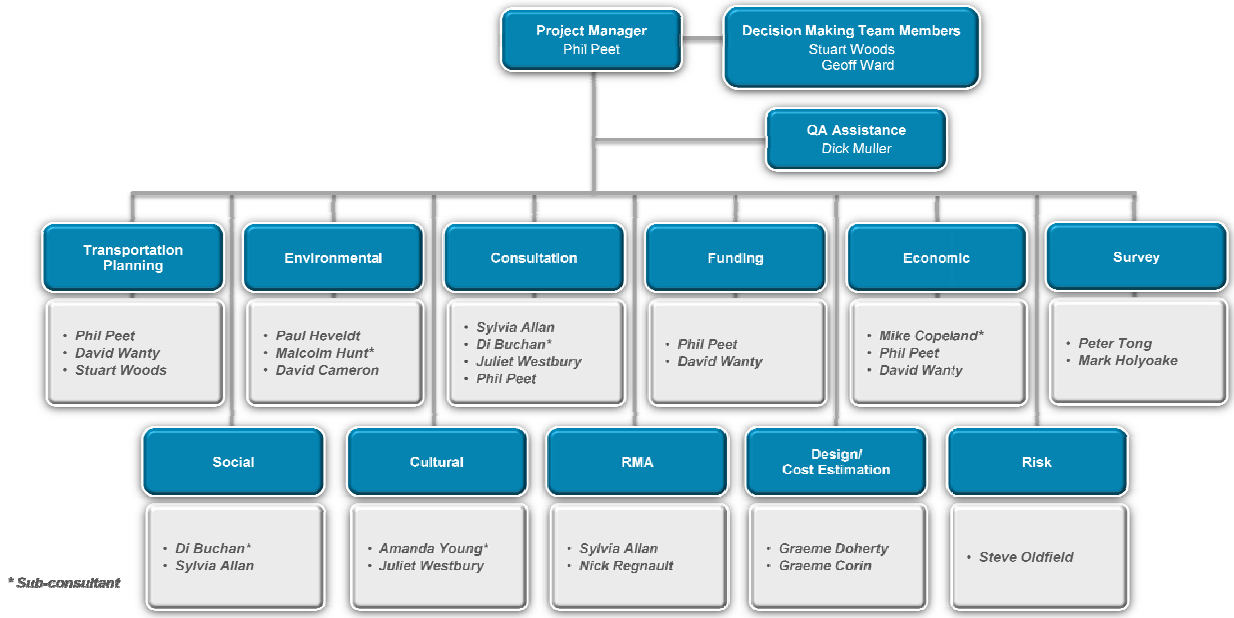
Appendix A: Decision Making Team

Andrew James	Nelson City Council
Martin Workman	Nelson City Council
Chris Ward	Nelson City Council
Selwyn Blackmore	NZ Transport Agency
Eddie Anand	NZ Transport Agency
Les Milligan	Nelson Marlborough DHB
Gary Clark	Tasman District Council
Phil Peet	MWH (Consultant Team Leader)
Geoff Ward	MWH (Member of Consultant Team)
Stuart Woods	MWH (Member of Consultant Team)
Sylvia Allan	Allan Planning and Research Ltd (Member of Consultant Team)
Di Buchan	Corydon Consultants Ltd (Member of Consultant Team)
Alan Nicholson	University of Canterbury

Appendix B: Consultant Team



Appendix C: Study Terms of Reference

TERMS OF REFERENCE
FOR THE
STUDY INTO THE EFFECTS OF ARTERIAL TRAFFIC FLOWS

OBJECTIVE: To determine the best transport configuration between Annesbrook and the QEII/Haven Rd roundabouts that will improve the city as a whole in the long term.

1. Evaluation of existing arterial traffic routes

(i) Model future traffic flows for 2016 and 2036 on the existing arterial routes between Annesbrook and the City assuming no additional roading capacity.

(i)(X) Model future traffic flows for 2016 and 2036 on the existing arterial routes between Annesbrook and the City assuming no additional roading capacity is made available except indirectly through the public transport improvements identified in the 2009-19 Community Plan for commencement in 2012/13.

(ii) Ensure the model is peer reviewed and signed off by the New Zealand Transport Agency (NZTA).

(iii) Carry out a cost/benefit assessment of the existing arterial traffic routes for the city and region as a whole, in the long term, in terms of the impacts identified in 3(ii), for both the base model (1(i)), and the base with PT model (1(i)(X)).

2. Selection of best arterial route options

(i) Review and summarise all transport route options between Annesbrook and the City, including those options raised as part of the Nelson to Brightwater Corridor Study.

(ii) Select those options likely to deliver the optimum transport route configurations for the city as a whole in the long term considering access to the CBD, waterfront, Port and State Highway.

(iii) Obtain sign-off from the NZTA that it is satisfied with the selected options.

3. Evaluation of best arterial route options

(i) Model these options for 2016 and 2036 traffic flows.

(ii) Carry out a cost/benefit assessment of the options for the city and region as a whole in terms of, but not limited to:

(a) Economic impacts – transport efficiency, travel time reliability, safety, land values, capital investment, and economic and employment activity from retail, marine and tourism opportunities in the city,

(b) Social impacts – on community dislocation and severance, schools and preschools, local facilities, parks and community areas, housing, tourism and amenity activity,

(c) Environmental impacts – noise, air and water pollution, and

(d) Cultural impacts – archaeological and heritage sites.

(iii) As part of the evaluation the future potential of Nelson's Waterfront and the Victory Urban Village, with and without arterial traffic flows, and the consequent Waimea Road and Tahunanui/Annesbrook Drive traffic flows, will be considered.

(iv) Where additional arterial transport routes are proposed, preliminary designs will be required to consider intersection treatments and any measures necessary to adequately address the direct and indirect environmental effects of those

designs to ensure accurate cost estimates are used. Liaise with the NZTA and obtain their sign-off for the preliminary designs.

(v) The assessment is to include interviews with all key stakeholders and open days for the affected communities to ensure all views and concerns are addressed and all benefits/disbenefits identified.

(vi) On completion, obtain sign-off from the NZTA that it is satisfied with the cost/benefit assessments.

4. Determination of preferred arterial transport configuration and comparison with existing arterial traffic routes

(i) From the evaluation in 3 above, determine the preferred future transport route configuration that will improve the city as a whole in the long term.

(ii) Compare this configuration to the existing arterial traffic routes (with and without PT) in terms of the future well-being of the region and its communities, and develop recommendations for consideration by Council.

(iii) Consult with the NZTA on the recommendations and seek its approval.

(iv) Present the study to Council in 2010.

Reference documents/studies and strategies

North Nelson to Brightwater Corridor Study
Gabites Porter Macro traffic model
Nelson City Council LTCCP
Nelson City Council Sustainability Policy
Nelson Urban Growth Strategy 2006
Draft RLTS and RLTP
Central City Strategy
Tahunanui Structure Plan
Nelson Resource Management Plan, including the Air Quality Plan
NZTA Cliff Management Strategy
NZTA economic evaluation manual
Environment Court decision on Southern Link
Social Wellbeing Policy
Pedestrian and Cycle Strategies

Key Stakeholders

Nelson Tasman Chamber of Commerce
Port Nelson Ltd.
NELSUST Inc.
NZ Road Transport Association
Victory Community Association
Automobile Association
Bicycle Nelson Bays
Nelson Marlborough District Health Board
Tahunanui Business Association Incorporated
Waimea Road and Rutherford Street Businessmen's and Resident Incorporated Society
Ministry of Education and relevant school and pre-school principals
Nelson Tasman Regional Economic Development Agency
Nelson Tasman Tourism
Save Nelson's Waterfront and Rocks Road Association
Motel Association of New Zealand
Nelson Heritage Advisory Group

Nelson Forests Ltd.
SBL Group Ltd.
Friends of Nelson Haven
Royal Forest & Bird Protection Society
Sustainable Transport Futures
Local MP's
Police,
Fire Service,
Nelson-Tasman Civil Defence Emergency Management Group

Appendix D: Economic Assessment Report

DRAFT

NELSON ARTERIAL STUDY
ASSESSMENT OF ECONOMIC OUTLOOK WITHOUT SIGNIFICANT NETWORK UPGRADES

Brown, Copeland & Co Ltd

23 February, 2010

1. INTRODUCTION

1.1 The purpose of this report is to provide an overview of the economic outlook for Nelson City and Tasman District (i.e. the Nelson/Tasman region) over the next 20 years. This will provide a base against which to consider the economic impacts of a number of network upgrades in terms of economic effects.

1.2 The economic outlook for both Nelson City and Tasman District are considered because of cross boundary interactions, particularly with respect to:

- Port Nelson as the exit port for much of the primary industry exports from the Tasman District;
- Nelson City being the place of employment for a number of the residents of Tasman District; and
- Richmond's rapid growth and position as a service centre and place of employment for residents of both Tasman District and Nelson City.

1.3 Like the rest of New Zealand, the Nelson City and Tasman District economies are not immune to cyclical effects of business cycles and changes in such things as interest rates, exchange rates, world commodity prices, central Government policies and the state of world financial markets. It is not intended to forecast such impacts but to provide a broad overview of the medium to long term (i.e. for the next 10 to 20 years) economic outlook for Nelson City and Tasman District.

1.4 The next section of this report presents data and information on the current situation and future outlook for the Nelson/Tasman region. Section 3 considers the likely distribution of future growth within the region. The report's conclusions are presented in Section 4.

2. NELSON/TASMAN REGION – CURRENT SITUATION, RECENT TRENDS AND FUTURE OUTLOOK

Population

2.1 Statistics New Zealand estimates give the 2009 population in Nelson City as 45,000 and in Tasman District as 46,800. Tasman's population has grown faster than Nelson's in recent years and it has been the larger of the two since 2003. Since 2006, population in Tasman is estimated to have grown at a rate of 0.7% per annum and in Nelson by 0.5% per annum. This compares to a rate of 1.0% for New Zealand as a whole. Over the 10 year period 1996 to 2006 the annual rate of population growth in Nelson was 0.7% and in Tasman was 1.7%. For all New Zealand over this period the annual rate of population growth was 1.2%.

2.2 Statistics New Zealand medium projections for Tasman's population are to average 0.7% per annum growth over the period 2006 to 2031 and for Nelson 0.4% per annum. For New Zealand as a whole the expected average growth rate over this period is 0.8%.

Employment[1]

2.3 Total Employment. Despite Tasman's population growing faster than Nelson's in recent years, employment growth in Tasman has in fact fallen by 1.6% over the last five years, whereas employment in Nelson has grown by 2.5%.This has occurred because of the contrasting fortunes of various industries within the region. These are discussed below.

2.4 Agriculture, Forestry and Fishing. The region's employment by industry is highlighted by its significant reliance on primary sector industries. As at March 2009 agriculture, forestry and fishing in Tasman accounted for 4,850 employees in Tasman (27% of the District's jobs) and 980 employees in Nelson (4% of the City's jobs). For the combined Nelson/Tasman region the number of jobs in this industry group was 5,830 or 14% of the region's workforce. This compares with 6% at the national level.

2.5 However employment in this group for the region has fallen over the period 2000 to 2009 by 1,060 jobs or by 15%. This is largely as a consequence of a reduction in the number of jobs in apple and pear growing (reducing from around 3,000 to 2,200). Although grape growing employment has increased (from around 60 to 240) it has been more than offset by a reduction (from around 310 to 100) in employment in berry fruit growing.

2.6 Employment in forestry and logging has been reasonably constant in the region with 395 jobs in 2000 and 366 jobs in 2009 – a fall of 7%.

[1] Data in this section from Statistics New Zealand unless stated otherwise.

2.7 Employment in the fishing industry has fallen from 1,000 in 2000 to 815 in 2009 – a reduction of 19%. Whist employment in aquaculture has increased from around 45 to 110 over the period, fish trawling , seining and netting and other fishing has fallen from around 990 to 775.

2.8 Manufacturing. Manufacturing in the Tasman/Nelson region accounted for 4,940 jobs in 2009 but this was down from 5,490 jobs in 2000 – i.e. a fall of 10%. The most significant part of the manufacturing sector in terms of employment is seafood processing, but employment in this industry has fallen from 2,020 jobs in 2000 to 1,340 jobs in 2009 (a fall of 34%). Meat and meat products manufacture employment has fallen from 263 to 48 jobs, dairy products manufacture employment has fallen from 170 to 126 jobs, fruit and vegetable processing has increased from 150 to 160 jobs, beverage manufacture has increased from 170 to 190 jobs, log sawmilling and timber dressing employment has increased from 590 to 620 jobs, other wood products manufacturing employment has increased from 470 to 540 jobs, fabricated metal products manufacturing employment has increased from 300 to 410 jobs, transport equipment manufacturing employment has decreased from 276 to 236 jobs and machinery and equipment manufacturing has increased from 230 to 280 jobs.

2.9 Manufacturing employment is now split approximately 50/50 between Tasman (2,370 jobs in 2009) and Nelson (2,570 jobs in 2009) but whereas manufacturing employment in Nelson has fallen by 26% since 2000, it has increased in Tasman by 17%.

2.10 Construction. Employment in the region's construction industry has grown from 1,560 jobs in 2000 to 2,830 jobs in 2009, an increase of 81%. The growth has been similar in Tasman (80%) and Nelson (83%). In 2009 Nelson has 1,570 construction jobs and Tasman had 1260 jobs.

2.11 Wholesale Trade. Employment in the region's wholesale trade sector has grown from 1,430 to 1,500 jobs (an increase of 5%) over the period 2000 to 2009, although all of the increase in jobs has been in Nelson (from 940 to 1,010 jobs). The number of jobs in wholesale trade in Tasman in 2009 was 490, the same as in 2000.

2.12 Retail Trade. Employment in retail trade in the Nelson/Tasman region in 2009 was 4,770 jobs up from 3,840 jobs in 2000, an increase of 24%. Retail jobs increased in Nelson from 2,350 to 2,840 jobs (a 21% increase). In Tasman retail jobs increased from 1,490 to 1,930 (a 30% increase), reflecting the increasing importance of Richmond as a retail centre within the region.

2.13 Accommodation and Food Services. Employment in accommodation and food services for the region increased from 2,530 jobs in 2000 to 3,550 in 2009, an increase of 40%. The increase was most marked in Tasman from 980 to 1,610 jobs (an increase of 64%), as compared to Nelson where jobs in this industry grew from 1,550 to 1,940 (an increase of 25%). Employment in this industry in the region for 2009 accounted for 8%, only slightly more than the 7% for all New Zealand. Whereas the accommodation and food services workforce for Nelson/Tasman region accounts for 2.7% of the national workforce in this industry, the region accounts for 2.1% of the population. This indicates that whilst tourism is an important industry for the region it is not as significant as for other parts of the country.

2.14 Professional, Scientific and Technical Services. Nelson/Tasman employment in this industry group has grown significantly from 1,360 jobs in 2000 to 2,250 jobs in 2009 – an increase of 65%. Nelson has the most of these jobs – 1,380 in 2009 up from 970 in 2000, an increase of 42%; but growth in Tasman has been faster – 870 jobs in 2009 up from 390 jobs in 2000, an increase of 123%.

2.15 Administrative and Support Services. Administrative and support services account for 1,840 jobs in the Nelson/Tasman region in 2009 up from 1,210 jobs in 2000, an increase of 52%. However these jobs are concentrated in Nelson, which accounts for 1,250 (68%) of these jobs in 2009 up from 660 in 2000, an increase of 89%. Tasman in 2009 had 590 of these jobs up from 550 in 2000, an increase of 7%.

2.16 Education and Training. Education and training in the Nelson/Tasman region accounts for 3,050 jobs in 2009, up from 2,370 jobs in 2000, an increase of 29%. Again these jobs are concentrated in Nelson with 2,070 (68%) in 2009, up from 1,300 in 2000, an increase of 60%. In fact jobs in Tasman in this industry fell from 1,070 in 2000 to 980 in 2009, a decrease of 8%.

2.17 Healthcare and Social Assistance. This industry group accounted for 5,140 jobs in the Nelson/Tasman region in 2009, up from 3,740 in 2000. Because of the location of the hospital in Nelson, most of these jobs (4,280 or 83%) are in Nelson, where these jobs have grown by 35%. Tasman in 2009 had only 860 of these jobs, up from 560 in 2000 (i.e. growth of 54%).

2.18 Summary. The agriculture, forestry and fishing sector although particular important to the region, especially for Tasman has reduced in significance over the past decade. Manufacturing has also declined in importance for the region as a whole, but this reflects a loss of manufacturing employment in Nelson, since manufacturing employment within Tasman has grown. Employment in the services sector (including construction, wholesale trade, retail trade, accommodation and food

services, professional, scientific and technical services, administration and support services, education and training and healthcare and social assistance) has grown in the last decade. Nelson is the predominant provider of employment for industries in this sector, especially health care and social assistance, education and training, administrative and support services and wholesale trade. However although Nelson is still the predominant provider of employment Tasman has exhibited faster growth in job numbers in the retail trade, accommodation and food services, professional, scientific and technical services and health care and social assistance.

2.19 For Tasman, job losses in agriculture, forestry and fishing have over the last five years largely offset increased employment in manufacturing, tourism, professional, scientific and technical services, construction, health care and social assistance and retailing.

2.20 For Nelson, job losses in manufacturing and agriculture, forestry and fishing have been more than offset by increased employment in health care and social assistance, education and training, administration and support services, professional, scientific and technical services, tourism, construction and retailing.

Tourism

2.21 As a guide to the level of tourism activity in the Nelson/Tasman region, Ministry of Tourism data relating to visitor nights in commercial accommodation spent in the Nelson Regional Tourism Office (RTO) area are considered. This does not include small accommodation providers or those staying with friends and relations. Also the data are for the Nelson RTO area and therefore aggregate together Nelson and Tasman visitor nights.

2.22 For international visitors the trend has been increasing numbers of visitor nights from 1.3 million in 2003 to 1.5 million in 2008 – i.e. an increase averaging 2.9% per annum. However in 2009 international visitor nights are estimated to have fallen to 1.4 million, a drop of 7.0%. The Ministry of Tourism is forecasting international visitor nights to increase by an average of 1.8% per annum over the period 2009 to 2015.

2.23 Domestic visitor nights fell from 2.4 million in 2003 to a low of 1.9 million in 2005. Since then they have increased to 2.1 million in 2009 – i.e. an average annual increase of 2.5% per annum. The Ministry of Tourism is forecasting domestic visitor nights to increase by an average of 0.5% per annum over the period 2009 to 2015.

2.24 For total visitor nights (i.e. international plus domestic), visitor nights are estimated at 3.5 million in 2009 (split 60% domestic and 40% international) and are forecast to

increase to 3.8 million in 2015 at an average rate of increase of 1.1% per annum. By 2015 domestic and international visitor nights will be split approximately 55/45.

2.25 In 2009 Nelson's RTO accounted for 3.5% of national visitor nights. This compares with the Nelson/Tasman region accounting for 2.1% of national population.

Port Statistics

2.26 Volumes of freight through the Port of Nelson have remained relatively static in the past four years at around 2.6 million tonnes per annum. Future growth over the next 9 years is expected to average around 0.6% per annum. (Source: Gabites Porter Modelling Update data).

3. SPATIAL DISTRIBUTION OF FUTURE GROWTH

3.1 On the basis of the preferred options set out in the Nelson Urban Growth Study (NUGS) future "greenfields" residential development in Nelson City is likely to be concentrated in the south of the City – i.e. in the foothills to the east of Stoke and in south Nelson. There is scope for greenfields residential development north of the city at Atawhai and in the longer term greenfields residential development is earmarked for Hira, also north of the city centre.

3.2 Further residential intensification is planned for the existing residential hubs of Stoke, Tahunanui and the Central City.

3.3 As noted above, Tasman District's population is expected to continue growing at a faster rate than for Nelson City. In particular Richmond's population is expected at a much faster rate than for the remainder of the Tasman District.[2]

3.4 Therefore in general terms new residential development would appear to be largely focussed south of the City Centre. However increased congestion on arterial road links south of the City Centre may have the effect of shifting the focus north with perhaps increased pressure for earlier residential development at Hira.

3.5 Employment in Nelson City is likely to be increasingly focussed on the Central City with the continued increase in relative importance of the services sector and reduced importance of manufacturing and the primary sectors. However within the services sector education and training, health care and social assistance and some of

[2] Data taken from the 2009 Tasman District Council Growth, Supply-Demand Model suggest a rate of population growth for Richmond 0.4% per annum higher than for the whole of the Tasman District over the period 2009 to 2029.

professional, scientific and technical services are likely to be located away from the City Centre. Accommodation and food services is also likely to spread throughout the City with concentrations in the City Centre, Tahunanui and Stoke.

3.6 Despite it faster growth in population, overall growth in employment in Tasman has been static in recent years and Tasman is likely to continue to be a net supplier of employees to Nelson City.

4. CONCLUSIONS

4.1 Recent trends in population growth and employment in Nelson City and Tasman District suggest faster population growth in Tasman District and the south of Nelson City, but an increasing intensity of employment to the north – i.e. in, an adjacent to, the Central City area of Nelson.

4.2 Enhancement of arterial routes to the south of the Central City area might accentuate this trend.

4.3 If congestion builds up to significant levels on arterial routes to the south, then a reversal of these trends may occur. Greater residential development may occur to the north of the Central City area. Also there may be greater dispersal of employment locations away from the Central City area. However to the extent some future employment growth is dependent upon a central city location, it is at risk (i.e. it may locate out of the region) if congestion increases substantially on arterial routes to the south of the Central City.

4.4 It can be expected that increased congestion on the Rocks Road route would tend to push land uses such as light manufacturing, distribution and storage to Richmond and perhaps further into the Tasman District, given the lack of alternative sites for these activities within Nelson. Greater congestion on the Rocks Road route might also drive some hospitality land uses (e.g. accommodation, restaurants, bars and cafes) into Nelson's Central City area. However again increasingly congested access to Nelson's City Centre (via either the Rocks Road route or inland routes) is likely to increase the amount of such activity which instead of locating in and adjacent to the City Centre is located to the south – e.g. Stoke, Richmond and elsewhere within the Tasman District. Increased congestion on the Rocks Road route will reduce the competitiveness of the Nelson/Tasman region's primary product exports using Port Nelson and therefore have a downward influence on employment in these industries.

4.5 Therefore in general terms increased traffic congestion, resulting from no improvement to the arterial routes to the south of Nelson's Central City, will lower

employment for the Nelson/Tasman region generally and encourage employment growth in Richmond and elsewhere in the Tasman District at the expense of employment growth within Nelson City.

Appendix E: Noise Assessment Report

Nelson Arterial Transport Study (NATS)

Assessment of Noise Effects Existing Roading Network

8 April 2010

Report Reference:
998-776-06(FIN-2)

Report Status:
FINAL

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Nelson Arterial Transport Study (NATS)
Assessment of Noise Effects
Existing Roading Network

MalcolmHuntAssociates
noise and environmental consultants

1.0 Introduction

Malcolm Hunt Associates (MHA) have been commissioned by Montgomery Watson Harza (MWH) on behalf of Nelson City Council (NCC) to carry out a traffic noise assessment for a Nelson Arterial Route. Current and future levels of noise effects experienced by noise-sensitive land uses (such as residential dwellings) relating to the operation of the existing roading network have been investigated. This report assesses the following existing arterial routes:

1. State Highway 6 (often referred to as the Rocks Road route) and ;
2. Rutherford Street / Waimea Road;

The purpose of the study is to review the generic noise effects of these two existing routes in terms of levels of current and future traffic noise along the two routes received at adjacent sensitive land uses (residential, schools etc), also taking into account noise from non-road traffic related sources (airport and seaport noise).

The study has been based on roading characteristics of the routes (width and location of traffic lanes, traffic flows, etc.) and the types of land uses that have developed in areas adjacent to these routes. Forecasts of future effects assume an increased population density and forecast increased future traffic flows (data provided by MWH traffic engineers). Information on noise levels and effects have been gleaned from the previous Southern Link noise studies and the Southern Link Environmental Court Decision [Decision No C35/2004].

2.0 The Study Area

The study area is from Annesbrook in the south to the QEII/Haven Road Roundabouts in the north. The study area is shown in **Figure 1** below in the two maps.

Figure 1: Study Area. Not to Scale. Reference: Goggle Earth Maps. NOT TO SCALE

2.1 State Highway 6 (Rocks Road)

The State Highway 6 route is approximately 5.6km long with a speed limit is 50km/h for the entire route. The Annual Average Daily Traffic (AADT) volume on Rocks Road, taken south of Richardson Road, was 20,200 vehicles per day (vpd) in 2009.

SH6 is named Rocks Road between Richardson Road and Tahunanui, but continues to comprise one lane in each direction. The highway along this stretch again is bounded by the sea on the western side. On the eastern side, steep banks and a reserve front the highway until residential development again appears towards Tahunanui.

Traffic signals have recently been installed at the intersection of SH6 with Bisley Ave, Beach Road and access to the beach. At this location SH6 heads back inland slightly along Tahunanui Drive. Tahunanui Drive also comprises one lane in each direction but includes a flush median with right turn bays for the majority of its length. Land use is predominantly retail and commercial, with Tahunanui School also fronting the highway on the western side. At Parkers Road, the highway becomes Annesbrook Drive which continues the cross section from Tahunanui Drive of a single lane in each direction with a flush median. However, the land use becomes residential all the way to the Annesbrook Roundabout at the southern end of the scheme

2.2 Rutherford Street / Waimea Road

The Rutherford Street / Waimea Road route is approximately 6.3km long. The speed limit is 50km/h apart from a stretch of road where Waimea Road approaches the Bishopdale reserve, adjacent land use becomes much less frequent and the speed limit increases to 70km/h. The AADT volume on Waimea Road, taken at Bishopdale Hill, was 25,100 vpd in 2009. The AADT volume on Rutherford Street, taken between Waimea and Nile was 14,400 vpd in 2009.

The Rutherford Street/Waimea Road route initially travels south from the QEII Drive (SH6) roundabout along Haven Road to Halifax Street. Haven Road has two lanes in each direction separated by a wide planted median. There are a few commercial properties adjacent to the northbound carriageway which are the only developed land along this stretch.

The Rutherford Street/Waimea Road route then takes a left at a roundabout into Halifax Street before making a right at traffic signals into Rutherford Street. Halifax Street comprises only one lane in each direction but widens to two lanes at the approach to the intersections at either end of the short link. Halifax Street is bounded by Anzac Park to the south and playing fields and commercial properties line the route on the northern side.

Rutherford Street is a wide retail / commercial street which runs through the Nelson Central Business District, one block to the east of Trafalgar Street, the main retail street in Nelson. A slight bend in the road signals the route diverting onto Waimea Road. Land use surrounding Waimea Road includes a hospital, schools and kindergartens as well as residential properties with some minor commercial and retail in pockets. As Waimea Road approaches the Bishopdale Reserve, adjacent land use becomes much less frequent. The speed limit increases to 70km/h and a short passing lane is provided in each direction. The route passes the seagull intersection of The Ridgeway before the speed limit reduces again to 50km/h on the approach to the Beatson Road roundabout. At this location traffic can choose to travel south via Waimea Road and Main Road Stoke, or continue along Whakatu Drive to the Annesbrook Drive roundabout to travel south via the SH6 Stoke Bypass. The route between The Ridgeway and the Annesbrook Roundabout has very few property accesses although it is passing through a residential area.

In terms of the State Highway 6 route the northern end of the study area is the Haven Road / QEII roundabout, which is a three arm roundabout with the SH6 on the western and northern arms. The arterial route initially travels west from this location along Haven Road past Port Nelson to Waterloo Quay. Land use adjacent to this section is predominantly commercial and industrial.

Haven Road becomes Wakefield Quay with the left turn bend towards the waterfront. Land use from Haven Road to Mary Ann Lane is mostly commercial with some restaurants and apartment buildings also along the road frontage. From Mary Ann Lane to Richardson Street the highway is bounded by the seawall on the western side of the road, with no development except the Boat Shed Café. On the eastern side of the road, residential properties line the route.

3.0 Traffic Noise Effects on Receiving Environment

The purpose of the report is to review the generic effects of road traffic noise within the existing receiving environment and to forecast the effects for a period of time into the future (in this case, 30 years into the future). Types of land uses affected by noise from the existing traffic routes that may be sensitive to noise from land transport are summarised as follows:

- Residential properties (dwellings, apartment buildings etc);
- Commercial properties (retail, restaurants, offices, accommodating facilities etc);
- Healthcare (hospitals etc);
- Childcare centres, kindergartens and schools;
- Parks and reserves (playing fields, open space recreational areas etc).

Land adjacent to the State Highway 6 route is mostly zoned 'Residential' under the Resource Management Plan, however there are two small areas adjacent the route zoned 'Suburban' being located in Haven Road and the top of Wakefield Quay opposite the port which represent commercial activity areas. There are a few sites zoned 'Suburban' under the Management Plan located in Tahunanui.

For the Rutherford Street and Waimea Road route, the majority of land use is 'Residential' under the Resource Management Plan, however the further north alone the route towards the Nelson CBD the zoning becomes a mixture of 'Residential' and 'Inner City'. There is a large industrial area between the two routes located between Vanguard and St Vincent Streets.

In terms of noise sensitivity, residential sites are viewed as the most noise sensitive as would any habitable space which requires special protection from noise such as wards in hospitals or classroom learning environments in schools for example. Commercial properties also require some protection to a lesser degree.

Surveys of the ambient noise environment by Nelson City Council in 1999 and 2009 have found traffic noise has been identified as one of the predominant source of noise in the area along with Nelson Airport and Nelson Seaport. The following describe the two routes and adjacent receiving environments. Key zones types and receiving environments have been underlined.

3.1 Effects on Adjacent Land Uses from Existing Traffic Noise

The effects land based transportation noise from local roads and the state highway network is primarily related to the proximity to noise sensitive sites alongside the route(s). Heavy trucks operating in a residential area, for example, will potentially have a greater adverse effect than trucks travelling through an industrial area.

Traffic noise is quantified using a 24 hour L_{eq} average sound level, in "A weighted" decibels (dBA) reflecting the overall subjective response on a daily basis, rather than reaction to isolated noise events (e.g. the passage of individual heavy vehicles). The L_{eq} (24 hour) is determined by the logarithmic sum of L_{eq} (1 hour) over the 24 hour period. In New Zealand, traffic noise is assessed at 1 m from the façade of dwellings.

Figure 2 indicates a general scale of noise effects for everyday noise sources:

Acoustic Pressure Pa	Sound Pressure level (dB re 2 x 10^{-5})	Typical Examples
200	140	Engine Test Cell
20	120	Jet Take Off at 50m
2	100	Chain Saw Operator
0.2	80	Noisy Factory Lawnmower (85)
0.02	60	Restaurant (70) Car Interior (60)
0.002	40	Normal Voice at 1m Private Office
0.0002	20	Whisper TV Studio
0.00002	0	Threshold of Hearing

Figure 2: dB sound pressure levels for common sound sources.

There are no statutory noise limits or requirements that control or regulate the effects of noise from traffic on the existing roading network. The Nelson City Resource Management Plan does not deal with traffic noise from either new or altered roading developments. The New Zealand Transport Agency [NZTA] Planning

Policy Manual is designed for the integrated planning and development of new state highways and sets out *Noise Guidelines* based on Appendix 6 - Transit New Zealand's "Guidelines for the Management of Traffic Noise – State Highway Improvements" which have been in effect since 1994. These noise guidelines have been developed to assist practitioners in procedures under the Resource Management Act by defining "design limits" for new or altered roads beyond which it is stated significant adverse noise effects may occur. The traffic noise guidelines specify limits for new or altered state highways based on an increase in future traffic noise over and above existing traffic noise levels. As above, these guidelines do not apply to noise from existing roads that are not being altered or realigned.

The measurement of levels of existing road traffic noise levels can be measured in the field, or alternatively there are relatively reliable methods that can be used to predict current or future traffic nosie levels that will be received at any given distance from the road. The model most commonly used to predict road traffic noise in New Zealand is the Calculation of Road Traffic Noise model (CRTN) originally prepared in the United Kingdom. This model has been validated for use in Australia and in New Zealand with minor modifications.

Figure 3 illustrates the predicted 24 hour (L_{eq} (dBA)) sound pressure level for SH6 and Rutherford / Waimea Road based on the above traffic data set out in ***Section 2.1*** and ***Section 2.2***, based on 50 km/hr speed limits. The expected levels are similar based on both routes having similar AADT volumes and speed limits. Note the drop off in noise level with increasing distance which occurs naturally as a result of the hemispherical spreading of the sound from the source (being the road vehicles).

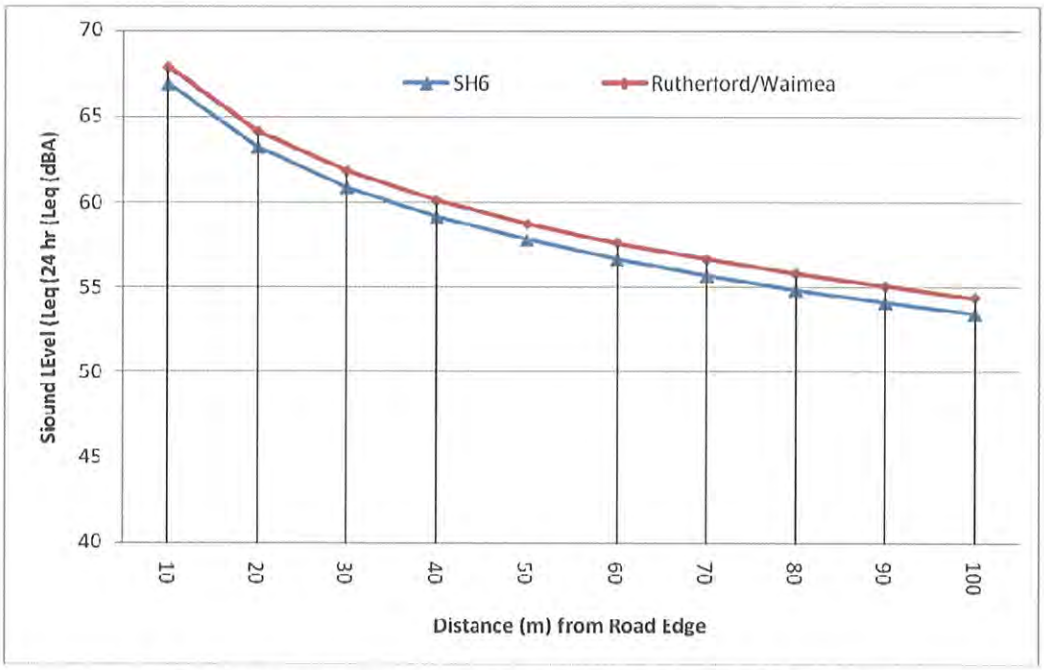


Figure 3: Predicted 24 hour (L_{eq} (dBA)) sound pressure level for the two routes.

Figure 3 shows typically traffic noise levels of 57 dBA or more would be expected within about 50 metres of the road. Higher levels arise at closer distances to the road. It is evident that traffic noise is currently emitted in significant quantities into the receiving environment adjacent the two roading corridors.

As above, there are no specific New Zealand guidelines for assessing the effects of noise from existing roads. As set out below, international guidelines indicate traffic noise levels above 55 dBA can be seen as significant, within levels above 65 dBA measured outdoors being generally unacceptable for noise-sensitive land uses such as residential accommodation. These levels of traffic noise are typically received at the frontage of dwellings located along the two existing traffic routes that lie within about 85 metres and 17 metres (respectively) from the edge of the road.

The World Health Organisation [W.H.O] has set environmental guideline values for outdoor living areas of 50-55 dB L_{eq}. This guideline value is set at the level of lowest adverse health effect and is intended to address annoyance effects, speech intelligibility and communication interference, disturbance of information extraction, sleep disturbance and hearing impairment caused by a various sources of environmental noise, including road traffic noise.

In Australia 55 dBA L_{eq} (24 hour) is considered the threshold above which adverse effects on people and communities may commence, with levels above 65 dBA L_{eq}(24 hour) representing possible unhealthy levels of noise exposure [Lansdell & Cameron1998].

The World Health Organisation[1] criteria are widely quoted as suitable to protect health and well-being. In Australia these guidelines have been interpreted [Lansdell & Cameron1998] as follows:

Below 55 dBA
L_{eq} during the day [at house front], damage caused by noise is very slight. Sound conditions enable the most noise sensitive activities to be carried out normally;

Between 55 and 60 dBA
Noise impact remains limited, but some disturbance is probably occasioned to the more sensitive individuals, in particular, older persons;

Between 60 and 65 dBA,
Behaviour designed to reduce the annoyance is exhibited, although not too constraining. Effects on sleep and especially the level of annoyance increase very appreciably [and];

Above 65 dBA
Constrained behaviour patterns arise, symptomatic of serious damage caused by noise.

Generic noise effects on adjacent land uses of road traffic noise received at levels between 55 and 65 dBA are likely to be annoyance and sleep disturbance. Annoyance would primarily be related to outdoor amenity and effects in front yards and garden areas or parks. Schools which have outdoor teaching areas and open classrooms are likely to be affected by road traffic noise. The most significant noise effect is likely to be sleep disturbance to potential health impact on the individual.

The presence of significant noise from the existing network does not mean that the existing environment alongside the two traffic routes is unsuitable for residential uses. It is observed that the community has evolved in the presence of noise from existing routes with noise levels generally increasing the area as a result of traffic growth over the years.

In terms of additional noise sources which have effect on these environments (excluding traffic) these are discussed in the following section:

3.2 Future Traffic Noise Effects

Future increase traffic noise effects will be determined by;

a) Increases in levels of road traffic noise (such as increasing traffic volume over the assessment time frame of approx 30 years);
b) Increasing urban living densities over the 30 year period in areas such as areas where apartment buildings are established in the vicinity of the two routes.

Although a number of factors can cause increases in traffic noise levels (such as increasing vehicle speed or increasing noise from individual vehicles), the reality is that with vehicles generally becoming quieter and traffic speeds on existing routes not able to increase to any significant extent, the only likely roading change to cause increased traffic noise in the future is growth in the number of vehicles using the existing routes each day. Traffic engineers at MWH have estimated future increase in 24 hour traffic volumes for a point in time 26 years into the future. Estimated future AADT values for the year 2036 are 24,500 on SH6 and 27,500 on Waimea Road. Both these increases represent an increases of less than 20% above current traffic volumes on the existing routes. Using the accepted CRTN prediction methods, the decibel increase as a result of the growth in daily traffic volume is calculated to be quite small, less than 1 dB. This more or less imperceptible change would occur over a time period of 26 years. However, this does not account for changes in traffic composition, such as heavy vehicles being more prominent in the traffic stream than they are currently. A doubling of the proportion of heavy vehicles in the traffic stream would result in a 2.3 dB increase in daily traffic noise.

Concerning the intensification of sensitive land uses within areas affected by noise from the existing routes, there appears to be some scope for new apartment buildings and in-fill housing on some lots, however it is considered the existing housing stock is not likely to be significantly replaced or re-newed within the 30 year time frame. The increase in noise effects due to land use changes increasing the number of noise-sensitive dwellings affected are estimated to be quite minor, in the region of 5%, certainly less than 20%.

Forecast increases in traffic noise emitted by the existing network are likely to increase by only a small amount within the planning time frame. The growth in daily traffic volumes will mean that the 57 dBA contour currently located about 50 metres from the roadside, will shift further away from the road, by about 10 metres. This means a small (5%) increase in dwellings that could be considered to be adversely affected however the effect is not large. A 100% increase (doubling) of daily AADT traffic volumes will only result in a 3 dB increase in daily traffic noise. A 3 dB increase could be significant as this would have affect of increasing the distance to the 57 dBA contour from 50 metres to 90 metres from the edge of the road which would mean an estimated 25% increase in the number of dwellings affected.

[1] Berglund B, Lindvall T. 1995. World Health Organization. Community Noise Guideline Document. WHO, Geneva.

Thus, based on assumed steady economic development of the district consistent with a "business as usual" scenario, the forecast is for increase in traffic noise effects from the exiting routes over the 30 year time frame to be quite limited (say 10%) unless wholesale land use changes occur within the planning timeframe to increase the number of dwellings located within areas affected by traffic noise (which does not seem likely).

3.3 Non Traffic Noise Sources

The acoustic environment is affected by non-traffic related noise sources which contribute to the overall ambient sound scape of the area. Two Resource management Plan designations in the area that have noise-related emissions include Nelson Airport and Port Nelson (which both have noise boundaries in the Resource Management Plan).

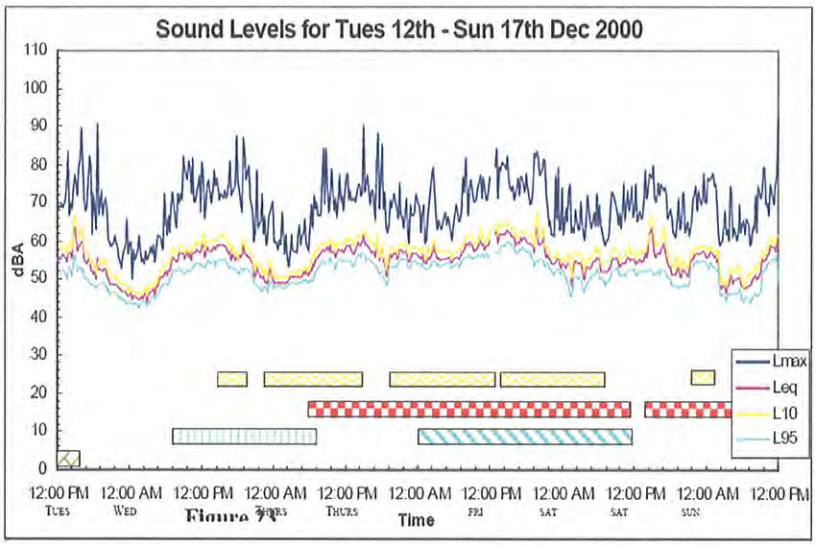
Both the airport and port operate seven days a week, with the Nelson Airport being one of the Countries busiest commercial airports with more than 2,600 air seats in and out per day. There are approximately 90 aircraft movements daily, with a plane taking off or landing on average every 4.5 minutes during scheduled hours.

Nelson Airport uses monitored aircraft movements from landing and takeoff for particular types of aircraft, to derive the total amount of aircraft noise at various reference sites. The Airport then uses this to assess compliance with the Nelson Resource Management Plan.

The key noise sources associated with the airport is fixed wing aircraft, taxing, approach and take off noise firm aircraft (namely props) using the site. The most significant off site noise source which may produce noise will be aircraft noise associated from commercial aircraft (fixed wing and helicopters) overfly with approach and departures would be received in the wider environment, albeit for a limited time.

Port operations associated with Nelson Seaport include ships at birth, and activities on wharves and other structures within the coastal marine area and on land. Noise associated with the seaport includes noise from machinery and mobile plant etc. In terms of noise associated with ship activity at birth the port has container ships, logging ships, MDF (roll on roll off) shipping, fuel and fishing vessels.

Figure 4 illustrates a historic sample of 5 day sound levels from port activities carried out a 66 Queens Road (approx 125m south from the port).



- Containers
- Logs
- MDF (Roll on Roll off)
- Petrol
- Fish

Figure 4: Historic sample of 5 day sound levels from port activities carried out a 66 Queens Road (approx 125m from the port). Reference; Nelson City Council.

The Nelson Resource Management Plan controls commercial, industrial and residential noise; however the Council is not responsible for the management of motor vehicle noise or noise from over flying aircraft.

Noise from the construction of new roads or the operation of the port or airport is however managed by the Council.

Noise associated with the seaport and airports has lead to development of New Zealand Standards due to the special characteristics associated with these two types of operations taking into account the projected future growth which is used to model future noise contours.

The Nelson Resource Management Plan uses the airport and seaport noise contours to introduce land use planning controls to "avoiding, remedying or mitigating any adverse effects on the environment", examples of these controls are the Nelson Airport Overlay or the Nelson Port Control Overlay where controls are placed on development and require noise insulation of habitable spaces. These port and airport noise boundaries have been set by Council to ensure maximum acceptable sound levels for the protection of community health.

Figure 5 below illustrates the Nelson Airport Designation and Airport Control Boundaries.

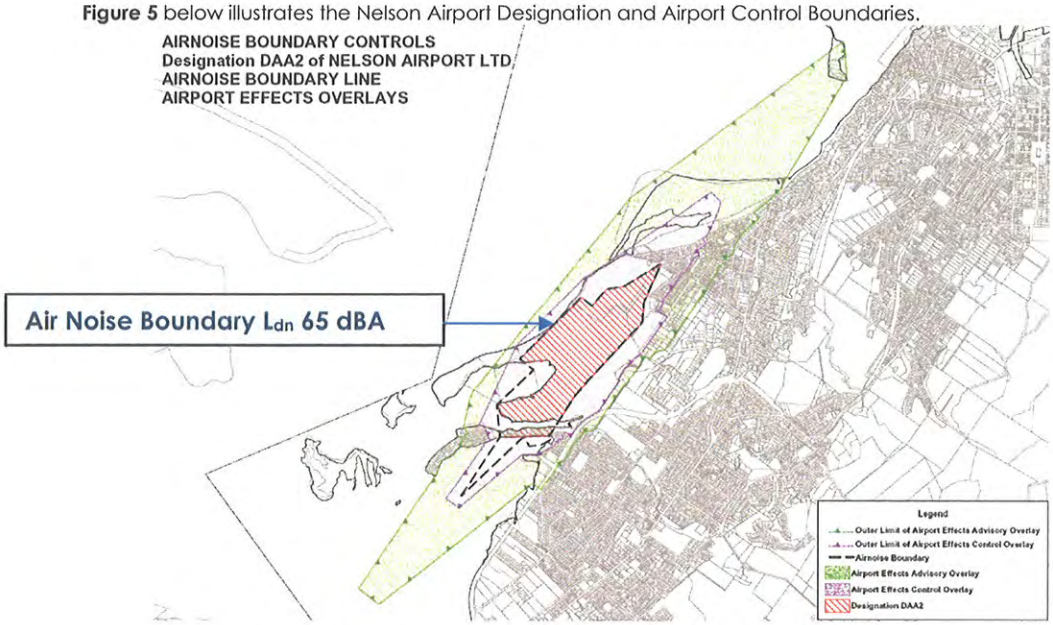


Figure 5: Nelson Airport Designation and Airport Control Boundaries. Reference Nelson Resource Management Plan [MAP_A4_1].

Figure 6 below illustrates the Nelson Port Control Boundaries.

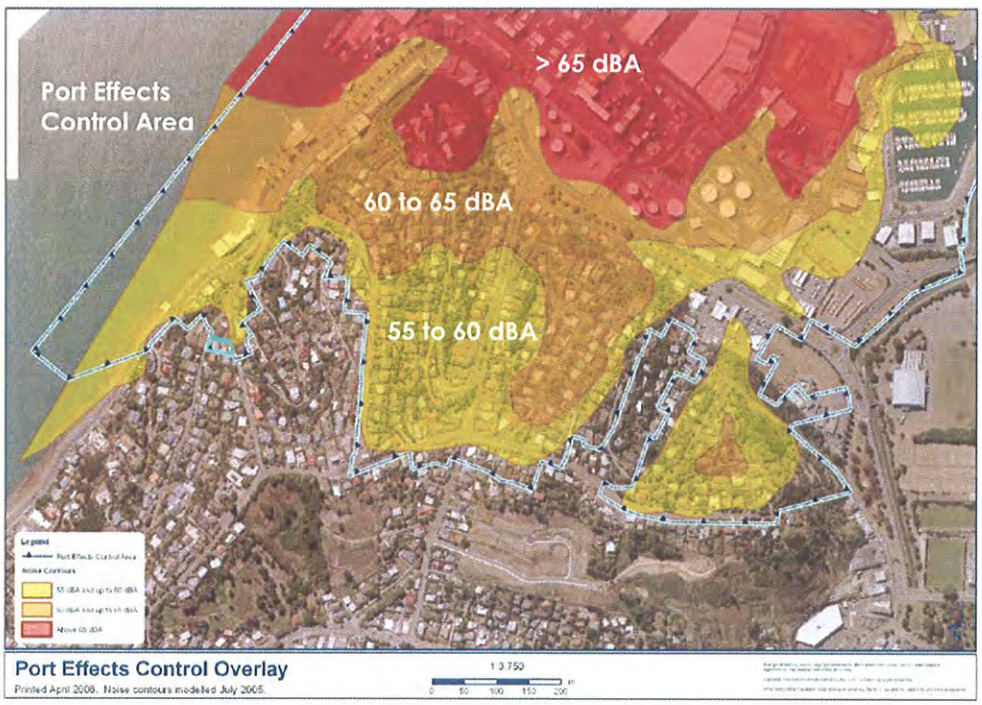


Figure 6: Nelson Port Control Boundaries. Reference Nelson City Council Port Noise Residential Guide.

There is also noise produced from commercial and industrial activities in the area including areas such as the Lakes Road area (mainly industrial).

The chief commercial area in Nelson relates to the CBD. Noise emissions here relate to shops offices and commercial activities, which themselves have many traffic-related noise sources. It is however generally accepted that these land use activities would only localised noise impacts associated with their particular site and location as opposed to the area wide noise effects which are produced from the existing arterial routes in the area.

The above areas (excluding the airport and seaport) may include the following noise sources:

- General day to day noise from residential activities i.e. people, lawnmowers, weed trimmers, etc;
- General day to day noise from commercial activities i.e. people, machinery, plant, vehicles (on site), etc;
- People noise associated with the above activities.
- Temporary noise from such things as construction, people using parks and reserves etc are also noise effects to be considered.

4.0 Summary

A review of the noise-related effects of the two existing main arterial routes in Nelson city has been carried out for the current day and for a hypothetical 'business as usual" scenario 30 years into the future.

The review has found the two routes have a corridor of noise emissions which are characterised in terms of traffic volume and speed, as well as traffic flow conditions. Potential adverse noise effects on adjacent land uses have been identified for noise-sensitive land uses, of which annoyance and sleep disturbance are likely to be the most significant. It is observed land use activities along the two routes exhibit some sensitivity to traffic noise effects due to increasing traffic in the future, however these land uses have developed over time in presence of significant amounts of road traffic noise and noise from non -traffic sources.

Currently, the community has assimilated these potentially significant noise levels without apparent adverse effects, although it is likely noise sensitive persons have shifted away from the existing routes if they were sufficiently disturbed by the noise. Thus, it can be surmised that the community has "grown up" with significant levels of road traffic noise and has learned to cope.

The analysis shows current levels of road traffic noise (and ensuing effects) will likely increase within the next 30 years. The estimates are for a limited increase in numbers of properties affected by significant levels of traffic noise, with the increase estimated to be 10% within the 30 year time frame for "business as usual" economic development of the district. Optimistic growth forecasts indicate an increase of up to 25% of the number of properties affected by significant levels of traffic noise, however such growth in noise levels coupled with increasing density of dwellings within noise-affected areas would appear unlikely in our view.

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Glossary of Environmental Noise Terms

Noise Level Descriptors

Time-Averaged Sound Level (Leq,T)
The Leq, T or $L_{eq,T}$ sound level is the averaged sound level (or equivalent sound level) that has the same mean square sound pressure level as the time-varying sound level under consideration. Commonly referred to as an "energy average" measure of sound exposure. The L_{eq} is made up of all the sound with the averaging time or measurement period a critical factor in determining the overall level. In terms of the measurement survey the L_{eq} sound level provides a good indication of all measured sounds during the measurement period, including high level sounds and low level sounds.

Single Event Maximum Sound Level (Lmax)

The Lmax or L_{max} value is the single highest sound level occurring during the monitoring period and usually arises from isolated single sound events such as "bangs" or "thumps". This descriptor is important for sleep protection and has therefore been incorporated in District Plan night time noise limits (between the hours of 10pm and 7am).

A-weighted Sound Pressure Level
The sound pressure level of a signal which has been passed through an "A" weighting filter whereby both low and high frequency components are attenuated without affecting the component near 1000 Hz. The unit is the decibel, but it is usual to distinguish between this and other uses of the decibel by writing the unit as dB(A).

A-weighting
A frequency-response adjustment of a sound level meter that makes its reading conform to human response. The sensitivity of the human ear is frequency dependent. At low and high frequencies, the ear is not very sensitive, but between 500 Hz and 6 kHz the ear is very sensitive. The A-weighting filter is a broadband filter that covers the interval from 20 Hz to 20 kHz. The shape of the A-weighting curve approximates the frequency sensitivity of the human ear. So the A-weighted value of a noise source is an approximation to how the human ear perceives the noise.

Airborne Sound
Sound that reaches the point of interest by propagation through air.

Attenuate

To reduce the level of:

- sound intensity by various means (for example, air, humidity, porous materials, etc.)
- sound level per unit distance by divergence, diffusion, absorption, or scattering

dB
decibel. A bel (after Alexander Graham Bell) is defined as the logarithm to base ten of the ratio of two acoustical powers, or intensities. One tenth of a bel, the decibel, is the generally used unit.

dBA, dB(A)

A sound-level meter reading with an A-weighting network simulating the human-ear response at a loudness level of 40 phons. The weighting is specified in ANSI Specifications for Sound Level Meter, S1.4-1983

Decibel (dB)
The primary unit of sound measurement; used to quantify both sound pressure level and sound power level. Used for measuring the relative magnitude based on a logarithmic scale.

Decibel Scale
A linear numbering scale used to define a logarithmic amplitude scale, thereby compressing a wide range of amplitude values to a small set of numbers.

Level
A sound pressure level in dB means that it is calculated relative to the standard reference level of 20 μPa for airborne sound. The word "level" associates that figure with the appropriate standard reference level. In common usage the level of a signal is its amplitude, but strictly speaking the term should be reserved for the amplitude expressed on a decibel scale relative to a reference value.

Logarithm
The exponent required (power to which a number must be raised) to produce a given number. For example, used in acoustics, 10 to the exponent 2 = 100; the log of 100 = 2.

Weighting Network
An electronic filter in a sound level meter that approximates, under defined conditions, the frequency response of the human ear. The A-weighting network is most commonly used.