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Prepared for:	Council
Report No.	P&S1851
Activity:	Environmental: Air
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PURPOSE

[1] To provide a summary of the 2019 Arrowtown Air Quality winter programme initiative.

EXECUTIVE SUMMARY

[2] Air quality in some Otago towns is significantly affected by home heating methods such as wood burning in winter months. During 2019, as part of the Air Quality Strategy Implementation Plan, ORC engaged with the Arrowtown community. Activities included education and monitoring to spread awareness and encourage better burning behaviour and the replacement of older heating appliances. This report discusses the methods used and explores the future options for the programme.

RECOMMENDATION

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That the Council:

1) ***Receives*** *this report.*

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BACKGROUND

[3] Arrowtown is one of the ORC Air Zone 1 towns, that is, it exceeds the National Environmental Standards for Air Quality (NESAQ) for PM_{10} more than ten times a year. The number of annual exceedances of the NESAQ (24-hour average PM_{10} concentration of over 50 $\mu g/m^3$) is between 20 and 40 and depends on the severity of the winter. Due to the landscape and meteorology characteristics of the area, Arrowtown is extremely susceptible to inversion layers in winter, which will trap the particulate matter at ground level (Figure 1). The source of PM_{10} in Arrowtown is almost solely from home heating appliances - the combustion of wood and other fuel (Wilton, 2016).

[4] *Figure 1. Particulates trapped at ground level in Arrowtown on a winter's morning in 2019*

[5] Between 2008 and 2013, ORC conducted a programme offering Clean Heat Clean Air subsidies for home heating appliances, in order to replace some of the older, inefficient burners. Air quality improved over this time, but has since plateaued, and the uptake of subsidies dwindled (ORC, June 2018).

[6] The Arrowtown Village Association approached ORC in 2018 and the Community Engagement Programme was extended to include agencies such as Cosy Homes Trust, the Southern District Health Board, and NIWA. In 2019/2020 the ORC Clean Heat Clean Air subsidy was renewed to foster installation of ultra-low emission burners, pellet burners or heat pumps. A secondary goal of this project was to identify effective engagement methods for use in other Air Zone 1 towns.

ARROWTOWN WINTER PROGRAMME

Policy Framework

[7] In 2018 the Air Quality Strategy for Otago was reviewed to reassert ORC's commitment to improving air quality for human health outcomes. Following adoption of the Air Quality Strategy, Council approved an implementation plan. The implementation plan emphasises non-regulatory methods and the development of local solutions, in partnership with local and regional stakeholders and communities. The effectiveness of the implementation plan, and its ability to achieve air quality objectives within 10 years, depended on the nature and extent of financial assistance available, and on the allocation of supporting ORC staff hours.

Objectives

[8] The Arrowtown winter programme objectives were:

i) Identify houses that have a non-compliant burner, or demonstrate non-compliant burning behaviour
ii) Initiate a conversation with the homeowner
iii) Facilitate a change in behaviour and/or appliance
iv) Follow-up for signs of change/improvement

[9] To achieve the winter programme objectives, a communications and monitoring programme was implemented between May and October of 2019.

Communications

[10] The communications plan objectives focussed on education, which was a contrast to previous rules-based interactions with communities (ORC, 2019):

a) Education for replacing non-compliant burners
b) Education on best practice burning
c) Information on financial support

[11] The types of channels employed for the Arrowtown campaign were regular social media posts, a video, regular advertisements in the local newsletter, and a brochure on good burning practices delivered to every house. Moisture meters have also been sold at the community events to promote burning dry wood with <20% moisture content. The campaign's messages were to link behaviour to air quality outcomes, and to promote home energy efficiency. The main messages included:

- "burn dry, breathe easy"
- "we breathe what you burn"
- "buy and stack wood before Christmas"

[12] Communication findings indicated a high level of engagement and awareness. The use of modern (website and social media) and traditional (leaflet and mail) outreach methods ensured the high saturation of the key messages. These messages have been successful in engaging the community, not only about air quality but improving home heating efficiency and saving money on home heating.

- Website visitor count for the Clean Heat Clean Air subsidy page more than doubled over the winter.
- Video had 20.1k views.
- There was a series of "I breathe what you burn" advertisements in the local newsletter (The Loop) highlighting key messages of the campaign to compliment the video - The Loop is distributed to 1600 mailboxes, both households and businesses in Arrowtown.

[13] *Figure 2. ORC "I breathe what you burn" advertisement*

Monitoring Results

[14] Two types of monitoring were conducted for burning behaviour and burner compliance.

Behaviour Monitoring

[15] Monitoring of smoky chimneys was undertaken for three evenings and three mornings on 19-21 June and 07-08 July 2019. Each monitoring morning/evening was cold and calm, and monitoring was carried out by two ORC staff. Monitoring consisted of driving a repeated route through Arrowtown and visually finding addresses with smoky chimneys, and re-checking these at least an hour later to identify the persistently smoky addresses.

[16] *Figure 3. Example of a smoky chimney*

[17] Table 1 displays the different categories of smoky chimneys identified. There were 176 individual residential addresses recorded and 89 were assigned to the following categories:

[18] *Table 1. Behaviour monitoring results*

Repetitive start-up smoke	54
Persistent smoke	26
Both	9
Total	89

[19] Repetitive start-up smoke properties were reported on more than one monitoring occasion which suggests that they produce start-up smoke regularly. The persistent smoke properties are those that were rechecked after an hour within one or more monitoring round, and still found to have smoky emissions.

[20] These 89 properties were sent a letter, to which there were 26 (29%) responses (Table 2). Of these, two people admitted to either trying to burn wet wood, or banking down the fire for the day, and one responded but did not disclose their burning practices. The other 23 were surprised to receive the letter, and indicated they understood the issues and demonstrated some or most of the good burning practices (Table 3). The one practice not many people carried out was to check the amount or characteristics of smoke emitted during their burning hours.

[21] A common problem that became apparent during monitoring was the high level of start-up smoke. This is observed between lighting of a fire and the period of time taken for combustion to reach optimal temperature. The responses received suggested that this level of smoke may occur in both low and ultra-low emission burners.

[22] *Table 2. Response rates for each type of monitoring letter*

Type of Letter	Sent	Responded	Response Rate
Behaviour	89	26	29%
Burner compliance	108	47	44%

[23] *Table 3. Types of responses to each type of monitoring letter*

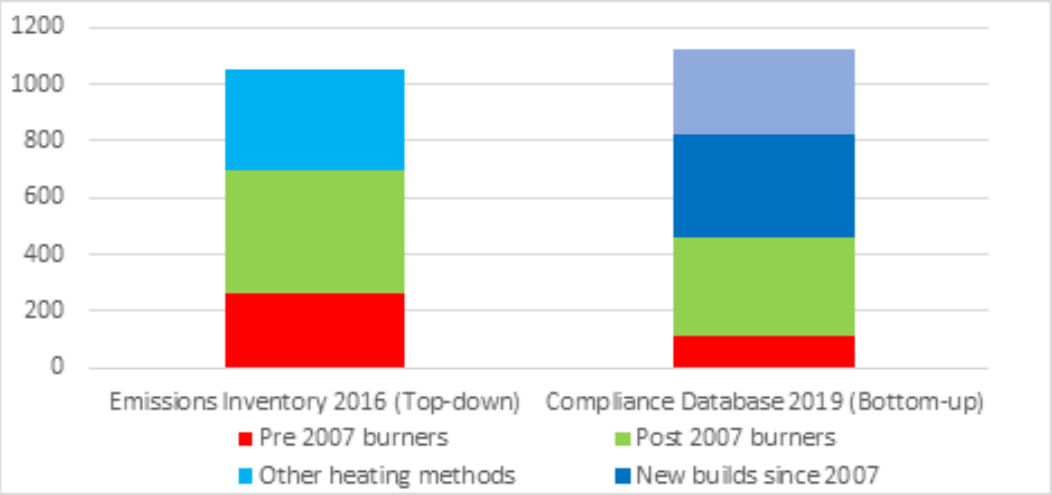
	Responses	n
Behaviour	Mostly best practice behaviour	23
	Non-compliant behaviour	2
	Didn't disclose	1
Burner Compliance	Compliant heating appliance	36
	Non-compliant burner	7
	Unknown or incorrectly identified	4

Burner Compliance

[24] A database of Arrowtown burners was created using information from a list of QLDC building consents. Figure 4 shows the difference in information available between this and the 2016 emissions inventory. There were 108 non-compliant burner installations identified, based on the year of installation. Anything installed prior to 2007 was assumed to be non-compliant as this was the year the Air Plan was updated to reduce the burner emission rate from 1.5 g/kg to 0.7 g/kg; prior to this very few burners installed were below an emission rate of 1.5 g/kg due to technology and market availability.

[25] Tables 2 and 3 show that 47 people responded (44%), of these 36 were able to prove they had a compliant burner installed, signifying that the information received from QLDC was not complete. Seven burners were non-compliant, with the owners of these expressing interest in the subsidy.

[26] *Figure 4: Arrowtown heating methods classifications differ between research approaches. Note that the number of pre-2007 (non-compliant) burners is lower in the 2019 compliance database, however the number of unknown heating methods is very high.*



Trends

[27] Table 4 shows that the majority (57%) of the behaviour letters were sent to rental properties, and the response rate for these was much lower than for owner occupied properties. Possible reasons for the low response rate could be the transient population, with less choices or knowledge regarding purchasing and burning wood, and what type of burner their home has.

[28] This pattern is similar for the burner compliance but to a lesser extent. This shows that the heating methods of rental properties may be a bit of a blind spot for property owners who may be unaware of air quality issues if they do not live in the town themselves.

[29] Another factor for these results is the amount of holiday accommodation, which could result in a combination of both lack of knowledge around burner use, and the property owner's disconnection from the local issues.

[30] *Table 4. Response rate of the different residence types*

	Type of residence	Sent	Responded	Response Rate
Behaviour	Owner-occupied	38	24	63%
	Rental property	51	4	8%
Non-compliant burner	Owner-occupied	43	23	53%
	Rental property	65	24	37%

[31] There were 14 properties that appeared on both lists. Only one of these properties responded. The other 13 should be followed up during future work.

Assessment of the monitoring methodology

[32] Non-compliant behaviour is difficult to monitor, as it can change on a seasonal, daily or hourly basis. This behaviour can occur using compliant and ultra-low emission burners, if incorrect burning techniques are used, or wet wood is burned. Likewise, non-compliant burners can burn cleanly. Another issue is that it is difficult to see the smoke against the sky, so some houses may have been overlooked, and for this reason this work may be more difficult to undertake in other towns. A benefit of this work is that it shows ORC is in the community taking action on air quality issues.

[33] Non-compliant burners can be difficult to find due to limited information of third-party data collection. Solutions to this would be to approach the TLAs to obtain the data directly and ask them to record more information. Forming stronger relationships with the TLAs and working with them in other areas of air quality would be beneficial in future.

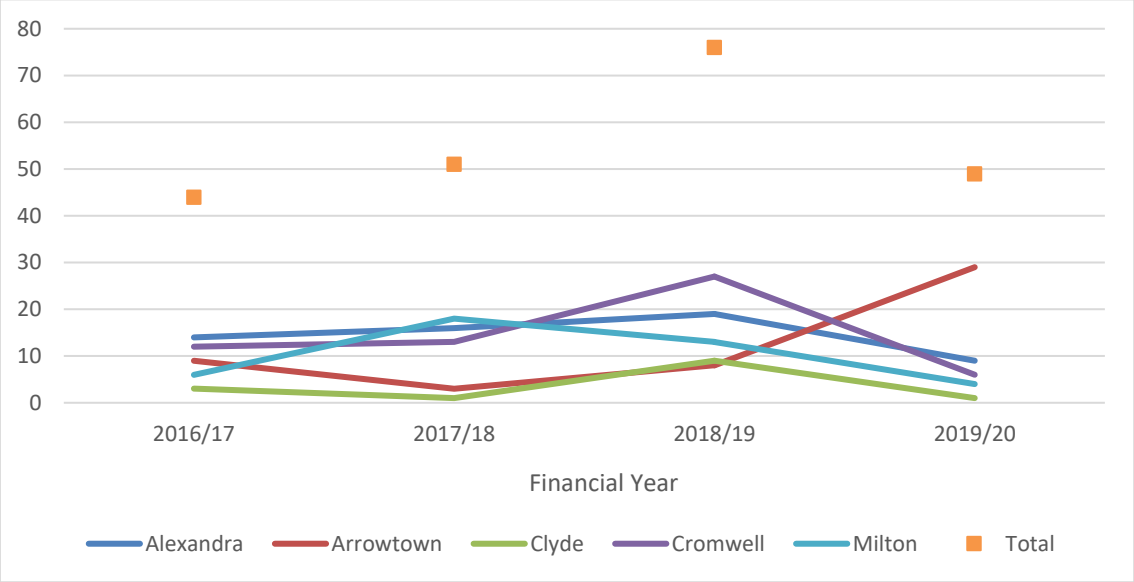
[34] Both types of compliance monitoring have logistical issues and are time intensive, however the bottom-up or one-by-one approach is the only way to identify individual non-compliant installations and behaviour, which is the most direct way of achieving the winter programme objectives ii – iv.

CONCLUSIONS

Response to winter programme

[35] The clean heat clean air subsidy budget was fully allocated by the end of March 2020. The number of subsidies allocated to Arrowtown were higher than previous financial years and higher than other Air Zone 1 towns (Figure 5).

[36] *Figure 5. Allocated CHCA subsidies for the most recent financial years.*



[37] The feedback from the Arrowtown Village Association was generally positive, with the following key points received:

- The community's interest in NIWA's project[1] meant people became highly engaged in the problem, with the additional realisation that everyone is responsible for the air quality.
- There is genuine concern for air quality within the town, which will lead to attempts to help make improvements where possible.
- Some of ORC's methods were more engaging than others. The responses to the letters were very mixed, but the newsletter advertisements, social media posts, and market day stalls were received positively.
- There are still some reservations about the ultra-low emission burners:
  - Subsidy application is viewed as a drawn-out process (there can be a significant wait for the building consent and installation, and final inspection of the new appliance prior to use).
  - Some people are waiting to see if prices come down or for the number of models on the market to increase.

Overall Conclusions

[38] Arrowtown has benefited from the engagement programme in terms of subsidy uptake and knowledge. The collaboration with the other stakeholders enabled consistent messaging. The NIWA project, during the monthly community information/update nights held, helped the community engage with air quality and view it as a shared problem. Additionally, working with the Cosy Homes Trust meant that the community had access to impartial and independent advice.

[39] The goals of the winter programme were partially met. The main final component is part iv – post monitoring follow-up, which will be continued during 2020.

[1] NIWA's project included a high-density ambient air quality network and recruitment of households for indoor air monitoring for $PM_{2.5}$.

[40] Future opportunities for this programme would be to work more closely with Queenstown Lakes District Council (and other TLA's), to obtain detailed building consent data. This would allow ORC to develop a complete and accurate database to use for complaint records as well as burner compliance. There is further work ORC could do to work towards the Implementation Plan such as outdoor burning work programmes and investigation into community heating schemes.

CONSIDERATIONS

[41] Whilst the implementation and engagement programme worked well for Arrowtown, translating into a significant uptake in clean heat clean air subsidies in 2019/2020, we believe that the implementation plan may not be easily transferrable to other Otago towns.

[42] A transformative change to ORC's air quality implementation initiatives is likely to be required to enable compliance with the new NESAQ and lead to an improvement in Arrowtown air quality.

NEXT STEPS

[43] The properties identified and contacted during the monitoring will be followed up with where possible.

[44] The communications programme can be reused in other towns in Otago for future projects.

[45] The monitoring and communications methods used in this project can be used to inform future compliance and enforcement of ORC Air Plan rules for domestic home heating.

[46] Further investigation into non-regulatory initiatives is recommended.

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ATTACHMENTS

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