NELSON CITY COUNCIL

Nelson Air Quality Plan

Proposed Plan Change A3

s42A Report – Appendix 5

Economic impacts

Report Date
21 April 2016

Hearing Date
3 May 2016

Nelson City Council
te kaunihera ō whakatū

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Interpretation

This report utilises a number of abbrievations as set out in the glossary below:

Abbreviation	Means…
"the Act"	Resource Management Act 1991
"the AQP"	Operative Nelson Air Quality Plan
"BCP"	Behaviour Change Programme
"the Council"	Nelson City Council
"HAPiNZ"	Health and Air Pollution in New Zealand
"NCC"	Nelson City Council
"NESAQ"	Resource Management (National Environmental Standards for Air Quality) Regulations 2004
"NES"	National Environmental Standards
"NPV"	Net Present Value
"the Operative Plan"	Operative Nelson Air Quality Plan
"PCA3"	Proposed Change 3 to the Nelson Air Quality Plan
"the Plan"	Operative Nelson Air Quality Plan 2008
"the Plan Change"	Proposed Change A3 to the Nelson Air Quality Plan
"PM_{10}"	Particulate Matter 10 micrograms or less in diameter
"RMA"	Resource Management Act 1991
"RPS"	Nelson Regional Policy Statement 1997
"s32"	Section 32 of the Resource Management Act 1991
"ULEB"	Small scale ultra-low emission burning appliances
"HAPiNZ"	Health and Air Pollution in New Zealand

1.0 INTRODUCTION

Report Author

1.1 My name is Lawrence Ryan McIlrath. I am an Associate Director at PWC (NZ).

1.2 I hold a planning degree (BA. et Sc. (Planning)) with Economics as a major as well as a Master of Business Administration from the Potchefstroom Business School[1].

1.3 I have fifteen years' experience in economic consulting and, in this time, I have completed numerous economic assessments and evaluations, including:

a. assessing the economic effects of retail developments;

b. evaluating the economic contributions of airports and airport networks; and

c. assessing the effects of proposed developments and policies on natural resources such as water and air quality.

1.4 I have been asked by the Council to prepare this addendum to the s42A report on PCA3.

1.5 Along with contextual information and other matters of fact, this report includes my personal views and recommendations. These views and recommendations are my own, except where I indicate otherwise.

1.6 Though not a requirement of Council plan change hearings, I have read and agree to abide by the Code of Conduct for Expert Witnesses, and have prepared this report in accordance with it. The report content is within my area of expertise except where stated otherwise. I have not omitted to consider material facts known to me that might alter or detract from the opinion expressed in this report.

1.7 In some instances, I have specifically relied on the evidence, expertise and/or views of others. The main parties being:

[1] South Africa

a. Dr Emily Wilton from Environet. This relates specifically to the projected change in burners[2] and the resulting PM_{10} emissions (percentage change in concentration in each airshed over time);

b. The Health and Air Pollution in New Zealand (HAPiNZ) studies, reports and models[3,4]. These are used to estimate the health effects and costs associated with different PM_{10} concentrations;

c. Nelson City Council information, including the capital costs associated with different burner types and fuel costs as well as Council's administrative and regulatory costs[5];

d. Statistics New Zealand, including population and household projections[6].

Report Scope and Structure

1.8 This report relates to the economic issues associated with PCA3, and is set out as follows:

a. **Section 2** provides a summary of the key economic considerations and findings underpinning the development of the plan change; and

b. **Section 3** includes a discussion of the submissions of relevance to my report.

[2] The data for each scenario were emailed to me in Excel format and Dr Wilton discusses here findings in her evidence.
[3] Examples include the Health Effects Model and the Updated Exposure Model.
[4] The HAPiNZ model and reports can be accessed from: www.hapinz.org.nz.
[5] This was based on personal conversations and email correspondence.
[6] Soured from Statistics New Zealand. Subnational projections (downloadable from http://nzdotstat.stats.govt.nz/wbos/Index.aspx under the 'population projections heading').

2.0 ECONOMIC CONSIDERATIONS

Assessment Approach

2.1. The economic assessment for PCA3 relied on the approach outlined in the Health and Air Pollution in New Zealand (HAPiNZ) studies. The assessment assumes that the relationships between health effects and PM_{10} concentrations, as presented in the HAPiNZ model, are accurate.

2.2. The assessment compares a number of scenarios against a baseline[7] scenario. This baseline scenario reflects a 'business as usual' situation under the current AQP and reflects the underlying movements and trends that are expected to drive the number of burners over the next 15 years. Examples of these drivers include:

a. the natural attrition rate of wood burners (replacements and/or removals of appliances);

b. population and household changes and growth rates including the shift in population demographics and age profiles; and

c. the phasing out of burners under the existing AQP.

2.3. The following scenarios[8] were assessed:

a. Enabling a *limited* number of ULEBs through a combination of new/amended policies, rules or other methods;

b. Enabling an *unlimited* number of ULEBs through a combination of new/amended policies, rules or other methods;

c. Enabling a site-by-site 'allowance' of particulate matter to be discharged[9], irrespective of the heating mechanism used (this is a performance limit);

[7] The baseline scenario is based on the modelling work undertaken by Dr Emily Wilton (for the domestic emissions and burner numbers by type) as well as household and population projections as published by Statistics New Zealand. It
[8] The scenarios were identified by the Council as part of the overall plan change process.
[9] This limit would likely be based on the discharge typically associated with a ULEB.

d. Enabling an unlimited number of NESAQ-compliant burners (NES burners) through a combination of new/amended policies, rules or other methods; and

e. Enabling a limited number of ULEBs through a combination of new/amended policies, rules or other methods but with a particular emphasis on behaviour change of burning practice across the Nelson Urban Area.

2.4. For each scenario, the estimated PM_{10} concentrations (per airshed) were translated into health effects using the HAPiNZ methodology. In simple terms, the health effects are based on the relationships between exposure to PM_{10} concentrations and the population's[10] (individuals) response to those concentrations. Essentially, this gives an indication of the number of health incidences[11] that can be linked to air quality (PM_{10}) levels. Once the health incidences[12] are known, it is possible to estimate the health cost. This is done by multiplying the health effects (count) by a cost factor (Dollar value) [13]. It is important to note that the costs associated with the health effects are borne by the wider community so they are classified as public costs.

2.5. There are also other public costs. These costs are associated with the Nelson City Council's spending to manage and enforce its Air Quality Plan and include:

a. meteorological monitoring, analyses and reports;

b. monitoring equipment rental and ancillary costs; and

c. programme design and development costs, implementation costs, communication and assessments[14].

2.6. In addition to the public costs, there are private costs that fall to individuals and households. In the context of this study, these include:

[10] Such as population ageing.
[11] This includes premature mortality, cardiovascular and respiratory hospital admissions, reduced activity days.
[12] As defined by HAPiNZ.
[13] Both the incidence rates and the cost factors were obtained from the HAPiNZ model. Where appropriate, the health costs (factors) were updated.
[14] This relates to all air quality management activities but specifically to behaviour change programmes.

a. costs associated with removing and replacing burners (such as consent fees, cost of the burner/appliance and builder's fees); and

b. Operating costs such as fuel and maintenance.

2.7. For this assessment, the total cost[15] associated with each scenario was estimated and compared against the total cost of the baseline scenario. In some cases, the costs of a scenario are lower than the baseline scenario suggesting that costs are not incurred. For example, if a scenario's health costs are lower than the baseline's, then that scenario has 'better' health outcomes. This is because some of the health effects (and therefore costs) are avoided. If a scenario's air quality is comparatively better than the baseline then it will have better health outcomes, lower health costs and therefore it will be viewed in a more favourable light.

2.8. Nelson City Council has been actively engaged in managing the City's air quality, and under the current AQP, air quality has been improving. This improvement is expected to continue. This 'continuous improvement' is important because it is in line with Council's 'maintain or improve' objective.

2.9. This also means that any scenario that results in a comparative decline in air quality will increase the public cost.

Assessment Results

2.10. Each airshed was assessed separately.[16] **Table 1** below summarises the results and shows the costs of the scenarios. A negative cost means that the cost of that scenario is less than the baseline and this is seen as a savings (or benefit). *Note: The Dollar values in this section are in Net Present Value (NPV) terms, out to 2030 using a discount rate of 3.25 per cent[17].*

[15] This includes both the public and private costs.
[16] The economic assessment was based on Environet's emissions modelling, burner numbers and temporal distribution.
[17] This discount rate is lower than the rates normally used when assessing commercial projects or investment opportunities. This because it is used in a societal context (i.e. a social discount rate).

Table 1: Results

Scenarios	Total Cost ($'m NPV @ 3.25%)				
	Nelson A	Nelson B1	Nelson B2	Nelson C	**Total**
Limited ULEBs	11.0	18.0	125.6	108.6	**263.2**
Unlimited ULEBs	118.3	48.9	125.6	111.9	**404.7**
Performance Limits	-	-	129.0	109.1	**238.1**
Unlimited NES	220.1	63.8	174.9	178.0	**636.8**
Behaviour Change	-10.5	-	26.9	18.7	**35.1**

2.11. The analysis suggests that the behaviour change scenario returns the lowest costs relative to the baseline. At a Nelson-wide level (all airsheds combined), the behaviour change scenario returns the lowest total cost. Crucially, this scenario is also the only one that results in a net improvement in PM_{10} levels relative to the current situation (AQP). Therefore, this is the only scenario that yields a health cost saving ($14.6m out to 2030).

2.12. The next best[18] scenarios are: the performance limits scenario and the limited ULEB scenario. Of these two scenarios, the limited ULEB scenario transfers a smaller portion of cost to the wider community (10.8% vs 11.7%) meaning that it is marginally better. The performance limits scenario covers only two of the airsheds so caution is needed when comparing it with the limited ULEB scenario.

2.13. On an airshed basis, the analysis returns the following:

a. Airshed: Nelson A

i. The behaviour change scenario delivers a cost saving of around $10.5m (in NPV terms);

ii. The limited ULEBs scenario (enabling 200 ULEBs in this airshed) delivers the second lowest total cost ($11m, of which 20.9% is health costs);

iii. The unlimited ULEBs and unlimited NES burners scenarios both impose extra cost on the community. For the unlimited ULEBs

[18] In terms of the lowest total cost.

scenario, this increase is due to a shift in operating costs and for the unlimited NES burner scenario, the shift in health costs drives the increase.

b. Airshed: Nelson B1[19]

i. The limited ULEBs (enabling 500 ULEBs in this airshed) scenario generates the lowest total cost. The total cost for this scenario is estimated at $18m and includes $2.3m of health related costs;

ii. The unlimited ULEB scenario returns the second lowest cost of all the scenarios ($48.9m). Fourteen per cent of this is health related.

c. Airshed: Nelson B2

i. The behaviour change scenario delivers the shift for the lowest overall cost ($26.9m). In this airshed, the behaviour change scenario delivers a cost saving ($1.8m) by improving air quality (i.e. reducing PM_{10} level relative to the baseline);

ii. The two scenarios relating to ULEBs (limited and unlimited) are both more cost effective than the other scenarios. These two scenarios are both assessed to cost $125.6m of which $7.5m will be health related.

d. Airshed: Nelson C

i. The behaviour change scenario delivers the change for the lowest overall cost ($18.7m that includes a health saving of $2.2m);

ii. The limited ULEB scenario[20] is the second lowest cost option. This approach will add $108.6m to the baseline cost. Fifteen per cent of this ($16.4m) will be in the form of health costs.

2.14. The analysis suggests that a behaviour change scenario is, compared to the other scenarios, the most cost effective. Such an approach is likely to

[19] Not all of the scenarios are applicable to this airshed. The behaviour change and performance limits scenarios are not applied to this airshed (based on the information received from Dr Emily Wilton).
[20] Limited to 3,000 ULEBs in this airshed.

deliver further improvements in air quality (PM_{10}) and therefore deliver positive health effects (i.e. a benefit because the total health costs are reduced relative to the baseline). However, this scenario does not apply to all airsheds. The limited ULEB scenario covers all airsheds and is the second lowest cost scenario.

3.0 SUBMISSIONS

Introduction

3.1. I have reviewed the Council's summary of submissions received. Less than a third of the 108 submitter have raised a point that has an economic dimension.

3.2. With reference to the relevant submissions, the main themes touched on are:

a. a desire to allow more burners to be installed; and

b. the cost of burners relative to other heating methods.

3.3. These themes cut across the issues as identified and classified by Council so there is some repetition in the discussion below.

Issues

3.4. This report adopts the issue-based approach from the main s42A report. This is done to assist the reader to reconcile the issues and responses across the different areas of expertise. It covers the following matters raised by submitters:

a. better monitoring, enforcement, education, and/or burning practice should be applied;

b. ULEB should be enabled in more/all airsheds;

c. enable burners with reduced/no limits on the number or type;

d. NES burners should be enabled instead of, or in addition to, ULEBs;

e. adopt 'Option 3' from the Staff Report considered at the December 2015 Council meeting (when notification decision on PCA3 was made);

f. wood burners are better, more effective and/or more efficient than heat pumps;

g. opposition to the plan change due to the effect of new burners on ambient air quality; and

h. adequacy of the s32 Report.

3.5. Each of these matters is discussed below, with responses from an economic perspective.

Better monitoring, enforcement, education and/or burning practice

3.6. Twelve submissions[21] raised the role of monitoring, enforcement, education and/or burning practice as important methods for managing ambient air quality.

3.7. The economic assessment pointed to the behaviour change programme as a cost effective approach to deliver an improvement in air quality for the relevant airsheds.[22]

3.8. As part of good practice, the use of appropriate fuel (dry wood) and the correct use of appliances were raised by some submitters. These are important aspects with a clear impact on air quality (PM_{10} emissions), as noted by Dr Wilton.

3.9. From a cost perspective, most of the costs are public (Council-related and associated with the behaviour change programme). Council estimates the annual cost of this programme at $60,000[23]. This is a small cost when compared against the value of fuel that is used in Nelson each year. Across all scenarios, the fuel cost[24] incurred by households is estimated at between $923,000/y and $1.7m/y. For every one per cent improvement in fuel usage that the behaviour change programme delivers, households would be $9,230 better off due to improved health costs. This saving is insignificant compared to the associated health effects. A one per cent

[21] Submissions 1, 16, 22, 29, 53, 61, 75, 85, 87, 89, 103 and 107
[22] Excluding Nelson B1.
[23] This includes programme development costs, staff costs as well as information costs. It is envisaged that the programme will be reviewed every five years. The annual cost, net of the development costs, is estimated at around $35,000.
[24] This includes the effects of free fuel.

improvement in air quality (due to the behaviour change programme) translates into a health saving[25] of $1.5m.

3.10. My analysis is based on the emissions modelling and changing the degree to which the behaviour change programme delivers results will affect my assessment. Based on my sensitivity analysis, changing the degree of effect (from 10 per cent to 5 per cent) is unlikely to have a material effect on how the scenarios compare to each other. That is, the relative position of the scenarios is unlikely to change.

ULEB should be allowed in more (or all) airsheds

3.11. Thirteen submissions[26] sought that the airshed restrictions for ULEB should be relaxed or removed.

3.12. It is my understanding that the burner and emission modelling considered natural attrition, replacement rates by burner types as well as potential uptake rates to estimate the number of burners (by type) per year in each airshed. The count and mix (type and age) of burners as well as usage profiles influence the potential PM_{10} concentration levels. This implies that an airshed's capacity for burners is limited[27], irrespective of the burner type.

3.13. In light of the air quality standards as outlined in the NESAQ, it is not viable to remove the restrictions on burner types. Removing the restrictions on burner numbers could result in poorer air quality with an increase in health costs. If an airshed currently falls outside the NESAQ standards then enabling burners in a way that increases PM_{10} concentrations would be inconsistent with NESAQ as well as NCC's policy. From an economic perspective, increasing PM_{10} concentrations will result in additional health effects and therefore add to the total costs incurred by the community.

[25] This assumes that the relationship between behaviour change and emissions, as defined in the original emissions modelling, stays constant.
[26] Submissions 2, 6, 16, 18, 23, 29, 34, 36, 53, 58, 60, 76 and 108
[27] Assuming that a cap applies. In this case the NESAQ sets a limit.

Enable burners with reduced or no limits on number or type

3.14. Eight submissions[28] sought to relax or remove the limitations on the number and type of burners enabled by the plan change.

3.15. In essence, reducing or removing the limit on the number of burners is likely to lead to a degradation of air quality. Under a 'no limit' situation, there is no control over the number or type of burners that could be installed. An increase in the number of burners (without regard to type) is likely to lead to poorer air quality.

3.16. A decline in air quality, relative to the baseline[29], will impose health costs on the community. The scenario analysis has shown that any situation that results in a growth in PM_{10} emissions will add to the overall costs. In effect, such a situation adds costs without adding real benefits.

3.17. Simply enabling more burners to be installed does not take into account the wider costs (externalities) that will fall to society. These costs arise in the form of health effects and costs which are incurred at a society level.

3.18. Allowing unlimited installation of burners (NES or other) could lead to a situation where the total emissions increase to levels that are greater than the baseline. In such an instance, the poorer air quality outcomes will add costs to society. Such an approach is likely to undo the recent gains in Nelson's air quality. As the emissions modelling suggests, it is not only the count of burners affecting total emissions. How burners are used is also important as shown by the behaviour change programme scenario illustrates. The economic assessment also highlights this observation.

NES burners should be enabled instead of, or in addition to, ULEB

3.19. Twenty-three[30] submissions sought that NES burners should be enabled by the plan change, either instead of or in addition to ULEB. A key focus of several parties is that ULEB appliances are too expensive to purchase relative to NES appliances.

[28] Submissions 4, 48, 69, 73, 75, 76, 89 and 91
[29] As defined earlier, the baseline refers to a continuation of current situation and trends under the existing Air Quality Plan.
[30] Submissions 5, 7, 8, 22, 29, 35, 38, 42, 43, 53, 57, 61, 77, 80, 81, 84, 89, 93, 94, 99, 104, 106 and 107

3.20. A ULEB is currently more expensive to purchase when compared to a NES burner. Information received from NCC puts this difference at around $3,245 – a ULEB is almost double the cost of an NES burner. The operating costs (fuel) for NES burners and ULEBs are broadly similar[31]. This direct comparison highlights part of the reason why some of the submitters favour the NES burners over ULEBs.

3.21. It is important to note the above comparison is from a user's own perspective and does not include any of the wider costs associated with air quality and the associated health effects.

3.22. I note that ULEB-technology is relatively new and ULEBs are selling at a premium. The reason for achieving a higher price could be due to a range of factors. For example, the ULEB manufacturing process could be more complex than other burners so producers need to charge more. Another reason could be that the sellers are marketing ULEBs as a premium product (because they are more environmentally friendly) and are pricing them accordingly.

3.23. It is difficult to comment on the likely future price for ULEBs. Some submitters have indicated that the cost of ULEBs is likely to come down over time. While this could happen, the timing and scale of such a reduction is unknown. A reduction in the price for ULEBs could be driven by aspects such as growing demand for ULEBs that enables producers to achieve economies of scale. Another factor that could lead to lower prices could be an increase in the number of producers selling ULEBs thereby increasing competition, providing greater consumer choice leading to lower prices. However, if NES burners are banned and only ULEBs are allowed, then there is less choice (fewer alternatives) in the Nelson market. This would support ULEB-prices and remove some of the incentives to reduce prices.

3.24. Notwithstanding this above, the price of ULEBs has been trending down. The Bay of Plenty Regional Council Bay[32] research shows that, initially, a ULEB burner cost upwards of $11,000 as they were imported. Recently, the price has come down to around $5,500. The price movement reflected

[31] Some ULEBs also require a 220V connection to operate.
[32] Bay of Plenty Regional Council. Development of Second Generation Regional Air Plan. Report to: Regional Direction and Delivery Committee. 31 March 2016.

new models coming to market and locally-based producers[33] establishing and their products being authorised. With reference to the models, a part of the price reduction can be ascribed to greater variety and also smaller models

3.25. Irrespective of the price issue, if the total number of burners operating in Nelson City grows in a way that results in emission levels (PM_{10}) rising above the baseline, then the health costs would increase. The cost to users is raised by some submitters and they rightly highlight the cost difference. However, focusing solely on the appliance cost does not consider the social costs of poor air quality.

Adopt 'Option 3' from the Staff Report to the 12/15 Council meeting

3.26. Two submissions[34] sought that a discarded option considered as part of the PCA3 consideration of alternative – 'Option 3' – be favoured to the notified provisions. The key difference between Option 3 and the notified provisions is that the former uses the NES levels as a benchmark for the purposes of allocating new appliances, whereas the plan change aligns with the operative AQP policy direction of continual ambient air quality improvement.

3.27. Under the conditions sought by these submitters, Nelson's air quality is likely to degrade relative to the baseline projections. Using the NES levels as a benchmark is inappropriate because in some airsheds (Nelson B1, Nelson B2 and Nelson C) the projected PM_{10} levels are below the NES levels.

3.28. If the NES levels are used as the threshold for the different airsheds and the air quality is reduced to the NES levels (up from the current baseline projections) then health costs would be added. In addition, using the NES levels as thresholds, instead of the baseline projections, would be inconsistent with the principles of maintaining or enhancing air quality.

[33] Greater Christchurch Urban Development Strategy Implementation Committee. 11 March 2016.
[34] Submissions 35 and 97

Wood burners are better, more effective and/or more efficient than heat pumps

3.29. Seven submissions[35] cite the shortcomings of heat pumps as a reason to liberalise the proposed plan change provisions. Of relevance to my report, several of these submitters provide the view that wood burners are cheaper to buy and operate than heat pumps.

3.30. A household's decision between a heat pump and a burner is influenced by a number of aspects of which cost is only one. Both options have advantages and disadvantages. For example, a burner could add to the ambience while a heat pump could be used for cooling during summer.

3.31. The initial capital cost (installation and purchasing the appliance) is substantial for all the options but heat pumps have a comparative advantage. Medium sized heat pumps are in the order of $3,350 to purchase and install. Installing[36] a NES burner is almost 50 per cent more expensive ($5,000) and a ULEB is two to three times more expensive ($6,000-$9,000).

3.32. In terms of operational costs, the cost to operate a burner is broadly similar to that of a large heat pump (6kW) depending on the level of use. However, small to medium heat pumps (2kW-4kW) are more cost effective to use in smaller areas.

3.33. In Nelson, some households have access to free firewood. Thirty-four per cent of wood is self-collected, or obtained for free. Clearly, this portion of the market is likely to continue to exhibit a preference for burners.

Adequacy of the s32 Report

3.34. Three submissions[37] have challenged the adequacy of the s32 Report. No specific details are provided in that respect; however, in light of the submission, the Council has reviewed the notified s32 Report with 'fresh eyes' to ensure it is complete and fit for purpose.

[35] Submissions 5, 8, 11, 14, 16, 17 and 29
[36] This includes installation cost, consent fees and the appliance but is exclusive of removing an old/existing burner.
[37] Submissions 65, 66 and 103

3.35. The result of that review is that the notified report is adequate, but that the opportunity can be taken to clarify or amplify points that were not canvassed in depth within the report.

3.36. As part of the current reporting process, I have been asked by the Council to consider s32(2) in more depth. In this respect, my view is that the proposed plan change does not undermine or put economic activity (Gross Domestic Product) or employment at risk.

3.37. By avoiding the health effects, demand for hospital admissions and treatment costs is reduced. Given the budget constraints that health services face in general, any budget savings are likely to be reallocated to other areas. Therefore, the local health system is unlikely to see a loss of employment or downsizing due to health costs that are avoided.

3.38. Other areas that might experience a change in activity due to the proposed change include:

a. *Construction and building activity*: under the proposed plan, the number of new burners that are installed will be capped, though greater than the status quo. As a by-product, the level of building activity associated with burner installations will be limited. In the context of Nelson City's economy, the effect on the construction sector will be insignificant[38]. All the scenarios contribute positively to construction but this contribution is small. The demand created by PCA3 is likely to support less than a third of a construction job per year.

b. *Burner manufacturing and sales*: the proposed plan change is likely to send signals to burner manufacturers that there is a need to focus their activities on cleaner burning appliances. This will likely lead to an increase in Research and Development (R&D) spending and efforts to improve the cost competitiveness of ULEBs relative to other burner types. It is not known what portion of the R&D and manufacturing takes place in Nelson but I suspect that it is not material to the local economy or employment.

[38] The Value Added (similar to GDP) for the scenarios range between $20,100 and $214,000/year. This is the direct economic value associated with the construction activity arising due to households appointing builders to install burners. Using the Nelson-Tasman economy as benchmark, this is less than 0.07% of construction's VA.

c. *Retail effect*: The appliances will be purchased via a retail or reseller network. Changing households' ability to access appliances (by restricting access to some) will impact on the retail/reseller network by altering the type of burners that they can sell. If demand for burners is restricted then retailers' sales will be similarly restricted. In turn this will limit the potential (positive) economic impacts associated with retail sales. The retail sector's economic linkages (multipliers) are comparatively small as it reflects the final point before consumption by households so the economic (GDP) effect on the Nelson economy of restricting sales is likely to be small.

3.39. The industrial sectors[39] also discharge. My comments about the industrial and commercial sectors and the potential effects on these economic sectors are based on Dr Wilton's assessment of future capacity and demand for industrial emissions[40]. In airsheds A, B2 and C, industrial emissions account for a small (<5%) portion of total emissions. In addition, limited emission growth is expected in these airsheds. Dr Wilton reports that a 10% increase in Airshed B2 and C's emissions would not have a discernible impact on PM10 concentrations in these airsheds.

3.40. With reference to airshed B1, industrial discharges account for 41 per cent of total emissions. A NCC survey of industry in this area indicates the possibility of increases in industrial emissions of around 12% for this Airshed. Such an increase will have different effects depending on the response. If the growth in emissions is not enabled and it ends up constraining growth then it could have an impact on the GDP and employment. The scale of such an impact is dependent on the industry's ability to respond to the limit without reducing its output growth. If output is constrained, then there will be opportunity costs (as growth is foregone[41]).

3.41. Responding to the limits by way of fuel change and emissions control technologies can add to the cost to do business. The additional cost needs

[39] This definition is used in a broad sense and includes industrial, commercial, education and health activities.
[40] Assessing the future capacity allowance for industry. April 2016. Dr E. Wilton. Report prepared for Nelson City Council.
[41] The lack of information about how industry is likely to respond if faced with a limit on discharge makes it difficult to estimate the potential scale of the opportunity cost.

to be compared against societal costs. The potential health costs associated with the higher emission levels[42] is estimated at $3.9m.[43]

3.42. Businesses are increasingly conscious of the environmental pressures and their effects on environmental outcomes and are, therefore, using measurement approaches[44] such as Triple Bottom Line reporting to judge their overall performance.

Closing Comments

3.43. The assessment focused on the air quality component and the health effects associated with PM_{10} emissions.

3.44. The economic assessment has shown that the most cost effective approach is the behaviour change followed by the limited ULEB scenarios. This is based on households' cost to change their burners (i.e. the capital costs), the operating costs (fuel) and the health costs. The health costs reflect the costs that are incurred by the community.

3.45. It is worth noting that the Ministry for the Environment is in the process of reviewing the NESAQ and may move to using $PM_{2.5}$ to measure air quality instead of PM_{10}.

[42] This assumes that the total industry allowance (of 12%) is taken up and that this adds 3 per cent to PM_{10} concentration in the airshed. This is relative to the baseline and essentially reflects the marginal health cost of increasing industrial emissions by 12 per cent.
[43] NPV at 3.25% discount rate out to 2030.
[44] Ministry for the Environment and Sustainable Business Network. Enterprise3 Your Business and the Triple Bottom Line.