Appendix AQ2B: requirements for small-scale ultra-low emission burning appliances

Interpretation

The provisions below are requirements for ultra-low emission burning appliances.

The Appendix refers to 'authorisation' and 'certification' processes for appliances. Broadly, these processes are for the following purposes:

a) **Authorisation** is a process for confirming that specific appliances will operate within the emission and efficiency limits for ultra-low emission burning appliances; and

b) **Certification** is a process for managing the allocation of ultra-low emission burning appliances in the Urban Area.

Further detail on the authorised appliances is provided under AQ2B.2 and on the certification process under AQ2B.3.

AQ2B.1 Requirements for small-scale ultra-low emission burning appliances

Small scale ultra-low emission burning appliances must:

a) have an authorisation number or approval number assigned by Nelson City Council, or Canterbury Regional Council, operating as Environment Canterbury, or the Ministry for the Environment, and

b) contain the following information on a label permanently attached to the device and placed in a position which is clearly visible after installation of the device:

   i) the authorisation or approval number required by a) above, and

   ii) the Burner Allocation Certificate number assigned by Nelson City Council (see AQ2B.3.2 below), and

   iii) the statement "Performance may vary from test values depending on actual operating conditions", and

   iv) the approved fuel for use in the device, and

   v) the measured particulate emission rate in grams per kilogram (g/kg) or milligram per Megajoule(mg/MJ), and

   vi) the percentage measure of thermal efficiency (for appliances used for space heating only), and

   vii) the range of heat output tested (e.g. low, medium and high burner rates), and

   viii) a space to allow the installer to place the date of installation of the device.

c) not be modified in any way so as to alter the specifications of the heating device from those tested and authorised, and

d) be maintained in good operational order and operated in accordance with the manufacturer's instructions (so long as those do not mandate operation that would lead to output that does not comply with c)).

AQ2B.2 List of Authorised Appliances

Nelson City Council will maintain a 'List of Authorised small-scale ultra-low emission burning appliances' that achieve ultra-low emission and efficiency standards under real life testing conditions[1]. The list may be updated without further formality, and will be held at the Council offices and on its website (www.nelsoncitycouncil.co.nz) and will detail the following:

a) the appliance make and model, and

b) the authorised fuel for that appliance, and

c) whether or not the appliance was tested and approved with a water heating unit (wet-back) fitted, and

d) the particulate emission rate, grams of total suspended particulate burnt per hour on average, and

e) the space heating efficiency, where applicable, and

f) the authorisation number, and

g) the date when the authorisation expires, if relevant, and

h) any other relevant information.

AQ2B.3 Certification Processes

AQ2A.3.1 Context

The Plan permits 1,600 small scale ultra-low emission burning appliances in Airsheds B2 and C (collectively). This allocation of appliances is based on monitoring and modelling undertaken in 2015, which illustrated that ambient air quality levels in these airsheds was approaching 'Acceptable' levels (as described in Policy A5-1.3).

The allocation of new appliances in Airsheds B2 and C is contingent on an enhanced Behaviour Change Programme. This Programme has been designed to improve the manner in which small scale solid fuel appliances are operated across the Urban Area, and is anticipated to contribute to ambient air quality improvements such that the overall permitted allocation will not compromise the Plan's policy aim of continual air quality improvement.

[1] ~~An example of a real-life testing methodology is Environment Canterbury's Canterbury Method 1 for testing of ultra-low emission wood burners (Revision 1.5, January 2015.~~ Refer to the definition of small-scale ultra-low emission burning appliances for more information on real life testing

The 2015 studies also determined that new appliances could not be accommodated in Airsheds A and B1 based upon the observed ambient air quality levels in those airsheds being above the 'Alert' category (as described in Table A5-2 under Policy A5-1.3) without reducing the number of existing burners. For this reason, no appliances are expressly allocated in these Airsheds.

With time, it is possible that the Behaviour Change Programme, in combination with the Plan's other policies and methods (and other factors), will accelerate the improvement of the Urban Area's ambient air quality to a level where additional appliances can be enabled, including perhaps in Airshed A or B1. The Plan facilitates the realisation of that potential extra capacity for appliances by two processes:

a) Rule AQr26A.3, which enables a case-by-case assessment of appliances which are not permitted through a non-complying activity resource consent process; and

b) Through a certification process associated with updated monitoring and modelling after 2015.

This future certification approach recognises that the initial permitted allocation is based on a single 'snapshot' of the Urban Area's air quality levels, and that future assessments may indicate that additional appliances can be accommodated. It provides an efficient and certain process for enabling any additional allocation deemed appropriate through future studies relative to subsequent plan change processes or ad hoc non-complying activity resource consents.

As outlined below, it is anticipated that the Council will carry out monitoring and modelling exercises every two years using the methodology set out in section AQ2B3.4 to facilitate additional allocations where appropriate.

AQ2B.3.2 General requirement for certification

Prior to installation of any new small scale ultra-low emission burning appliance, a Burner Allocation Certificate (BAC) must be obtained from the Council.

AQ2B.3.3 Certification: Permitted appliances in Airsheds B2 and C

The Council will issue a BAC if ~~provided that the~~:

a) the small-scale ultra-low emission burning appliance is located ~~on a site~~ in Airshed B2 or Airshed C~~,~~; and ~~the following limits are not exceeded (from the date that Plan Change A3 was made operative):~~

b) when an application for a BAC is received by Council:

~~a)~~ i) if the application is for an appliance in Airshed B2, no more than 1000 appliances ~~shall be certified~~ hold a BAC in that airshed; or

~~b)~~ ii) if the application is for an appliance in Airshed C, no more than 600 appliances ~~shall be certified~~ hold a BAC in that airshed.

AQ2B.3.4 Certification: Any appliance in Airshed A or B1 and any appliance in Airshed B2 or C where AQ2B.~~2~~3.3 does not apply

For appliances in Airshed A or B1, and in Airshed B2 or C where AQ2B.3.3 does not apply, the Council will issue a BAC when the following procedure is undertaken and the requirements of the procedure are satisfied:

A. Methodology for determining capacity

This methodology is based upon the approach used in 2015 for determining airshed capacity for new appliances. It describes how future capacity will be determined (if any) for the purposes of additional certification of appliances not addressed by AQ2B.3.3.

While the approach is similar across all four Urban Area airsheds, there are some bespoke measures to be adopted for each as described below.

1. AIRSHED A

Background

The overall aim is to determine whether PM_{10} concentrations in Airshed A are within the ~~NES 'Alert' level~~ 'Acceptable' category value[2] (or better) when taking into account worst case meteorological conditions (as monitored between 2001 and 2014) and the extent to which there may be capacity in Airshed A for new installations of burners.

The method is based on an examination of the relationship between winter time PM_{10} concentrations and meteorological conditions in Nelson. Using data from Airshed A and local meteorological data it has been identified that high pollution episodes typically occur when there are more than nine hours per day of hourly average temperature less than five degrees Celsius and highest concentrations occur when the wind speed is less than 2 ms-1 for 24 hours.

Moreover, the years of 2003, 2006 and 2009 have been identified as containing likely worst case meteorological conditions with respect to the second highest PM_{10} concentrations. A worst case peak (second highest PM_{10}) to mean (smoothed data from winter high pollution dataset) ratio[3] of 1.56 from 2003 is used to estimate likely worst case peak concentrations based on average concentrations on days that meet the specified meteorological criteria.

The method requires the peak to mean ratio be applied to a 'rolling' three year average to ensure that the trend is sustained and minimises the potential that the result for any year is an anomaly occurring as a result of a low frequency of calms during the winter period.

Method

Step 1: Identify days between May and August inclusive which have nine or more hours of average hourly temperatures less than five degrees Celsius. Take the average of PM_{10} concentrations on days that meet this criterion for each year. Note that the analysis can only be

[2] The term 'Acceptable' here and in the methods for Airsheds B1, B2 and C below relates to the category described in Table A5-2 of Policy A5-1.3

[3] The peak to mean ratio is determined by dividing the second highest PM_{10} concentration for each year by the smoothed average of PM_{10} concentrations on days that meet the specified meteorological criteria.

undertaken if valid data for the period May – August (all meteorological conditions) exceeds 75%.

Step 2: To get a three year average representative of high pollution events, average the most recent year's PM_{10} concentrations for high pollution days (step 1) with the equivalent value for the preceding two years.

Step 3: Multiply the three year winter average PM_{10} for high pollution days (step 2) by a worst case peak to mean ratio of 1.56.

Step 4: Express the peak concentration from step 3 relative to the ~~NES~~ 'Acceptable' category value of ~~50~~ 33µg/m^3 by dividing it by ~~50~~ 33µg/m^3 and multiply by 100 to give a percentage. A value greater than 100% represents non-compliance with the ~~NES~~ 'Acceptable' category value for PM_{10} and a value less than 100% indicates available capacity. The capacity would be represented by subtracting the resulting percentage from 100%.

Step 5: ~~Assess the ability for additional burner numbers by considering the extent of capacity available,~~ Issue a BAC if the targets in Policy A5-1.3 and Policy A5-1.4 can be met.

In determining whether these targets can be met, the Council must consider ~~having regard to~~:

a) the ~~impact of~~ worst case meteorological conditions established under steps 1-3; ~~on concentrations (including airshed dispersion); and~~

b) the capacity for compliance with the 'Acceptable' category value established under step 4;

c) the number of ULEBs in the Council's inventory of certified appliances ~~burners installed~~ (and therefore the number that may still be certified/installed under the current allocation); and

d) real life emission factors and fuel use for new small-scale ultra-low emission burning appliance installations.

2. AIRSHED B1

Background

The overall aim is to determine whether PM_{10} concentrations in Airshed B1 are ~~below the NES~~ within the 'Acceptable' category value (or better) when taking into account worst case meteorological conditions (as monitored between 2001 and 2014) and the extent to which there may be capacity in Airshed B1 for new installations of burners.

The method is based on an examination of the relationship between winter time PM_{10} concentrations and meteorological conditions in Nelson. The meteorological conditions identified for Airshed A are applied to Airshed B1 to estimate the days when meteorological conditions are most conducive to elevated PM_{10} concentrations. Although a separate analysis of the relationship between meteorological conditions and PM_{10} concentrations in Airshed B1 would provide the most robust analysis, a strong correlation between wintertime PM_{10} concentrations between the sites indicates that meteorological conditions impact on both locations coincidentally.

A worst case peak (second highest PM_{10}) to mean (smoothed data from winter high pollution dataset) ratio of 1.99 from 2006 was identified for the Airshed B1 dataset.

The method requires the peak to mean ratio be applied to a three year average to ensure that the trend is sustained and minimises the potential that the result for any year is an anomaly occurring as a result of a low frequency of calms during the winter period.

Method

Step 1: Identify days between May and August inclusive which have nine or more hours of average hourly temperatures less than five degree Celsius. Take the average of PM_{10} concentrations on days that meet this criterion for each year. Note that the analysis can only be undertaken if valid data for the period May – August (all meteorological conditions) exceeds 75%.

Step 2: To get a three year average representative of high pollution events, average the most recent year's PM_{10} concentrations for high pollution days (step 1) with the equivalent value for the preceding two years.

Step 3: Multiply the three year winter average PM_{10} for high pollution days (step 2) by a worst case peak to mean ratio of 1.99.

Step 4: Express the peak concentration from step 3 relative to the ~~NES~~ 'Acceptable' category value of ~~50~~ 33µg/m3 by dividing it by ~~50~~ 33µg/m3 and multiply by 100 to give a percentage. A value greater than 100% represents non-compliance with the ~~NES~~ 'Acceptable' category value for PM_{10} and a value less than 100% indicates capacity may be available. The capacity would be represented by subtracting the resulting percentage from 100%.

Step 5: ~~Assess the ability for additional burner numbers by considering the extent of capacity available,~~ Issue a BAC if the targets in Policy A5-1.3 and Policy A5-1.4 can be met.

In determining whether these targets can be met, the Council must consider ~~having regard to~~:

a) the ~~impact of~~ worst case meteorological conditions established under steps 1-3; ~~on concentrations (including airshed dispersion); and~~

b) the capacity for compliance with the 'Acceptable' category value established under step 4;

c) the number of ULEBs in the Council's inventory of certified appliances ~~burners installed~~ (and therefore the number that may still be certified/installed under the current allocation); and

d) real life emission factors and fuel use for new small-scale ultra-low emission burning appliance installations.

3. AIRSHED B2

Background

The overall aim is to determine whether PM_{10} concentrations in Airshed B2 are lower than the projected downward trend occurring as a result of natural attrition replacement of older burners with NES compliant wood burners over time.

Initial trends evaluation for Airshed B2 has not been undertaken, owing to the limited PM_{10} data available.

The starting point for 2014 PM_{10} has been estimated using the 2014 Airshed A concentration for the second highest day, multiplied by the peak to mean ratio for Airshed A (which gives 58 $\mu g/m^3$) and adjusted by the relationship between Airshed B2 concentrations and those measured in Airshed A on the same day. This gives a likely worst case second highest PM_{10} concentration for Airshed B2 for 2014 of around 39 $\mu g/m^3$.

Method

Step 1: Monitor PM_{10} concentrations in Airshed B2 on a continuous ongoing basis. Identify days between May and August inclusive which have nine or more hours of average hourly temperatures less than five degree Celsius. Take the average of PM_{10} concentrations on days that meet this criterion for each year. Note that the analysis can only be undertaken if valid data (all meteorological conditions) for the period May – August exceeds 75%.

Step 2: Identify the worst peak to mean ratio by adjusting the peak to mean ratio for any year for Airshed B2 by the worst case peak to mean ratio for Airshed A as follows. Compare the peak to mean ratios from Airshed B2 to those for Airshed A for the same year and adjust for a worst case year (e.g., ratio for $B2_{year}$ x (ratio Airshed A_{2003} /ratio Airshed A_{year}). For example if the peak to mean ratio for 2017 for Airshed B2 was 1.2 and the ratio for Airshed A for 2017 was 1.6 then multiply 1.2 by 1.56/1.6 to give a peak to mean ratio for Airshed B2 of 1.5. The 1.56 is the peak to mean ratio for Airshed A for 2003 (worst case ratio).

Step 3: Average the outputs from step 1 for two years initially (e.g., 2016 and 2017) and then for the rolling three years (e.g., 2016-2018, 2017-2019….). Multiply by the peak to mean ratio output from step 2.

Step 4: Compare the output from step 3 to Table 1 for the appropriate year (for example if data averaged in step 3 are for 2016 and 2017, compare with the output for 2017). If the number is less than the value in Table 1, it is indicative of additional capacity that would be available for new small-scale ultra-low emission burning appliance installations.

Step 5: ~~Assess the ability for additional burner numbers by considering the extent of capacity available,~~ Issue a BAC if the targets in Policy A5-1.3 and Policy A5-1.4 can be met.

In determining whether these targets can be met, the Council must consider ~~having regard to~~:

a) the ~~impact of~~ worst case meteorological conditions established under steps 1-3; ~~on concentrations (including airshed dispersion); and~~

b) the capacity for compliance with the trend line in Table 1 established under step 4;

c) the number of ULEBs in the Council's inventory of certified appliances ~~burners installed~~ (and therefore the number that may still be certified/installed under the current allocation); and

d) real life emission factors and fuel use for new small-scale ultra-low emission burning appliance installations.

TABLE 1 - Estimated natural attrition trend in PM_{10} concentrations (for worst case meteorology) in Airshed B2

2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
38	37	37	36	36	35	34	33	33	33

4. AIRSHED C

Background

The overall aim is to determine whether PM_{10} concentrations in Airshed C are lower than the projected downward trend occurring as a result of natural attrition replacement of older burners with NES compliant wood burners over time.

Similar to Airshed B2, no initial trends evaluation has been completed for Airshed C. However, the relative derivation method used for B2 is also not an option for Airshed C, owing to low correlation in monitoring data between Airshed A and Airshed C. For these reasons, the methodology for determining capacity in Airshed C relies upon additional preliminary steps to be followed before ultimately adopting the approach used in the other airsheds.

Method

An evaluation of historical air quality monitoring data from different sites in Airshed C and an evaluation of dispersion modelling results will be undertaken to determine the extent to which concentrations of PM_{10} measured at Brook Street are indicative of concentrations or contribute to PM_{10} in other part of the Airshed. The following additional work is required to establish baseline information for the areas contributing to and represented by the current monitoring site:

- Air quality monitoring for an additional two winters at the Brook Street monitoring site.
- An evaluation of the relationship between PM_{10} concentrations and meteorological conditions.
- Evaluation of the peak to mean ratios for high pollution days for Airshed C.
- Application of peak to mean ratios to determine worst case PM_{10} concentrations representative of 2014 emissions.
- Derivation of PM_{10} targets for 2017-2026 by multiplying the worst case PM_{10} concentration for 2014 by the values shown in Table 2.

Once this information is established the methodology ~~can~~ will follow the approach described for Airshed ~~A~~B2 (steps 1-5 adjusted to reflect the above baseline determination steps).

TABLE 2 – Estimated natural attrition projection for PM_{10} in Airshed C

2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
95%	93%	91%	88%	84%	81%	78%	75%	75%	75%

B. Reporting

The Council will undertake the necessary monitoring and modelling as described in the above methodology every two years, commencing from the winter of 2015.

The results of this work will be held at the Council Offices and publicised on the Council website (www.nelsoncitycouncil.co.nz), and will include the number of additional appliances (if any) that may be certified as a result, relative to the previous certification allocation.

For example, the results of monitoring and modelling to be produced in 2017 will indicate whether:

- more than zero (0) appliances can be accommodated in Airshed A or Airshed B1;
- more than 1000 appliances can be accommodated in Airshed B2; or
- more than 600 appliances can be accommodated in Airshed C.

The subsequent report from 2019 will have regard to the 2017 report and so on.

C. Other Certification Resources

1. Appliance Inventory

For the purposes of administering the allocation of appliances, the Council will maintain an inventory of appliances that have been certified. The inventory will be held at the Council Offices, and details will be available on the Council website (as appropriate).

2. Database of Interested Parties

The Council will maintain a database of parties who wish to obtain certification for an appliance during periods where the current allocation does not expressly enable such a certificate. For example, for the period 2015-2017, the database will relate to parties in Airsheds A and B1, or in the other airsheds if the permitted allocation (1600 appliances) is fully utilised prior to 2017.

Where any two-yearly report (as described under B. above) indicates additional BACs can be allocated, interested parties on the database will be given priority by chronological order.

The database will be held at the Council Offices, and details on how parties can register an expression of interest will be available on the Council website.

AQ2B.3.5 Certificate Duration and Administration

Any BAC will be issued in conjunction with the associated building consent for the appliance. The BAC will lapse 12 months after the issue date unless a code compliance certificate (under s95 of the Building Act 2004) has been issued for the appliance.

No certificate of compliance may be granted for a certified appliance under Rule AQr.26A until such time as the code compliance certificate for the appliance is issued.