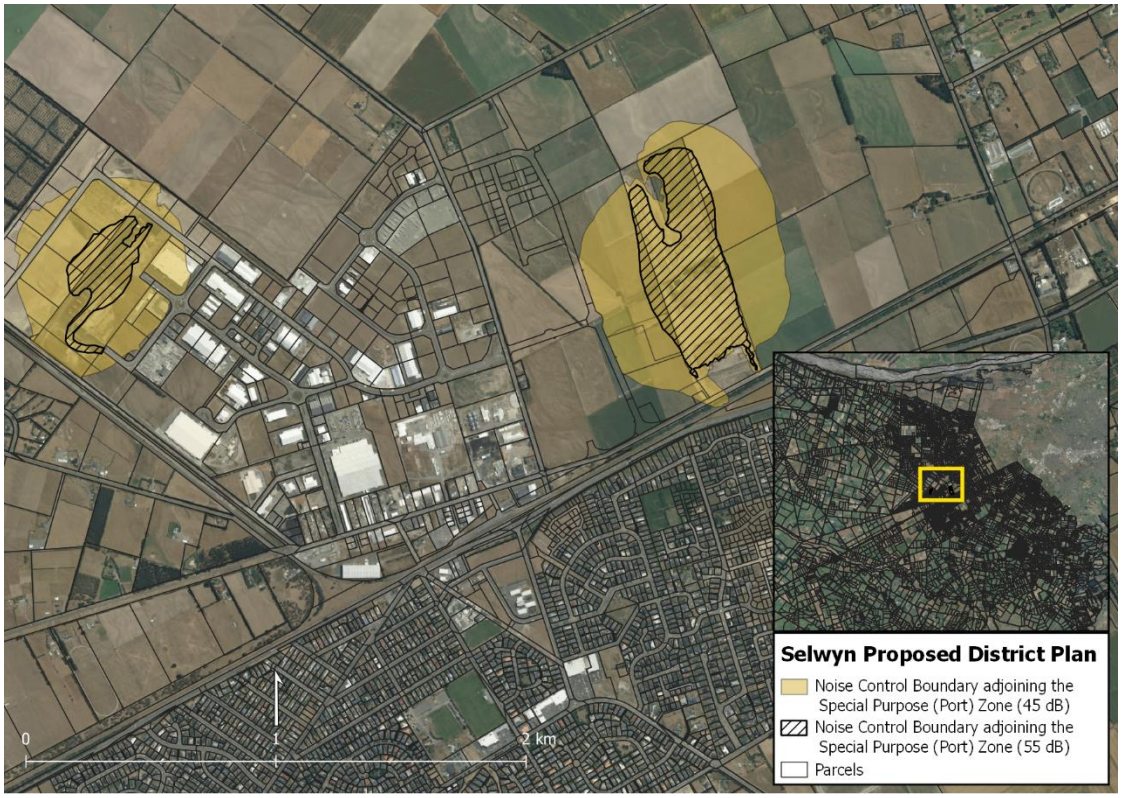
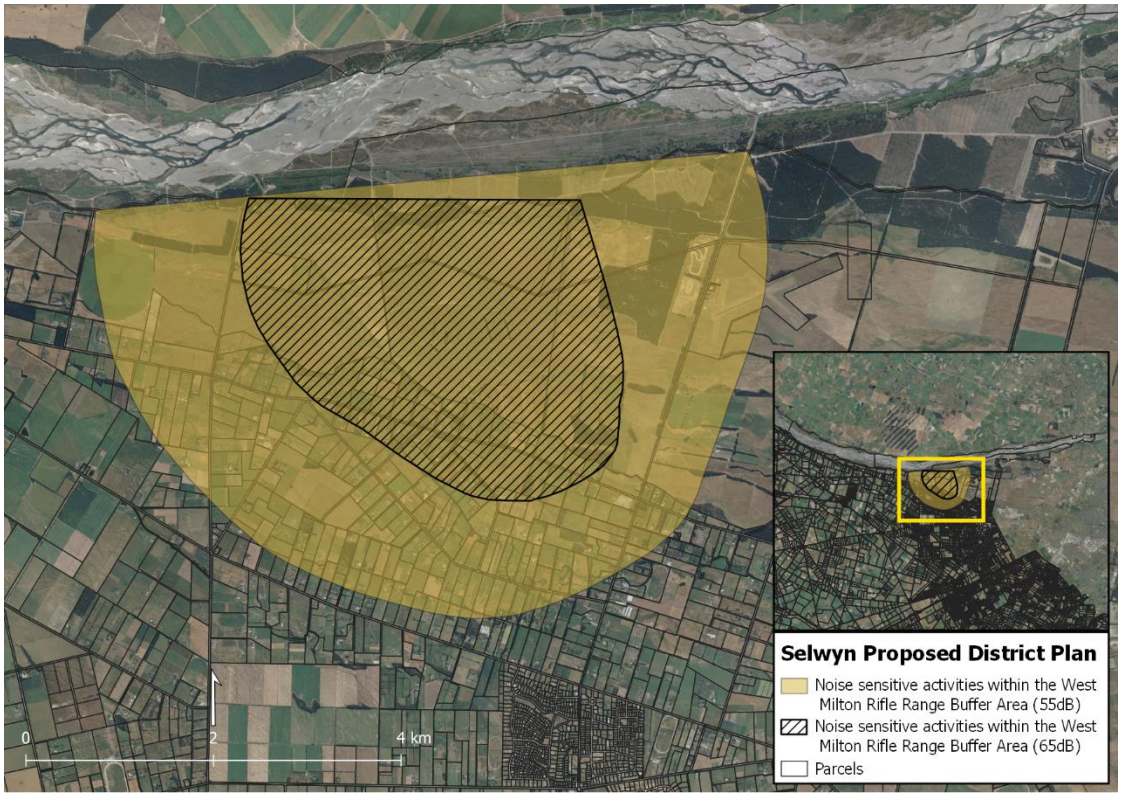


Figure 2.5: Noise Overlay Maps - Noise-R6 Dairy Processing Zone

Figure 2.6: Noise Overlay Maps - Noise-R7 West Melton Rifle Range



The remaining rules in the Plan have relatively minor implications compared to the above mentioned noise rules in the Plan. These rules have relatively less impact because they apply to activities that,

- occur temporarily (military training, emergencies, events),
- are not prevalent in the District (frost fans, wind turbines, blasting),
- other infrequent activities (aircraft movements), or
- there is limited change from the ODP (Darfield Gun Club).

The rules in Table 2.2 have minor impact on the types of activity that occur in the District, however these rules may have important implications on the amenity values received by the community.

Table 2.2: Other Noise Provisions in the Proposed District Plan

Rule	Activity/Use	Status	Notes
Noise-R8	Temporary military training activities	P or RD	Minor changes – temporary nature.
Noise-R9	Temporary activities	P or RD	Minor changes – temporary nature.
Noise-R10	Wind turbines	P or NC	New rule– included to future proof plan as there are few instances of this activity in the District.
Noise-R11	The use of generators for emergency purposes	P or RD	Minor change – temporary nature.
Noise-R12	Audible bird scaring devices	P or RD	Minor changes to existing rules.
Noise-R13	Frost fans	P or RD	New rule – included to future proof plan as there are few instances of this activity in the District.
Noise-R14	Land use activities at airfields and associated aircraft movements	P or D	Rule in accordance with NZS and National Planning Standards.
Noise-R15	Land use activities at helicopter landing areas and associated helicopter movements	P or D	Rule in accordance with NZS and National Planning Standards.
Noise-R16	Darfield Gun Club	P or RD	Minor changes
Noise-R17	Blasting activity	P or D	New rule – included to future proof plan as there are few instances of this activity in the District.
Noise-R18	Land use activities generating vibration effects on structures	P or D	Rule in accordance with a NZS and National Planning Standards.

3 Economic Assessment of Noise

The following section draws from existing research to establish the potential costs and benefits associated with the noise provisions in the Proposed Plan. The assessment establishes the marginal value of the Plan, as compared to the existing noise provisions in the ODP. The assessment covers the rules Noise-R1 to Noise-R7. The other noise provisions have been excluded from the scope of work as they have limited effect on economic activity in the District.

The economic assessment in this section starts with a qualitative discussion of the costs and benefits associated with the proposed noise provisions. Section 32(2)(b) of the RMA requires that, where practicable, the benefits and costs of a proposal are to be quantified. The economic assessment provides a quantitative estimation, where possible, of the value of some of the costs and benefits. The section concludes with the findings of this report.

The MFE commissioned s32 report on the National Planning Standards suggests that the benefits from implementing the complete package of standards would provide a positive outcome for New Zealand.[11] However, the report provides no indication of the potential costs and benefits associated with the noise component of the National Planning standards. Therefore, the MFE report is of little use to the assessment of the proposed noise provisions in the Plan.

3.1 Costs and Benefits

The proposed noise provisions in the Plan are likely to result in benefits and costs accruing to the Selwyn community, both in terms of activity in the economy and other non-market values. The literature search conducted for this report indicates that the following eight costs and benefits are generally important for noise provisions,

- Amenity Values,
- Economic Activity,
- Assessment Costs,
- Development Costs,
- Development Opportunity,
- Compliance,
- Administration, and
- Development Pattern Efficiency.

The following subsections provide a qualitative discussion of the processes by which these costs and benefits accrue to the community, as a result of noise provisions in the Plan.

3.1.1 Amenity Values

Noise has the potential to cause unwanted effects on amenity values received by the community, ranging from socio-psychological to health and well-being impacts. The impacts of noise can include annoyance, sleep disturbance, impact on performance of daily activity (productivity loss), stress, hypertension, stroke and heart disease.[12] The noise level at which such effects are observed does not have to be high. It has been shown that people exposed to traffic noise with a 24-hour average of 55 dBA are found to be at a higher risk for hypertension and those exposed to 60 dBA or greater are found to be at a higher risk for

[11] Castalia Advisors (2018) Economic Evaluation of the Introduction of National Planning Standards.

[12] Nijland HA, Kempen EEMM van, Wee GP van, Jabben J. 2003. Costs and benefits of noise abatement measures. Transport policy. 2003; 10(2): 131-140.

stroke.[13] These costs mainly accrue to the community in the urban areas (Living zones) and to households in rural zones. To a lesser extent there will be costs to businesses in the commercial zones.

Typically, the negative impacts of noise are not quantified in monetary terms because there is no direct market transaction from which to estimate the value. One method for understanding the potential impacts on amenity values is to study the relationship between noise and willingness to pay for a house, which enables economists to develop a 'shadow price'. There are a number of economic studies that have estimated a shadow price for noise using house price data, which has shown that the shadow price of 1 dBA increase in noise is reflected in house price decrease range from 0.4%[14] to 1.5%[15].

While noise shadow price literature shows that the costs of noise are likely to be substantial, it is important to note that the methods applied are likely to only capture some of the impacts on amenity values. For example, it is likely that the lost productivity associated with noise at night (i.e. sleep disturbance) will result in other negative costs that flow onto other people in the community that are not directly affected by the noise. These other costs may not be captured in the sales prices of houses. Also, the studies discussed above mostly relate to urban areas in other countries, which are likely to be different from New Zealand, Canterbury and Selwyn District so may not be completely applicable.

The literature review conducted for this report has found no research on this topic for New Zealand. The New Zealand Transport Agency standard transport project evaluation also notes that there are no applicable studies in the New Zealand context, however it is suggested that it is reasonable to use a figure of 1.2% per 1 dBA, which could be approximately -$5,400 per dwelling per 1 dBA increase or equivalent to a cost of $350 per dwelling per annum.[16]

Previous s32 studies of noise provisions in other districts around New Zealand have not quantitatively assessed the amenity value implications of the policies.[17] For example Auckland Council report found that it,

> "*is difficult to determine as a whole the costs and benefits of protecting each noise sensitive land use, it 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.*"[18]

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[13] Swoboda, A., Nega, T. and Timm, M. (2015) 'Hedonic Analysis Over Time and Space: The Case of House Prices and Traffic Noise', Journal of Regional Science, 55(4), pp. 644-670.

[14] Nelson, Jon P. 1982. "Highway Noise and Property Values: A Survey of Recent Evidence," Journal of Transport Economics and Policy, 16(2), 117–138.

[15] Delucchi, Mark and Shi-Ling Hsu. 1998. "The External Damage Cost of Noise Emitted from Motor Vehicles," Journal of Transportation and Statistics, 1(3), 1–24.

[16] NZTA (2016) Economic Evaluation Manual.

[17] Auckland Council (2013) 2.43 – Land transport noise - section 32 evaluation for the Proposed Auckland Unitary Plan.
Queenstown District Lakes Council (2015) Section 32 Evaluation Report Noise.
Kāpiti Coast District Council (2009) Kāpiti Coast District Plan Review Section 32 Analysis – Summary Report Noise.
Whangarei District Council (2014) Plan Change 110 – Noise and Vibration Section 32 Evaluation Report.

[18] Auckland Council (2013) 2.43 – Land transport noise - section 32 evaluation for the Proposed Auckland Unitary Plan. Page 10 paragraph 4.

The recent MFE s32 assessment of the National Planning Standards provides no assessment of the amenity value associated with noise provisions outlined in the standards.

Notwithstanding the limitations discussed above, it is likely that the amenity values associated with noise will be significant in Selwyn District. In other previous s32 assessments, and the NZTA standard economic assessment methods, suggest that the benefits associated with the protection of amenity value from noise are significant. This report finds that amenity value is important for the assessment of the noise provisions in the Plan, therefore it should (where possible) be quantified.

3.1.2 Economic Activity

Activities that generate noise can also contribute to the community's welfare, e.g. industrial areas providing employment or noisy outdoor activities providing recreation. Noise provisions may discourage new businesses from starting up or existing business from operating, which has flow on implications for the economy.

In many cases existing activities should be protected from the reverse sensitivity effects of noise sensitive activities. Strategic infrastructure is particularly susceptible to the effects of reverse sensitivity when noise sensitive development occurs in the vicinity of the existing infrastructure; i.e. Christchurch Airport, state highways and railways, ports, West Melton Rifle Range. Similarly, there are other important activities in the District which have far reaching roles in the economy and the community, which have been protected in the Plan using overlays that recognise the reverse sensitivity effects, i.e. dairy processing.

The noise provisions also impact the types of business activity that can occur in each zone, which can impact the types and scale of economic activity that can occur in the District. The Plan shifts the noise provisions in District, which in some case increases the scope of activity that can occur in business zones (day-hours extended and noise limits increased). There are some instances where the new noise standards may constrain the level of activity possible in a zone (construction noise limits). Also there will be restrictions on some types of rural activities which may impact farming activities.

On the whole, the noise provisions in the Plan may (positively) impact the level of economic activity in the District. Given that the changes to the reverse sensitivity overlays are confined to a relatively small number of properties in the district wide context and the noise provisions that govern most business activity in the District are being relaxed in the Plan compared to the ODP, it is likely that the impacts on the economic activity will be less than minor.

3.1.3 Assessment Costs

The reverse sensitivity noise provisions can require additional assessments for developments that occur within the overlays. These assessments will be required to ensure that the noise sensitive activities constructed within the affected areas comply with the additional requirements set out in the provisions.

For example, Noise-R3, Noise-R4, Noise-R5, Noise-R6 and Noise-R7 require a design report to be submitted to council when building a noise sensitive activity within identified noise contours in relation to important

infrastructure. The cost of a design report is likely to be relatively small, for example the cost of a report for residential building may be in the order of $1,000 per dwelling.[19]

There are no requirements for assessment in the ODP for the Inland Ports or the West Melton Rifle Range, however similar provisions already exist in the ODP in relation to the Christchurch International Airport and dairy processing plants.

3.1.4 Development Costs

There can be additional development costs associated with some of the noise provisions set out in the Plan. These costs will mostly accrue to households that buy dwellings in the areas of the District that have a reverse sensitivity overlay (as discussed in the previous subsection). These costs are mostly related to additional costs to cover specific building requirements that minimise noise entering the building. For example, requiring greater insulation to reduce noise and heat pumps so that the dwelling can be ventilated/cooled without needing to open the windows.

There may also be some costs to develop new operations/facilities in business zones in order to minimise noise emissions, through the building/inclusion of noise attenuation in the design. These costs would accrue to (some) new businesses that locate in the District, which will be in the form of increased capital outlay to build the premises or higher rents.

Given the relatively confined coverage of the reverse sensitivity overlays in the Plan and the small changes suggested to the noise provisions in the business zones, it is likely that the development costs associated with the Plan will be less than minor.

3.1.5 Development Opportunity

Some of the noise provisions will impact the nature of development pattern which can occur in some parts of the District (areas covered by the reverse sensitivity overlay). The noise provisions can impact whether the land could be subdivided and/or where dwellings can be constructed on the land.

In some instances, the noise provisions may reduce the number of dwellings that could be developed. This represents a lost opportunity to the landholders and potential impacts on the efficient use of land.

Given the relatively confined coverage of the reverse sensitivity overlays in the Plan, it is likely that the development costs associated with the plan will be less than minor.

3.1.6 Compliance

Businesses commonly face a range of compliance costs in order to undertake their operation (health, safety, record keeping, pollution, noise, etc). There is a multiplicity of different rules across the country which can result in additional compliance costs to businesses that operate across district boundaries. The Plan has, for the most part, proposed to update the ODP provisions to align with New Zealand Standards related to noise, the National Planning Standards and/or similar rules to adjacent Districts.

[19] Stephen Chiles - email correspondence "Re:Selwyn District Plan – road and rail" 13th May 2019.

The approach that is adopted in the Plan is likely to reduce compliance costs for businesses operating in the District. The greater alignment of the noise provisions may also reduce risks, as the provisions will result in greater certainty about what activities can and can not occur in each zone.

Given the nature of the changes proposed in the Plan, it is likely that compliance costs would be reduced compared to the ODP. This reduction represents a benefit to businesses and the community, which is likely to be less than minor.

3.1.7 Administration

The Council expends resources administering the noise provisions, both in terms of the development of the Plan, complaint resolution and reviewing new applications for activities.

The Plan's adoption of the national standards and alignment with neighbouring districts may result in,

- reduced upfront costs (and time) associated with developing the Plan and potential appeals processes. The discussions shown in the stakeholder engagement provides some indication that the reliance on national standards may have resulted in greater agreement on the noise provisions in the Plan.
- reduced ongoing costs (and time) associated with implementing and enforcing the Plan. Council officers will be able to draw from existing precedents from other areas to quickly and efficiently assess complaints and new applications for activities.

These cost saving benefits are related to the compliance cost benefit, which may be viewed as the two sides of the same coin.

Also, of note is that the Plan has suggested a practical change in the definition of the noise limits, which would mean that the noise would be tested in terms of the property that receives the noise rather than the property that the noise emanated. This may reduce the costs associated with assessing complaints.

Given the nature of the changes proposed in the Plan, it is likely that administration costs would be reduced compared to the ODP. This reduction represents a benefit to Council and the community, which is likely to be less than minor.

3.1.8 Development Pattern Efficiency

Finally, the noise provisions may have implications for the development pattern in the District. The reverse sensitivity provisions could result in changes in the location of development in the District. In some cases the costs of complying with the reverse sensitivity provisions could result in developments not being financially feasible (i.e. additional building costs may result in developers choosing not to develop in the overlay areas)[20]. Also, the overlays may result in some land only being developable for noise sensitive activities subject to resource consent, which may discourage development in the overlay areas.

[20] Note according to Council Officers "acoustic attenuation largely matches modern construction requirements under the Building Act, in any case and that additional costs are minimal."

Therefore, reverse sensitivity provisions may result in a different development pattern. The change in spatial pattern could be less efficient, for example

- Noise-R3 – covers land that is very well connected to the District and regional economies.
- Noise-R4 – covers land that is close to Christchurch, which is relatively more connected than the rest of the District.
- Noise-R5 – covers land that is close to Rolleston and the state highways, which is also very well connected.
- Noise-R6 and Noise-R7 – covers rural land, which is less connected than the other land covered in the reverse sensitivity provisions. However, on average this land has better connections than the average land in the District.

The potential shifting of development from these relatively more connected locations to less connected locations may have negative impacts on the efficiency of the District economy. However, given the relatively small scale of each of the coverage of the reverse sensitivity provisions this cost is likely to be relatively small.

3.2 Estimating Value of Costs and Benefits

The following section provides a quantitative assessment, where possible, of the costs and benefits discussed in the previous section for each of the key noise provisions in the Plan (see Table 2.1). The quantification is conducted using a marginal assessment – i.e. What are the additional costs and benefits that the noise provisions in the Proposed Plan compared to the existing provisions in the ODP?

The following assessment is conducted using information from 2019 and 2020, which is then applied for the life of the Plan (coming decade). The cost and benefits associated with the noise provisions may change over the life of the Plan, however it is unlikely that the changes will be sufficient to change the overall findings in this report.

3.2.1 Noise generated by land use activities (Noise-R1)

The provisions suggested in Noise-R1 of the Plan represent relatively small changes compared to the ODP. In summary, the proposed provisions will increase the night time noise limit permitted in the Living Zone and decrease the lenient Rural daytime limit, which is likely to impact amenity values and ensure the levels are more aligned with New Zealand Standards, WHO guidelines and other districts. The simplification and matching of the Plan to other districts (and the national standards) will also generate savings in terms of reduction in compliance costs for businesses and administration costs for the Council.

The changes also amend the 'day time' and 'night time' hours that apply. Currently the day time period when the noise limits apply in Selwyn District is 0730 to 2000 hours and the night time period is 2000 to 0730 hours. This is an early night time onset and a subsequently longer night time period than in most Districts, including Christchurch and Ashburton. The onset of the 0730 hours rather than 0700 hours is also uncommon and the hours are also inconsistent with NZS 6802 (0700-2200 hours day time and 2200-0700 hours night time). The day time hours have been amended to 0700-2200 and the night time hours to 2200-0700.

To understand the impact on amenity values this report has compared dBA allowed in the zones (both ODP and the Plan) to establish the theoretical level of noise that could be enabled. The policy changes noise limits as follows,

- Living Zone: night time limit will be increased from 35dAB to 40 dBA, while day time limit stays unchanged.
- Rural Zone: day time limit will be decreased from 60dBA to 55dBA, while the night time limit stays unchanged.

Currently there are approximately 21,300 households in the District, around three-quarters located in the Living Zone and the remaining quarter live in Rural Zones. This means that the average household in the District could (in theory) experience an additional 5dBA at night in Living Zones. While rural households could experience 5dBA less during the day time.

The change in noise limits in the Living Zone will have little practical impact on noise levels because the current ambient noise level often exceeds 35dBA and lesser activity occurs at night, and the changes to the Rural Zone day time noise limit from 60dBA to 55 dBA will have little practical impact on noise levels because rural productive activity is exempt from the rules.

In this report we estimated the change in amenity value by combining the number of households in each zone, with the values discussed in NZTA Economic Evaluation Manual (i.e. $350 per 1 dBA change in noise). While the noise provisions suggested in the Plan apply to all households in the District, it is very unlikely that noise will increase to the limit for each and every household. We have (conservatively) assumed that half of households will experience the maximum change enabled in the Plan.[21] Based on these assumptions the amenity value associated with Noise-R1 would be in the order of -$11.3 million per annum.

The economic activity which will be enabled by the change in the Noise-R1 noise provisions in the Plan will be a small fraction of the existing activity that occurs in the District.[22] In this report the impact on economic activity has been estimated by combining existing activity (in GDP terms) in each zone and the change in noise levels allowed as well as the day/night time periods. This assessment is conducted to provide a high-level approximation of the potential value.

First, the economic activity is attributed to each zone. For example, GDP associated with Agriculture is attributed to rural zone. The GDP associated with commercial activities (café, bars, retail, professional services) is attributed to commercial zones (Business 1) and industrial activities (manufacturing, wholesale, warehousing) attributed to industrial zones (Business 2). Finally, all construction activities are attributed to residential zones. Broadly, these results can be used to estimate the productivity for each day-time hour – i.e. economic activity generated in the average hour of day-time.

Combining the approximate GDP values by zone from above, with the changes in noise provisions (day-time hours are increased by 2.5 hours) it is possible to establish the maximum level of additional economic activity that could be generated under the Plan.

However, it is likely that the new additional day-time hours will be less productive or may not be utilised. This report has (conservatively) assumed that only 10% of the new day-time is used productively. This

[21] The other half of the households in the District are assumed to have no change in noise levels.

[22] The main difference will relate to the extension of day time hours in the PDP, which enables more economic activity to occur within a day.

would produce a benefit of +$14.6 million per annum, which is equivalent to 0.7% gain on the existing economy.

Next, the review of the rules associated with Noise-R1 indicate that there are no additional assessment costs, development costs or impacts on development opportunity. These three costs are assumed to be the same under the ODP and the Plan – i.e. $0.0 million per annum.

To estimate the compliance cost savings, it is assumed that every business in the District would save a small nominal amount ($100 each) per annum because the noise provisions in the Plan are easier to comply with (i.e. national standards and cross boundary consistency). The change in compliance costs could save in the order of +$0.6 million per annum.

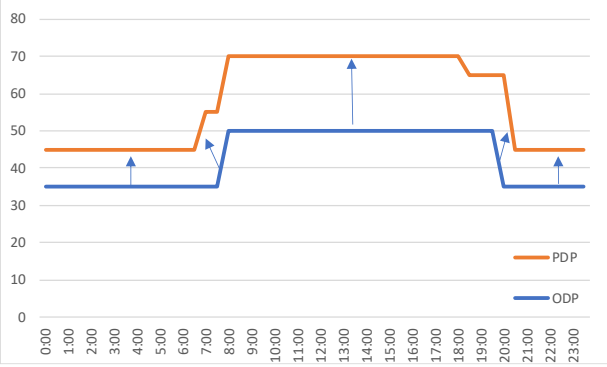
Finally, the Council is assumed to save a small nominal amount of time on administering Noise-R1, relative to the ODP. It is assumed that the number of complaints remains the same as in the ODP, however the time taken to assess each claim is reduced by $20.[23] The change in administration costs could save in the order of +$0.02 million per annum.[24]

Based on the assumptions above, the broad assessment suggests that the benefits of Noise-R1 in the Plan outweigh the costs. The estimated net difference between the benefits and costs is +$3.9 million per annum (see Table 4.1).

3.2.2 Noise generated by construction activities (Noise-R2)

The provisions suggested in Noise-R2 of the Plan represent relatively small change because they only relate to activities which are inherently temporary (i.e. some periods in the building construction process). Furthermore, they provide more clarity around permissible levels of noise associated with construction, whereas the ODP has no provisions specific to construction and the zone limits apply The Noise-R2 provisions will allow greater construction noise than the ODP which may impact amenity values (see Figure 3.1), while producing positive benefits in terms of additional construction activity and cost savings from less compliance and administration (because the new rules are clearer).

Figure 3.1: Construction Noise Limits in Living Zone – Weekday dBA



[23] SDC Noise Officers advise that noise administration costs cost between $50 (complaint) and $300 (enforcement). It is assumed that costs drop by $20 per incident, which is 40% decrease for a complaint or 7% decrease for an enforcement.

[24] Assuming that 5% of residents complain per annum. SDC Noise Officers have not been able to provide detail on the number of noise administration events occur per annum.

To understand the impact on amenity values this report has compared dBA that is allowed for construction in the Living zone (both ODP and the Plan) to establish the theoretical level of noise that could be enabled. This assessment shows that the new construction rules (Noise-R2) will represent a relaxing of the rules, from 43 dBA to 56 dBA (see Figure 3.1).

Currently there are approximately 21,300 households in the District, around three-quarters located in the Living Zone and the remaining quarter live in Rural Zones. This means that the average household in the District could (in theory) experience an additional 10 dBA on average over the full-day.

However, in any given year most households will not have construction near their house and/or construction is temporary (occurring for several months rather than years and noise reaches limits occasionally during the build process). In this report it is assumed that 5% of households are exposed to construction noise and that this noise occurs for half a year.

In this report we estimated the change in amenity value by combining the number of households in the Living zone that can be expected to be affected in each year, with the values discussed in NZTA Economic Evaluation Manual (i.e. $350 per 1 dBA change in noise). While the noise provisions suggested in the Plan allow construction noise to a theoretical maximum, it is very unlikely that noise will increase to the limit for long periods of time. Based on these assumptions the amenity value associated with Noise-R1 would be in the order of -$1.9 million per annum.

The economic activity which will be enabled by the change in the Noise-R2 noise provisions in the Plan will be a small fraction of the existing activity that occurs in the District. In this report the impact on economic activity has been estimated by combining existing construction activity (in GDP terms) and an assumed increase in output of less than 2%.[25] This would produce a benefit of +$2.4 million per annum, which is equivalent to 0.1% gain on the existing economy.

Next, the assessment of the rules associated with Noise-R2 indicate that there are no additional assessment costs, development costs or impacts on development opportunity. These three costs are assumed to be the same under the ODP and the Plan – i.e. $0.0 million per annum.

To estimate the compliance cost savings, it is assumed that every construction business in the District would save a small nominal amount ($100 each) per annum because the construction noise provisions in the Plan are clearer (i.e. national planning standards and cross boundary consistency) and easier to understand. The change in compliance costs could save in the order of $0.1 million per annum.

Finally, the Council is assumed to save a small nominal amount of time administering construction noise (Noise-R2), relative to the ODP. It is assumed that the number of complaints remains the same as in the ODP, however the time taken to assess each claim is reduced by $20. The change in administration costs could save in the order of +$0.02 million per annum.

[25] The increase in daytime hours and increase in noise allowance may allow more construction activity. In this study it is assumed that 5% of the additional noise allowance is used which results in greater activity.

Based on the assumptions above, the broad assessment suggests that the benefits of Noise-R2 in the Plan outweigh the costs. The net difference between the benefits and costs is +$0.6 million per annum (see Table 4.1).

3.2.3 Reverse Sensitivity Provisions (Noise-R3, Noise-R4, Noise-R5, Noise-R6 and Noise-R7)

The provisions that have been proposed to account for reverse sensitivity in the Plan represent relatively small change because they only apply to a limited number of properties. However, these provisions are important as they provide more clarity around noise issues associated with development near important infrastructure. The reverse sensitivity provisions will have positive impacts on amenity value and in some instances positive benefits in terms of protecting important aspects of the economy. There may also be savings in terms of compliance costs.

The key costs associated with the reverse sensitivity provisions are the impacts on the cost of construction (including acoustic design reports) and the potential impact on development opportunities. The Council may also bear some additional costs to administer the provisions.

A key initial step in this report was to establish the nature of land that is covered by each of the reverse sensitivity provisions. This has been conducted using GIS that compares the private land by zones in the ODP.[26] The assessment has also excluded small parcels, as this land is likely to have already been subdivided or have little development potential.[27] Table 3.1 shows each provision and the area of private land that may be developable,

- Noise-R3 covers over 8,380 hectares of land. The bulk of the land covered by the overlays is currently zoned rural (96%) and the remaining land is residential (227 hectares) and business (93 hectares). The overlays represent most of the land that is covered by the reverse sensitivity provisions (84% of the total). Also the overlays covers approximately 1.3% of the land in the District.
- Noise-R4, Noise-R5 and Noise-R6 are relatively small compared to the other two reverse sensitivity provisions. In total these three overlays cover less than 500 hectares. Most of the land impacted by these rules is zoned rural, the main exception is the inland ports near Rolleston which also covers 41 hectares of industrial land.
- Noise-R7 has the second largest coverage at 1,524 hectares, which is 0.2% of the land in the District.

[26] In some instances, there will be zone changes suggested in the Plan which have not been accounted for in this assessment. Therefore, the assessment may underestimate the amount of residential and business land covered by each reverse sensitivity provisions and overestimate the amount of rural land.

[27] Any rural parcel under 4 hectares and any urban parcel under 1 hectare has been excluded.

Table 3.1: Reverse Sensitivity Provisions Noise – land by zone

Reverse Sensitivity Provisions		Rule	Zoned Land Area (ha)				% of District
			Business	Residential	Rural	Total	
Noise-R3	Highways	Within 100m	56	176	4,935	5,167	0.8%
	Railways		37	51	3,128	3,216	0.5%
Noise-R4	Christchurch airport	55 dBA	-	-	123	123	0.0%
Noise-R5*	Inland Port	45 dBA	42	-	21	63	0.0%
Noise-R6*	Dairy Factories	Overlay	-	-	319	319	0.0%
Noise-R7*	West Melton Rifle range	Overlay	-	-	1,524	1,524	0.2%
Total Reverse Sensitivity Provisions			135	227	10,050	10,413	1.6%

**excludes the land which special activities occurs - i.e. inland port, rifle range and dairy factories.*

To understand the impact on amenity values this report has compared the potential number of dwellings that could be located in each of the areas covered by the reverse sensitivity provisions and an assumed decrease in noise in these dwellings.[28] First, it is assumed that the provisions result in new dwellings having a reduction of noise levels as outlined below,

- Noise-R3 results in a 6 dBA improvement for new houses built within the highway and railway overlay. This is based on NZTA acoustic treatment guidelines which suggest dwellings at 20 metres have noise of 46 dBA, while dwellings at 80 metres have noise of 40 dBA.[29]
- Noise-R4, Noise-R5, Noise-R6, and Noise-R7 results in a 5 dBA improvement for new houses built within the overlay areas. Again, this is based on the on NZTA acoustic treatment guidelines which suggest that a fully open window results in 10 dBA difference to the internal noise.[30] The rules require dwellings in the overlay areas to have mechanical heating/cooling, which will allow residents to close windows. It is assumed that residents in new dwellings only close the windows half the time, such that the noise improves by 5 dBA.

Second, the number of dwellings impacted in each area covered by the reverse sensitivity provisions was estimated using the following assumptions,

- For each of the reverse sensitivity provisions 5% of the land is assumed to be developed each year.
- Developable rural zoned land is assumed to be subdivided into 4 hectare lots.
- Developable living zoned land is assumed to be subdivided into 800 m^2 lots.
- The road and rail overlays are assumed to have no impact on the density of rural development because lots in these areas will be sufficiently large to allow building platforms to be located outside the overlay.

Applying the assumptions above suggests that the number of dwellings impacted by the reverse sensitivity provisions could be less than 200 per annum, which is equivalent to one-fifth of the current yearly growth

[28] Rules extend to all noise sensitive activities, of which the majority will be residential activity. This assessment only covers residential activities, as there is expected to be limited amounts of other sensitive activities that are affected.

[29] NZTA (2015) State highway guide to acoustic treatment of buildings. p19 (indoor) and p41 (outdoor).

[30] Ibid p17.

in the District.[31] Most of the impact will be in the road and rail overlays (142 per annum) and the rifle range overlay (19 per annum). The other reverse sensitivity provisions may impact less properties, Christchurch Airport contour (2 per annum), Inland ports (1 per annum) and Dairy factories (4 per annum).

Based on the noise levels and development assumptions the total package of provisions may produce positive amenity value of +$0.3 million per annum, of which most relates to the Noise-R3. This outcome relates to the relative coverage of each of the overlays defined for each of the reverse sensitivity provisions (see maps in Section 2.2).

Some of the reverse sensitivity provisions may produce positive impacts on economic activity. Specifically, some of the changes may enable key businesses to improve their operations (i.e. port) which could produce flow on benefits to the economy. However, it is not possible to quantify the impact as there is no information on the potential scale of this likely effect. Notwithstanding this limitation, the following points provide a notational value which gives an understanding of how large this impact may be,

- Noise-R4, which protects the International Airport, could result in positive benefit to the economy via greater tourism spend. Notionally this benefit may equate to a 0.1% increase in economic activity associated with tourism (retail, cafes, accommodation etc).
- Noise-R5, which protects the inland ports, could result in positive benefit to the economy via more efficient handling of trade. Notionally this benefit may equate to a 0.1% increase in economic activity associated with trade (manufacturing, wholesaling, warehousing).
- Noise-R6, which protects the dairy factories, could result in positive benefit to the economy via greater/more efficient processing of dairy products. Notionally this benefit may equate to a 0.1% increase in economic activity associated with agriculture.

In total these three national values equate to approximately +$1 million per annum in additional economic activity. However, these estimates are based on broad assumptions which may overestimate the true value of the additional economic activity. The reverse sensitivity provisions associated with roads/rail (Noise-R3) and the rifle range (Noise-R7) are expected to have no impact on the economy.

The reverse sensitivity provisions also produce costs to the community that chooses to live in the area covered by the provisions. The following methods are applied to estimate the costs,

- Assessment costs: dwellings built in the some of the areas covered by the provisions will be required to provide acoustic reports, which will result in additional costs. In this report it is assumed that new dwellings built within the areas covered by Noise-R3 to Noise-R7 require an acoustic report. The cost of the report has been set at $1,000, which is based on email correspondence with Dr Chiles an independent expert who represents NZTA and KiwiRail.[32] In total, the package of reverse sensitivity provisions could result in an additional construction costs of -$0.2 million per annum, most of which relate to Noise-R3.
- Development costs: dwellings built in the some of the areas covered by the provisions will be required to meet higher acoustic standards which will result in additional costs. The additional development costs have been estimated by combining the development potential in each area

[31] At most 300 dwellings may be impacted per annum, which could result in additional building and assessment costs.

[32] Stephen Chiles - email correspondence "Re:Selwyn District Plan – road and rail" 13th May 2019.

covered by the reverse sensitivity provisions and costs for additional acoustic related construction. For most of the reverse sensitivity provisions the costs have been set at $28,500 per dwelling[33], which is an estimate of the costs of including a heat pump, heat recovery and ducted air-conditioning.[34] For Noise-R3 this report applies the NZTA estimates of the costs of acoustic treatment at a 90 metres set back ($8,000 per dwelling).[35] In total, the package of reverse sensitivity provisions could result in an additional development costs of -$1.3 million per annum, most of which relate to Noise-R3.

- Development opportunity: in some instances, the noise provisions in the Plan include a rule that seeks to avoid noise sensitive uses of land, which can reduce the development yield. In the case of Noise-R3 there is restriction on building for sensitive uses where there is no noise barrier or noise exceeds 57dBA within 100 metre of the highway or railway. This rule means that noise sensitive uses may not be built on approximately one-third of the land in the Noise-R3 overlay, unless a resource consent is obtained. In this report it is assumed that yield in residential zones drops by approximately a third.

  The Noise-R5 and Noise-R7 also include additional restrictions on building within higher noise areas, unless a resource consent is obtained. This restriction applies to land that has 55 dBA from the inland ports, which represents 8% of the land covered by Noise-R5. For the West Melton rifle range this restriction applies to the land with 65 dBA, which represents 15% of the land covered by Noise-R7.

  However, most of this development activity will not be lost to the District, being likely to relocate to other areas within the District or a resource consent could be sought.[36] The remaining development is assumed to result in loss of profit to the landholder of $100,000 per dwelling. In total, the package of reverse sensitivity provisions could result in lost development potential which costs of -$0.2 million per annum, most of which relates to Noise-R3.

To estimate the compliance cost savings, it is assumed that each of the businesses that benefits from the protections of the reverse sensitivity provisions would save a small nominal amount ($1,000 each) per annum because the noise provisions in the Plan are easier to comply with. In total the reverse sensitivity provisions could result in compliance costs savings of less than +$0.1 million per annum.

Finally, the Council is assumed to bear a small nominal amount of time administering reverse sensitivity provisions, relative to the ODP. It is assumed that the Council will be required to spend approximately $1,000 per new dwelling that are built within the areas covered by the reverse sensitivity provisions. The change in administration costs could be less than +$0.1 million per annum.

Based on the assumptions above, the broad assessment suggests that the costs of reverse sensitivity provisions in the Plan outweigh the benefits. The net difference between the benefits and costs is negative, at -$0.3 million per annum (see Table 4.1). Most of the (negative) value is associated with Noise-R3 (highway and railways), while the other four reverse sensitivity provisions produce very little costs or benefits.

[33] Noise-R4, Noise-R5, Noise-R6 and Noise-R7.

[34] Marshall Day (2019) Acoustic Insulation within NCB – Memo to Synlait.

[35] NZTA (2015) State highway guide to acoustic treatment of buildings.

[36] In this report it is assumed that 95% of the development relocates to other areas in the District.

4 Conclusion

This report has applied an economic assessment to establish the net outcome if the noise provisions in the ODP are changed to the proposed provisions in the Proposed District Plan. Specifically, this report has drawn on all available data to assess the potential costs and benefits for the key noise provisions. This assessment shows that the total package of provisions would produce a positive outcome for the community.

The economic assessment provides a quantification of the net cost and benefits, which is summarised in table form below (Table 4.1).

As would be expected Noise-R1, which covers all zones in the District, produces the widest and largest level of costs and benefits. The new noise rules for construction (Noise-R2) also covers the entire District, however only relates to construction activities which occur temporarily. The assessment in this report indicates that these two provisions in the Plan are likely to produce a positive benefit to the community relative to the ODP of +$3.9 million and +$0.6 million per annum respectively.

The reverse sensitivity provisions have much less impact (both in terms of costs or benefits) as they relate to small areas and relatively limited activities. While the assessment in this study shows that the Plan is likely to produce negative outcome for Noise-R3, the results are minor compared to the other provisions assessed in this report.

Our review of the material that supports Noise-R3 indicates that the blank application of 100 metre overlay may not be justified. It seems from NZTA guidelines that the overlay width of 100 metres is a generic maximum and that the overlay could be smaller if a noise assessment was undertaken for each State highway and railway in the District. If the overlay was reduced this would have obvious implications for the assessment of Noise-R3.

Table 4.1: Key Noise Provisions Net Costs and Benefits - $ million per annum

Cost and Benefits (annual)	Noise-R1	Noise-R2	Noise-R3	Noise-R4	Noise-R5	Noise-R6	Noise-R7	Package
Amenity Value	-$11.3	-$1.9	$0.3	$0.0	$0.0	$0.0	$0.0	-$12.8
Economic Activity	$14.6	$2.4	$0.0	$0.2	$0.4	$0.4	$0.0	$17.9
Assessment Costs	$0.0	$0.0	-$0.1	$0.0	$0.0	$0.0	$0.0	-$0.2
Development Costs	$0.0	$0.0	-$1.1	$0.0	$0.0	-$0.1	$0.0	-$1.3
Development Opportunity	$0.0	$0.0	-$0.2	$0.0	$0.0	$0.0	$0.0	-$0.2
Compliance	$0.6	$0.1	$0.0	$0.0	$0.0	$0.0	$0.0	$0.7
Administration	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Development Pattern Efficiency	$0.0	$0.0	-neg	-neg	-neg	-neg	-neg	-neg
Value $ million (2018)	$3.9	$0.6	-$1.2	$0.2	$0.4	$0.2	$0.0	$4.1

Caveat: it is important to note that it is inherently difficult to undertake an economic assessment of costs and benefits associated with noise. Notwithstanding the difficulty of the assessment, this report has quantified each of the costs and benefits based on a range of assumptions. The findings of this report are most sensitive to the Amenity value assumption (drawn from NZTA EEM) and the economic activity impacts (based on small incremental impacts).