TECHNICAL COMMITTEE AGENDA

WEDNESDAY 13 JUNE 2018

Edinburgh Room, Municipal Chambers, The Octagon, Dunedin 8:30am

Membership

Cr Andrew Noone	*(Chairperson)*
Cr Ella Lawton	*(Deputy Chairperson)*
Cr Graeme Bell	
Cr Doug Brown	
Cr Michael Deaker	
Cr Carmen Hope	
Cr Trevor Kempton	
Cr Michael Laws	
Cr Sam Neill	
Cr Gretchen Robertson	
Cr Bryan Scott	
Cr Stephen Woodhead	

Disclaimer

Please note that there is an embargo on agenda items until 8:30 am on Monday 11 June 2018. Reports and recommendations contained in this agenda are not to be considered as Council policy until adopted.

TABLE OF CONTENTS

1. APOLOGIES
Cr Woodhead

2. LEAVE OF ABSENCE
Cr Kempton

3. ATTENDANCE

4. CONFIRMATION OF AGENDA

5. CONFLICT OF INTEREST
Members are reminded of the need to stand aside from decision-making when a conflict arises between their role as an elected representative and any private or other external interest they might have.

6. PUBLIC FORUM

7. PRESENTATIONS

8. CONFIRMATION OF MINUTES
Recommendation
That the minutes of the meeting held on 2 May 2018 be received and confirmed as a true and accurate record.

Attachments
1. Minutes of the Technical Committee meeting - 2 May 2018 **[8.1.1]**

9. ACTIONS

Status report on the resolutions of the Technical Committee.

Report No.	Meeting	Resolution	Status
10.1 Central Otago STED site no. 2	2/5/18	*That CODC, ORC and NZTA agree the criteria, and that Council requests for the Central Otago District Council to formally advise their preferred site, which satisfies the agreed criteria for the second new STEDS in Central Otago, by 31 July 2018.* *That staff keep the elected arm informed as to the process of this request (councillors are kept informed and included in all communications in relation to the STED site options).*	

Attachments

Nil

10. MATTERS FOR COUNCIL DECISION

10.1. Shag/Waihemo River and Waianakarua River Morphology and Riparian Management Strategies - Council Committee Hearing

Prepared for:	Technical Committee
Activity:	Environmental - Waitaki Rivers & Waterway Management
Prepared by:	Ellyse Gore, Natural Hazards Analyst Dr Jean-Luc Payan, Acting Manager Resource Science
Date:	21 May 2018

---

1. Précis

River morphology and riparian management strategies have been prepared for two North Otago Rivers. The Shag/Waihemo River strategy covers the stretch between the village of Waynes and the mouth, and the Waianakarua River strategy includes the Waianakarua River North Branch from Graves Dam, and the Waianakarua River South Branch from McKerrow Road to the confluence with the Pacific Ocean (Fig. 1). The strategies were developed to help protect and enhance the recreational, cultural and ecological values associated with the Shag/Waihemo riverbed and Waianakarua riverbed and their margins. Similar strategies have been developed by ORC and endorsed by council for the Kakanui[1], Pomahaka and Strath Taieri[2] Rivers.

[1] Otago Regional Council, Report Number 2015/1163, *Kakanui River morphology and riparian management strategy*, Presented to the Technical Committee on 14 October 2015.

[2] Otago Regional Council, Report Number 2016/0796, *Pomahaka River and Taieri River Morphology and Riparian Management Strategy*, Presented to the Technical Committee on 8 June 2016.

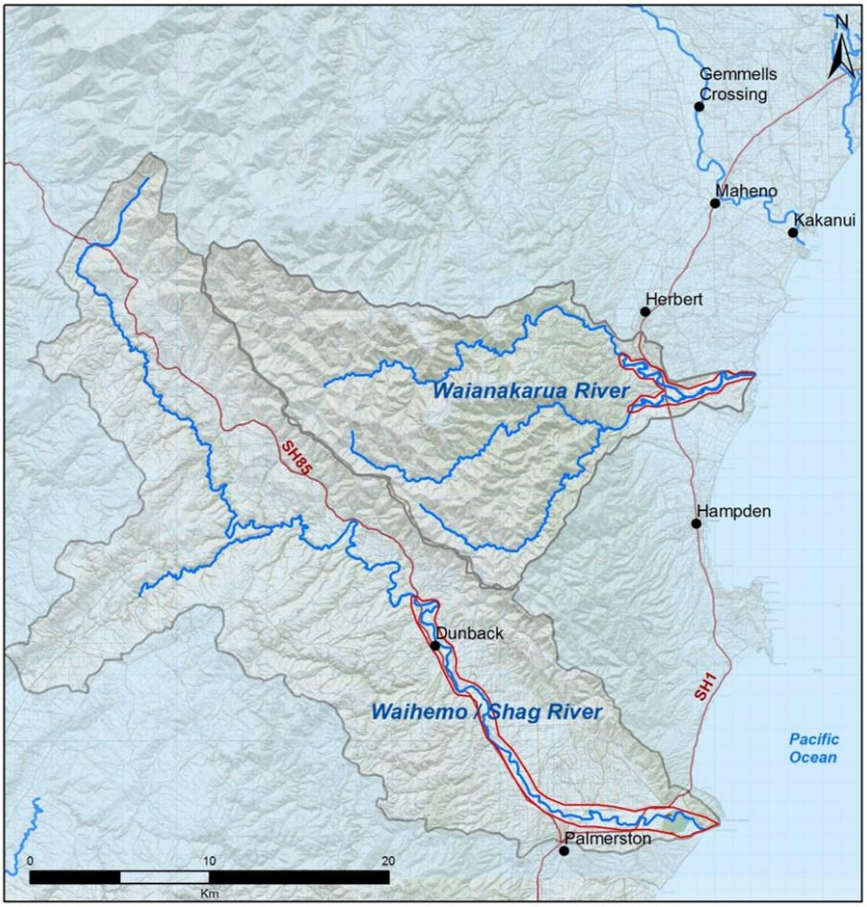

Figure 1. Map of Waianakarua River and Waihemo/Shag River catchments in North Otago. The strategies apply to the river reaches outlined in red.

The development of each strategy is part of the 2017/18 Annual Plan target RA 358:

Develop a River Morphology and Riparian Management Plan (RMRMP) for Waianakarua and Shag rivers, setting out river values, management objectives, methods and the respective roles of ORC, land-holders and other stakeholders.

The intention is that this work will result in incremental enhancements to the natural character and enjoyment of the riverbeds, and enable long-term, sustainable use of the land which borders the rivers.

The strategies have been developed to guide work programs, decision-making and activities for the community, the Otago Regional Council (ORC), local iwi and other stakeholders. The strategies have been prepared by ORC, with input from the local community, iwi and other interested parties using an approach similar to that used for the Kakanui River[3], Pomahaka River[4] and Strath Taieri River[5]. The principles, objectives and actions outlined in the strategies reflect the values and concerns which have been identified by local residents, iwi and stakeholders through an extensive consultation process. It is therefore recommended that people who live, work or play within the

[3] ORC.2015: Kakanui River morphology and riparian management strategy, Dunedin, New Zealand, 978-0-908324-20-0

[4] ORC.2016: Pomahaka River morphology and riparian management strategy, Dunedin, New Zealand, 978-0-908324-32-3

[5] ORC.2016: Strath Taieri River morphology and riparian management strategy, Dunedin, New Zealand, 978-0-908324-34-7

Shag/Waihemo River and Waianakarua River catchments consider, and give effect to the critical components of these strategies.

2. Community consultation and strategy development

The process of developing the strategies commenced in October 2016 when, at drop-in sessions, held in Dunback and Waianakarua, the community was invited to share their values and issues associated with the two rivers. Following this there was an opportunity for the public to consider the strategies in April 2017, including a public submission process. The reports have been finalised over the past year.

The values and desires that the local iwi and community attributed to the morphology of the Shag/Waihemo River and Waianakarua River environments are summarised below. The strategies are a means of encapsulating these values and desires, and using them to inform decision-making and work programs within the Shag/Waihemo River and Waianakarua River catchments.

- That the function of the river continues to support social, cultural, spiritual, recreational, and farming activities.
- That the form of the river includes riparian plantings (including willows but with more of a focus on native plantings), weed control and fencing.
- That the river is able to shift laterally within an identified margin, but
    - Farmland beyond the margin is not eroded;
    - Main flood flows are kept in the main channel;
    - Infrastructure is resilient and quickly reinstated.
- That the vegetation is managed appropriately and affected parties notified of associated works.
- Both rivers are an important habitat for native fish such as longfin eel and galaxiids, their habitats must be maintained and enhanced.
- Both rivers should support recreational activities such as swimming and fishing
- Both rivers have areas and structures of historical significance.
- That the gravel resource is managed appropriately to control gravel build up and bank erosion and that affected partied are suitably notified.
- Both rivers have Mana Whenua values of kaitiakitanga, mahinga kai, ki uta ki tai and mauri.

The communities of both the Shag/Waihemo River and Waianakarua River have similar values as shown in the list above, indicating that a similar approach can be taken to managing these two rivers. Differences between the two communities include different uses of the rivers; the Waianakarua River has community value in that it can be used for whitebaiting, drinking water, stock water, irrigation, and gravel extraction whereas this was not raised by the Shag/Waihemo River community.

3. Legislative context

The strategies are not statutory documents; rather they are intended to present the aspirations of the community, iwi and the various stakeholder agencies. However, the statutory processes which do influence river management activities[6] are more likely to be used effectively and efficiently if there is a general consensus on what is valued about the rivers, and commonly understood objectives. The strategies set out the values identified by the community, and the outcomes they seek from managing river form and function, and will be used to inform resource consent decision-making.

[6] Including the Local Government Act (in regard to funding considerations), and the RMA (in regards to managing environmental effects)

4. Critical components

4.1. Principles

The strategies provide a framework to guide activities and decision-making, based on the following set of principles:

- *Ensure sustainable river management.* Appropriate use of land, which will limit exposure to natural river and catchment processes.
- *Plan ahead.* An adaptive approach to river management that will allow for the dynamic nature of the Shag/Waihemo River and Waianakarua River.
- *Maintain and enhance the natural environment.* Activities are managed in a way that results in a more visually appealing river system, and habitat that supports wildlife, fish and suitable plant species.

4.2. Objectives

These are areas where the community, ORC and other stakeholders can achieve positive outcomes within the Shag/Waihemo and Waianakarua riverbeds and along their riparian margins. They are derived from the principles listed above.

- *Recognise and characterise natural river processes.*
- *Equip the community to live with the effects of changes in river morphology.*
- *Enable sustainable gravel extraction.*
- *Promote activities that enhance the natural character and enjoyment of the river.*

4.3. Information

ORC has undertaken work to understand and quantify the natural river processes that occur in the Shag/Waihemo River and Waianakarua River, as well as the iwi and community values associated with the riverbeds and their riparian margins. This information can be used to inform decisions and activities, such as gravel extraction and river maintenance work.

- *River form and function values.* Elements of the river system which are valued by the community and iwi.
- *River corridor design.* The location and width of the active river fairway, as well as appropriate buffer zones, which together form a corridor within which the river would naturally lie.
- *River maintenance work areas.* Priority sites where work will be undertaken by ORC operations staff to assist in maintaining the shape and location of both rivers fairways.

5. Implementation

The strategies are concerned with the form and function of the Shag/Waihemo River and Waianakarua River. It is intended to deliver appropriate guidance and assist with active engagement. It will help guide activities which affect the morphology of the rivers and their riparian environments, including those elements of the river system which are highly valued by the community. The strategies will help to ensure that these activities are undertaken in a sustainable and appropriate manner.

The strategies are relevant to those who live, work or play within the Shag/Waihemo River and Waianakarua River catchments; decision-makers (including landowners, ORC, iwi and other stakeholders) should therefore consider and give effect to the critical components contained with the two strategies.

It is noted that the strategies provide a comprehensive list of actions which can be used to achieve, or implement the key principles and objectives. However, due to the dynamic nature of these rivers, parts of the strategies are likely to change as the rivers themselves

change. As such; the strategies should be treated as a live document, with regular review and revision required.

The program of river management work to be undertaken by ORC (as guided by the strategies and provided for in the annual plan process) will always be a balance between what is desired by the community, and what is affordable. Irrespective of the level of work undertaken, there will always be a remaining residual risk associated with the effects of large flood events on river morphology. The 2018-28 Draft Long Term Plan provides for the implementation of the Shag/Waihemo River and Waianakarua River morphology and riparian management strategies.

6. Recommendation

a) That the report be received; and

b) That the Shag/Waihemo River and Waianakarua River morphology and riparian management strategies are endorsed.

Endorsed by: Gavin Palmer
Director Engineering, Hazards & Science

Attachments

1. TC MFN Attachment 1 - Waianakarua River - 2017 Waianakarua River Management Strategy **[10.1.1]**
2. TC MFN Attachment 2 - Shag Waihemo River - 2017 Waianakarua River Management Strategy **[10.1.2]**

10.2. Leith Flood Protection Scheme Dundas Stage Programme

Prepared for: Technical Committee
Activity: Leith Flood Protection Scheme
Prepared by: Dr Gavin Palmer, Director Engineering, Hazards & Science
Date: 31 May 2018

---

1. Background

The design of the Dundas Street stage of the Leith Flood Protection Scheme is nearing completion. Construction contract documents are being prepared and discussions with landholders and other stakeholders are progressing.

The programme for construction of this stage of the scheme is to invite tenders in July and to award a contract in September, subject to favourable tenders being received. Construction would take place over Summer 2018/19. The 2018-28 Draft Long Term Plan is based on this programme.

This stage completes the flood protection component of the scheme. Importantly, other stages already constructed become fully effective once this stage is commissioned as it is upstream of those other stages. Completion of this stage will be a significant milestone.

2. University of Otago request

The University of Otago has very recently requested that commencement of construction of the Dundas Street stage be delayed until after December 2019. The university wishes to avoid construction works that may impact on access to and enjoyment of the university's 150th celebrations during 2019[1]. In practical terms construction could not commence until Summer 2020/21, a delay of approximately two years.

3. Discussion

The proposed Dundas Street stage works do not take place on land owned by or under the control of the university. They will however affect traffic near the university for a period of not less than seven months. The duration of the works depend on factors outside the control of ORC including contractor performance, weather and floods.

The university is not funding any of the works.

Delaying commencement of construction has financial and other resourcing implications for ORC. It delays the reduction in flood risk for parts of the Dunedin Central Business District including parts of the university campus and the existing and proposed Dunedin Hospital sites. There would be less certainty about the state of the construction market expected at the time the works are to be undertaken.

Further and full analysis may identify other risks and implications for ORC and the community. That analysis should be undertaken so that Council can make an informed decision on the acceptability of those risks and implications, and then advise the

[1] University of Otago 150th Anniversary Celebrations events key dates: https://www.otago.ac.nz/150/key-dates/index.html

university accordingly. This needs to be undertaken in a timely manner so that it does not jeopardise ORC's construction tendering and evaluation programme.

4. Recommendations

a) *That this report is received and noted;*
b) *The request by the University of Otago for ORC to delay construction of the Dundas Street stage of the Leith Flood Protection Scheme is noted;*
c) *That staff identify and assess the risks and implications for ORC and the community of delaying construction of the Dundas Street stage, in consultation with the University of Otago, Dunedin City Council and Southern District Health Board, and report to Council by 31 July 2018.*

Endorsed by: Gavin Palmer
Director Engineering, Hazards & Science

Attachments
Nil

11. MATTERS FOR NOTING

11.1. An assessment of the Clean Heat Clean Air program's effectiveness

Prepared for: Technical Committee
Activity: Environmental - Clean Air Implementation Initiatives
Prepared by: Deborah Mills, Environmental Scientist
Date: 2 May 2018

---

1. Précis

The purpose of this paper is to provide an assessment of the Clean Heat Clean Air (CHCA) programme's effectiveness. CHCA was designed to provide a financial incentive for homeowners to upgrade their solid-fuel burners to cleaner heating options. A paper presented to the Finance and Corporate Committee on 13 September 2017[1] detailed the financial status of the programme. This paper examines the environmental outcomes related to work done for the CHCA initiative, fulfilling s an annual plan target in the Air Management Planning project (A4 – Air Quality).

The CHCA programme was a central element of the Otago Regional Council's air quality strategy of 2007. This paper assesses the programme in relation to its original objectives; it is not an assessment of the air quality strategy itself.

Section 2 outlines the origin of the programme with consideration to the air quality strategy at the time. Details of the work accomplished through the programme are given in Section 3. Section 4 evaluates the effectiveness of the programme in relation to its original goals as well as some of the co-benefits that were achieved. Section 5 outlines some of the issues that arose from the evaluation of the programme to be considered in any future initiative.

2. Background

In 2004, wood burner emission and efficiency standards were introduced with the National Environmental Standards for Air Quality (NESAQ)[2]. Those standards served as a tool to assist councils in meeting the ambient air quality standards.

In 2007, Council developed a regional air quality management strategy[3] to provide direction for meeting the NESAQ. The strategy allowed for a regulatory framework, monitoring and reporting, communication with stakeholders, collaboration, and the provision of incentives. The expected outcomes from the strategy were:

1. Meeting the NESAQ by 2013 (the original date, since revised by central government to 2020)
2. Improving the health of Otago residents
3. Enhancing resident and visitor well-being

[1] ORC Report, *Clean Heat, Clean Air Initiative*, Report Number 2017/1032, Presented to the Finance and Corporate Committee on 13 September 2017
[2] All wood burners installed from 1 January 2005 on properties less than two hectares are to have a discharge of less than 1.5 grams per kilogram of dry wood burnt and a thermal efficiency of not less than 65%.
[3] ORC Report, *Otago Regional Council Clean Air Strategy: 2007-2013*, Report Number 2007/451, Presented to the Policy and Resource Planning Committee on 5 September 2007,

As part of the regulatory framework, the Otago Regional Plan: Air (Air Plan) addressed home heating discharges to air. Due to the severity of particulate pollution in Air Zone 1 towns, the Air Plan set stricter emission standards[4] for all heating appliances installed after 14 April 2007 (Alexandra, Arrowtown, and Cromwell) or 1 April 2009 (Clyde). In addition, ORC implemented a burner "phase-out" rule; as of 1 January 2012, the use of heating appliances with particulate discharges greater than 1.5g/kg became a prohibited activity in all Air Zone 1 towns.

Due to their age, most solid-fuel burners would not have met the new standards for emissions and efficiency at the time the air strategy was developed. As a consequence, approximately 3,200 solid-fuel burners[5] were due to be phased out of use in the four Air Zone 1 towns by 1 January 2012 (Alexandra, Arrowtown, Clyde, Cromwell).

An early project incentivising burner change, initiated in 2007/2008 by central government, showed that the community was interested in taking up financial incentives to change their home heating.

With that knowledge, a key component of the air strategy was Council's partnership with the central government when the Warm Homes Clean Heat project began in 2009 (run by the Energy Efficiency and Conservation Authority (EECA)). Through this programme, the ORC participated in and promoted financial subsidies as part of an effort to assist homeowners in Air Zone 1 with upgrading and phasing out their older solid-fuel heating appliances. This became the Clean Heat Clean Air programme in Otago (CHCA). The programme has run continuously since that time.

The next section details the work done in the CHCA programme in Air Zone 1 and Milton (AZ1+M), which was added to the scheme in 2009 once monitoring revealed the extent of the air quality issue over winter months.

3. CHCA Data

The original model of the CHCA programme provided financial incentives in the form of subsidies for insulation (where needed) and/or a new heating appliance. Over the life of the programme to 2018, approximately 2,150 claims have been filed with Council. Table 1 provides a high-level breakdown of those claims.

[4] All heating appliances to have a discharge of less than 0.7 grams per kilogram of fuel burnt and a thermal efficiency of not less than 65%

[5] 2013 Census meshblock dataset, *Area unit data about dwellings in the Otago Region,* containing data from 2001, 2006, and 2013. Stats NZ

Number	Activity	Description
2,150	Total claims	Includes all insulation and appliance installations in all areas of Otago (2008-2017, inclusive)
1,250	Number of appliances installed in Air Zone 1 and Milton (AZ1+Milton)	The majority of these are wood burners as opposed to no-emission appliances[6].
250	Number of insulation-only claims	No appliance retrofitted
700	Number of CSC holders	This was a priority group for the CHCA programme
650	Number of claims from areas outside of AZ1+M	From 2009 to 2012 the scheme was available in all of Otago; the majority of these claims were insulation-only

Table 1. Breakdown of CHCA claims from 2008-2017 inclusive

Figure 1 provides the annual and geographic distribution of appliances installed in AZ1+M. Most of the activity took place in Alexandra and Cromwell and peak activity in most towns occurred during 2011. EECA ended their general insulation subsidy in 2013, a move which clearly impacted Council's regional programme.

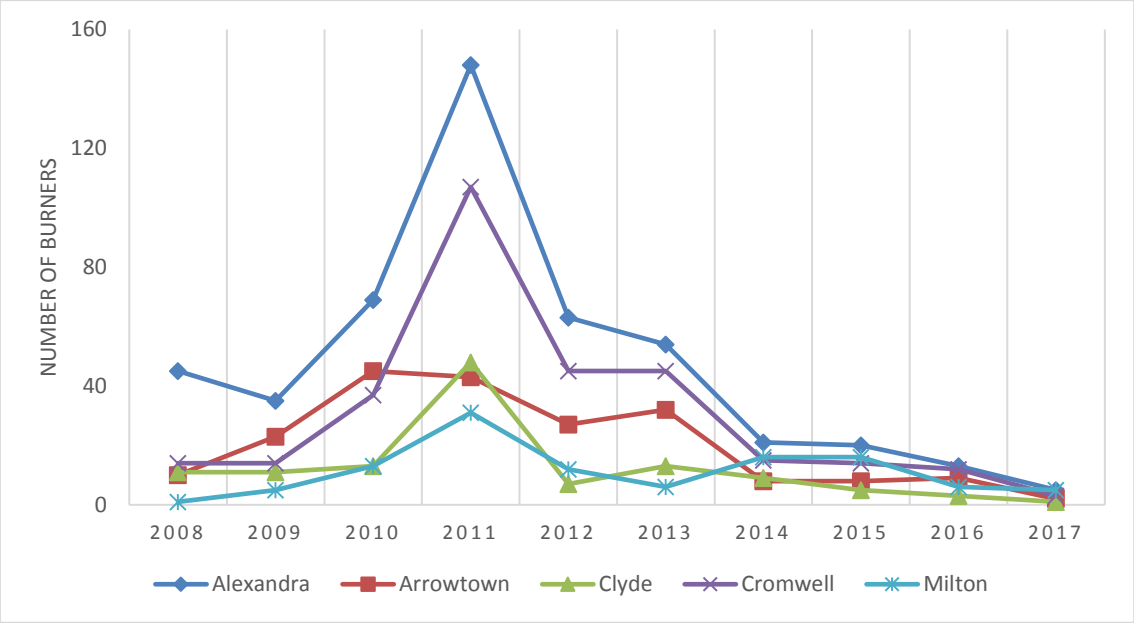

Figure 1. Distribution by year and town of the number of appliances installed through the CHCA programme

[6]Originally, the Warm Homes Clean Heat project required a no-emission appliance to replace a solid-fuel appliance, e.g. a heat pump, but due to resistance from the community ORC allowed for wood burner replacements.

Not all home heating installation activity that occurs is associated with the CHCA programme. Over the last 10 years, CHCA-related upgrades accounted for approximately 58% of all burners installed in existing houses in AZ1+M (Table 2).

Total # of solid-fuel burners in use at 2006	Total # of wood burners replaced since 2008	Total # installed using CHCA	Percentage of CHCA-related installations	Town
1,270	678	468	69%	Alexandra
640	326	219	67%	Arrowtown
300	212	132	62%	Clyde
970	606	318	52%	Cromwell
690	348	111	32%	Milton
3,870	2170	1248	58%	TOTAL

Table 1. Breakdown by town of total number of appliances installed in AZ1+M and how many were related to the CHCA programme

4. Programme evaluation

An incentive programme was a central element of council's original air quality strategy. The programme focused primarily on Air Zone 1 to create an accelerated push to replace old, non-compliant burners in order to meet the NESAQ by its original deadline of 2013. Council worked closely with central government, territorial authorities, and contractors to deliver maximum effort. Within Council, work streams supporting the programme cut across communications, operations, science, and the consents team.

This assessment looks at 3 main factors:

1. Did the CHCA programme accelerate the natural uptake of clean heat?
2. What were the effects on the environment in Air Zone 1 and Milton?
3. Have other co-benefits been realised as a result of the CHCA programme?

It also highlights some of the issues that arose during administration of the programme and what opportunities might exist for any future programme.

4.1 Programme Uptake

The programme was designed not only to assist homeowners with upgrading their old solid-fuel heating appliances, but to actively encourage homeowners to change to cleaner heating ahead of the phase-out date. Based on recent invoices, a household can expect to pay anywhere from $2500 to $8000 (median of $4000) for the installation of a new solid-fuel burner. CHCA programme incentives generally ranged from $1000-$2500.

Over the past 10 years (2008-2017), CHCA-assisted burner upgrades comprised the majority of all burner replacements in Air Zone 1 towns. The percentage of CHCA-assisted replacements in Milton is about one-third of total replacements (Figure 2). NB: There is no phase-out rule in Milton requiring the removal of old, inefficient burners.

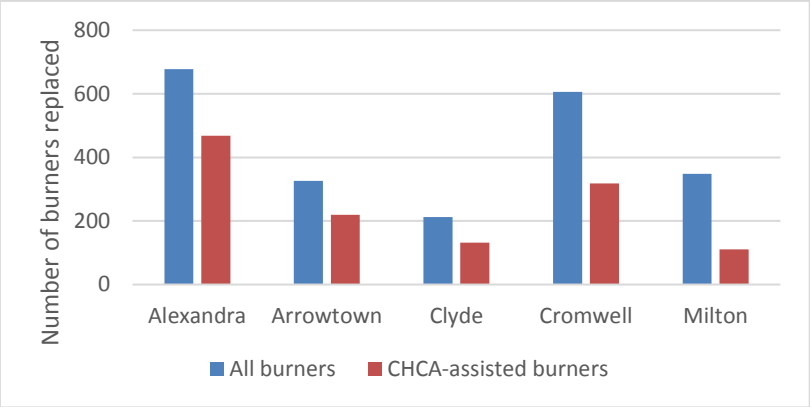

Figure 2: The total number of burners installed in existing houses from 2008-2017 (blue) and the number which were CHCA-assisted (red).

Every year a certain number of households replace their solid-fuel burners; a building consent from the local territorial authority is required for this activity. An analysis of those building consents for the three years prior to the CHCA's inception (2005-2008) and the four years after the EECA programme's funding ceased (2014-2017) indicates that the typical rate of replacement is between 3-4% per annum in Air Zone 1 towns and Milton.

During the period when the CHCA programme was most active (2009-2013), overall burner replacement rates were significantly higher than normal in every town (Table 3), ranging from 7 to 9%.

	2009	2010	2011	2012	2013	Average Replacement Rate (inc. CHCA)
Alexandra	5%	6%	12%	9%	5%	8%
Arrowtown	6%	7%	9%	6%	7%	7%
Clyde	5%	9%	17%	10%	6%	9%
Cromwell	5%	3%	14%	11%	7%	8%
Milton	12%	4%	9%	5%	5%	7%

Table 2 Overall burner replacement rates during years of key CHCA activity.

It does seem reasonable to assume that the CHCA incentive did encourage additional homeowners to take up burner replacements, i.e. people who may not have been inclined to change burners did so, given the financial incentive.

There is no hard evidence available to understand homeowner motivation; however, main programme messages included encouraging homeowners to upgrade their burners ahead of the phase-out date (2012), and encouraging those people selling their houses to upgrade as a benefit to potential buyers[7].

4.2 Effect on the environment

The desired outcome of burner phase-outs and/or a shift to clean heat appliances was to achieve lower particulate emissions and, therefore, lower particulate concentrations in airsheds. In this case, the term 'clean heat' refers to no-emission (heat pumps, gas, etc.) and low-emission (conventional burners at less than 1.5g/kg emissions and pellet fires) appliances.

[7] Personal communication, Lauren McDonald

Regular emission inventory surveys provide information regarding particulate emission trends in towns. The latest inventory performed for Otago (2016) included Alexandra, Arrowtown, and Milton.[8] Results of that study indicate that emissions reduced by approximately 50% in these areas from 2005 to 2017. Most of that change was attributed to "reduced coal use for domestic heating and the replacement of older wood burners with burners that meet the National Environmental Standard design criteria for wood burners" (Wilton).

State of the Environment (SoE) air quality monitoring data complement the emission inventory and provide a second measure as to the real effect on the environment. All of the towns targeted by the CHCA programme have 10 years of PM_{10} data. With that length of record, the effects of weather on particulate levels will be smoothed and trends resulting from interventions should appear.

Three indicators are used to track trends:

- Number of Exceedances during the calendar year (green bar)
- Winter average PM_{10} from May-August (red line)
- Average PM_{10} of the highest 10 days (purple line)

Except for exceedances, which are measured in number of days, the other two metrics are measured in micrograms of PM_{10} per cubic metres of air. The rationale for these metrics follows:

The number of exceedances is based on short-term, daily averages of PM_{10}. In instances where pollution levels are high this is a rather blunt measure, but useful to understanding the margin of improvement that is needed to meet the NESAQ.

Longer-term winter averages are taken by averaging the PM_{10} for the 123 days of winter (May through August); it indicates the seasonal pollution level. Lowering these averages requires a sustained and real change to particulate levels.

The trend in the average of the 10 highest days (top 8% of winter) is a useful measure of whether the PM_{10} load is reducing and is regarded as an early indicator of change.

Figures 3-7 indicate these metrics for the five towns under discussion.

[8] Emily Wilton, Environet Ltd., *Alexandra, Arrowtown, Mosgiel and Milton Air Emission Inventory – 2016 (2017 Amendment),* Prepared for the Otago Regional Council, August 2017

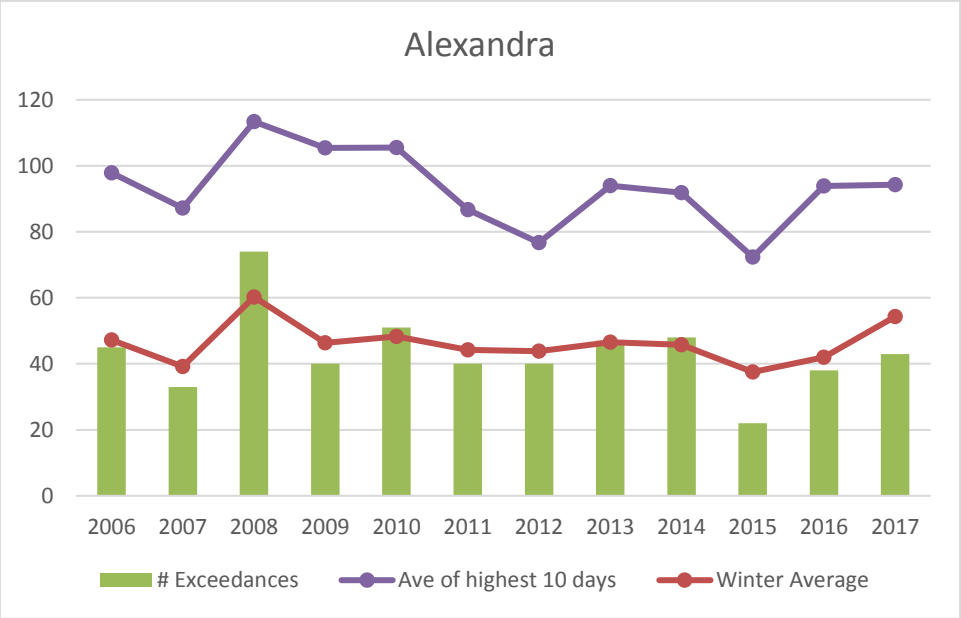

Figure 3: PM_{10} values for Alexandra from 2006-2017

In Alexandra (Figure 3), the number of exceedances and the winter average have stayed relatively consistent over the years. Of note is the significant decrease in the highest PM_{10} levels during the time the CHCA programme was most active. Since 2013, that indicator has plateaued.

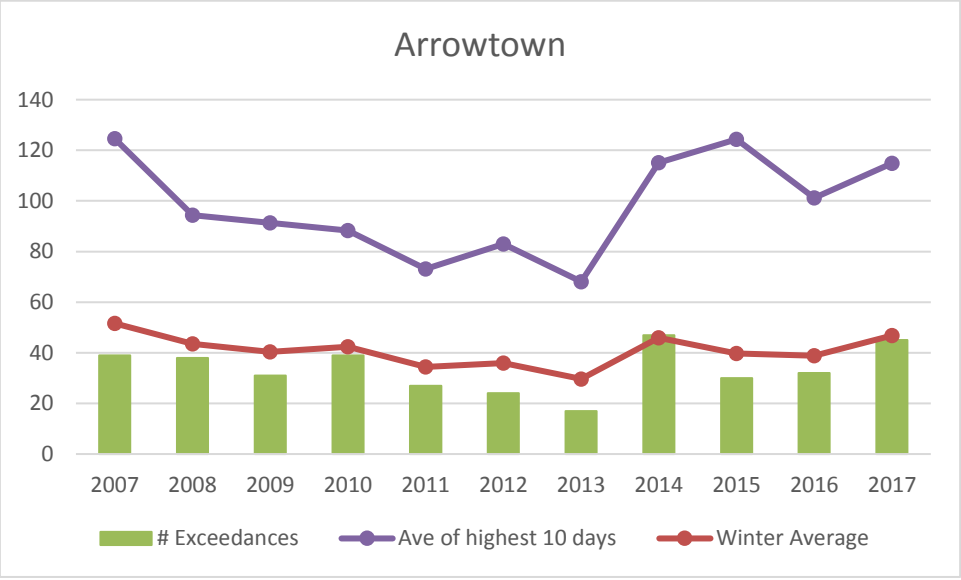

Figure 4: PM_{10} values for Arrowtown from 2007-2017. NB: In 2014 the monitor was moved to a new location.

It is noted that the monitoring site was moved for the start of 2014 due to expansion of the Arrowtown School. There appears to be significant change to all indicators from the beginning of the record until that move. The new location is obviously located in a more polluted environment and it will take several more years of monitoring to identify any trends.

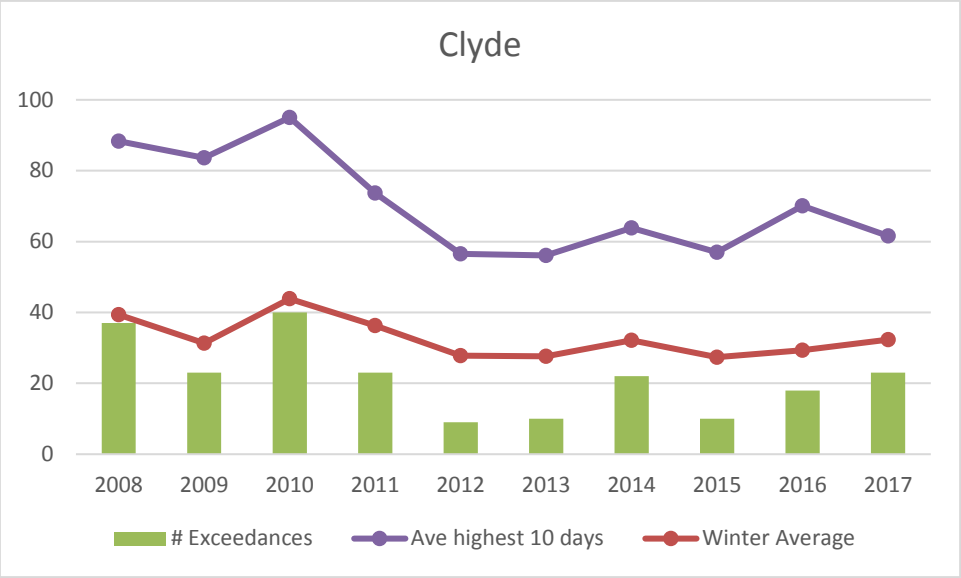

Figure 5: PM_{10} values for Clyde from 2008-2017

PM_{10} indicators all trended sharply downwards from 2010 through 2012 and have subsequently plateaued.

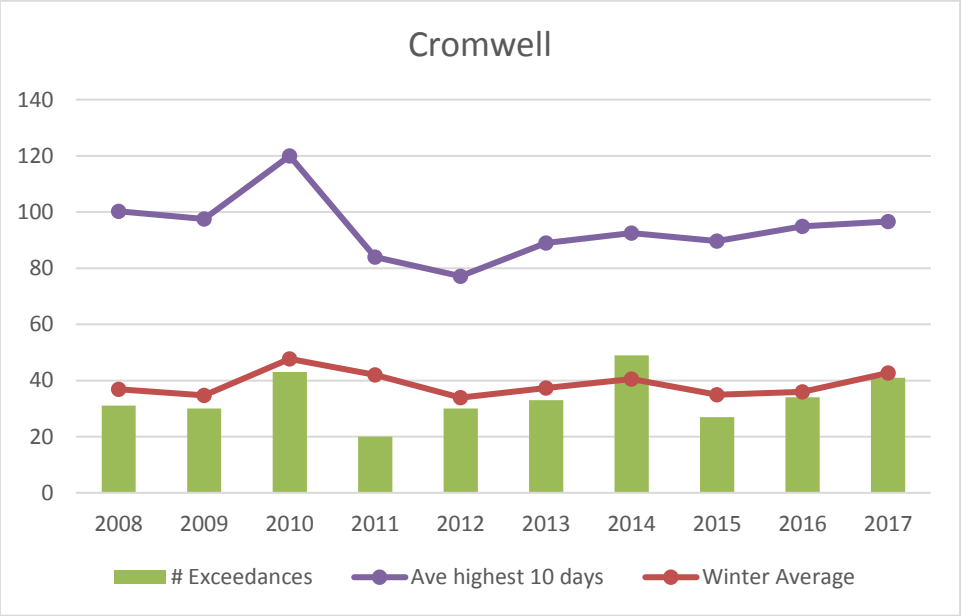

Figure 6: PM10 values for Cromwell from 2008-2017

The highest levels of PM_{10} trended downwards from 2008 through 2012 when the CHCA programme was most active. There appears to be an upward trend since that time, but it is unclear at this point whether that trend is valid.

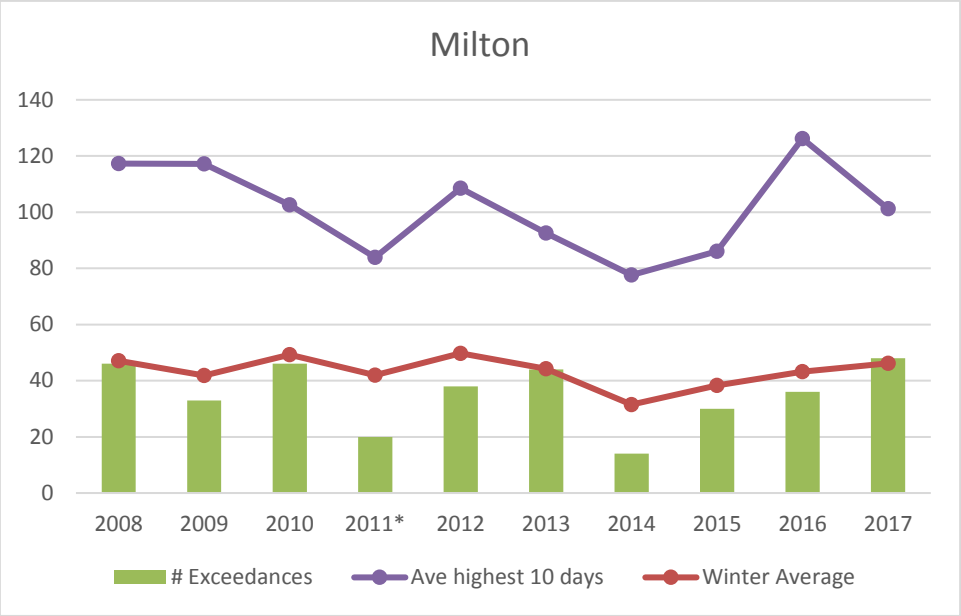

Figure 7: PM_{10} values for Milton from 2008-2017. Data for 2011 is excluded due to excessive missing data.

For the most part, Milton's particulate indicators are highly variable and a real trend is yet to be identified. The winter average has stayed fairly consistently between 40-50µg/m^3, one of the highest in the region and comparable to Alexandra's winter average.

In Central Otago towns where there was an active programme with a deadline date for phase-outs there was an improvement to air quality. This is evidenced by the downward trend in the highest PM_{10} values and, in some cases, in the exceedances and winter averages. The objective of the CHCA programme was to assist homeowners in changing their heating appliances, not necessarily to ensure that the NESAQ was met. The initiative was one part of a larger, coordinated programme including an education and awareness campaign that took place during the programme's most active phase.

The trend in improving air quality tended to level off after 2013, which was when EECA closed its programme and our own programmes across Council were scaled back.

Further emission-reduction analyses indicate that in Central Otago, even if all solid-fuel burners had been upgraded to low-emission style burners (0.7g/kg or 1.5g/kg emission rates), it is highly unlikely that the NESAQ would be met. The airsheds are, in a sense, over-allocated, even with the lower emissions and improvements that have been made.

4.3 Co-benefits achieved by the CHCA programme

In addition to improved outdoor air quality the CHCA programme likely provided co-benefits to the communities and participants, including savings to household energy costs, improved indoor comfort and quality of life, and attendant health savings.

While household energy saving seems an obvious benefit, research has shown that when the thermal nature of a house improves there will be people that take that improvement in what is termed a 'take-back' or rebound effect. Instead of saving money on energy, they take-back the improvement in the form of greater comfort from being able to increase the indoor temperature for the same amount of money[9].

[9] Philippa Howden-Chapman, et al., *Warm homes: Drivers of the demand for heating in the residential sector in New Zealand,* Energy Policy 37, 2009

Some of the increased comfort from elevated indoor temperatures will result in improved health outcomes for residents, particularly the most vulnerable in the population. An evaluation of the effects of EECA's Warm Up New Zealand: Heat Smart programme on health services utilisation and costs was performed in 2011 by the *House and Health Research Programme, a consortium of health researchers in New Zealand*[10].

Results of the analysis indicates that in terms of changes in total hospitalisations and total pharmaceutical costs, there is an overall on-going annual benefit of $563 per household for retrofitted insulation. For CSC holders, the benefit is predicted to be about $820 due to improved health outcomes from warmer and drier homes; for non-CSC holders the benefit may be approximately $230.

Of the 2150 total CHCA claimants, there were 590 claims that included insulation; of those, 435 claims were from CSC holders. According to the predicted health cost savings, the annual on-going benefit from retrofitted insulated is estimated to be approximately $390,000.

In 2013 an insulation and heating appliance scheme (*Warm Dunedin)* was run in Dunedin by the Dunedin City Council. Participants were surveyed afterwards on their perceptions of the change in their houses[11]. Of the respondents:

- 88% feel their house is warmer
- 47% feel their house is healthier
- 73% feel their house is more comfortable
- 73% feel their house is more efficient to heat

This is a strong indication that participation in such a scheme can result in positive tangible and intangible outcomes for households.

5. Issues for consideration

The CHCA programme was a key element of the Otago Regional Council's 2007 air quality strategy, sitting within a wider framework. On its own, the programme accomplished its goal of incentivising homeowners to upgrade their solid-fuel heating appliances to cleaner, more efficient wood burners. In addition, the programme provided financial assistance for insulation, thereby improving the thermal envelope of older homes.

Ambient air quality did improve in most Air Zone 1 towns from 2009 to 2013 as a result of the concerted effort made Council-wide during that time; however, since then particulate levels have plateaued and burner replacement rates have declined. Several key issues can be pulled from the experience of the CHCA initiative, its delivery, and its effectiveness.

<u>Programme design</u>

The CHCA programme did affect ambient air quality, but it may have had a more pronounced effect with a different design:

[10] Lucy Telfar Barnard, et al., *The impact of retrofitted insulation and new heaters on health services utilisation and costs, pharmaceutical costs and mortality: Evaluation of Warm Up New Zealand: Heat Smart*, Commissioned by the Ministry of Economic Development, Wellington, 2011

[11] Dunedin City Council Report, *Warm Dunedin Targeted Rates Trial, Participants Survey, Report for April 2014,* Dunedin

- The programme was available to anyone willing to remove any non-compliant burner in Air Zone 1, and was not targeted at the largest emitters first, i.e. open fires, multi-fuel burners and coal appliances
- The programme mostly resulted in the replacement of old burners with compliant solid fuel burners rather than no or ultra-low emissions appliances (heat pumps, gas, pellet etc.). ORC's latest estimates show that a large uptake of compliant burners will not be sufficient in meeting the NESAQ standards.
- There was no control over what became of the burners being replaced, and whether they had been disposed of, or re-used in another household.

Understanding community motivation

There is an obvious difference in the programme take-up rates between the Air Zone 1 towns and Milton. Understanding the reason(s) for that difference may be important for any future work that might be done in the region.

Air Zone 1 town residents were faced with a deadline for burner phase-outs while Milton residents were not; this likely provided added impetus and interest in the CHCA programme. Even though the nature of compliance monitoring was not originally included in the air strategy, the notion that there was a deadline would likely have spurred action on some participants' part.

Admittedly, not all homeowners in Air Zone 1 towns have converted to compliant burners so it is possible that all of the 'low-hanging fruit' has been taken and the rest will require some further council intervention.

How the programme is tailored may also influence its effectiveness. There is a significant difference in the socio-economic setting between towns, e.g. Milton and Arrowtown lie at opposite ends of the deprivation index (as described by Stats NZ). It is possible that the amount of financial incentives offered in Arrowtown may not be scaled appropriately in Milton.

Knowledge Gaps

Thorough planning at the start of any programme should include setting out the parameters for assessment so that appropriate data can be collected during the programme. Examples of data that would be useful but have not been collected are:

- Reasons for homeowner participation – these could be varied and include the amount of the financial incentive, the suppliers chosen, the products available, sale of house, etc. Understanding this could help tailor any new programme.

- A record of what types of appliances, e.g. open fire, multi-fuel, etc. were taken out of circulation. These data would have helped to refine emission modelling.

- Information on participant satisfaction – a timely survey of participants could have provided data on house warmth and satisfaction after an upgrade.

Much of these data could be obtained through survey (pre- and post-participation) and paperwork submitted by suppliers at the time of delivery.

All of these considerations can inform thinking around the development of any future programmes.

6. Recommendation

a) *That this report be received.*

b) *That this report be used to inform the review of ongoing financial incentives for Air Quality, proposed for 2018/2019 in the 2018-2028 Draft Long-Term Plan.*

Endorsed by: Gavin Palmer
Director Engineering, Hazards & Science

Attachments
Nil

11.2. Director's Report on Progress

Prepared for:	Technical Committee
Activity:	Governance Report
Prepared by:	Dr Jean-Luc Payan, Manager Resource Science (acting) Dr Ben Mackey, Manager Natural Hazards (acting) Chris Valentine, Manager Engineering
Date:	June 2018

---

1. Précis

This report presents an update on the following matters:

1. Lower Taieri and Lower Clutha flood scheme stakeholder meetings;
2. Leith Flood Protection Scheme;
3. Roxburgh debris flow hazard;
4. Mt Roy (Wanaka) mudflow hazard, and
5. ORC participation in NIWA's air quality project launch.

It is recommended that this report is received and noted.

2. Lower Taieri and Lower Clutha flood scheme stakeholder meetings

On 2 May and 3 May, a series of three public meetings were held on the Taieri Plain (Mosgiel and Momona) and in Balclutha. The purpose of the meetings was to give an overview of the operation of the different flood protection and drainage schemes in those areas as well as to present current key projects and proposed projects for the coming years as described in the 2018-28 Draft Long Term Plan. It was also an opportunity to provide an update on the work (physical and analytical) following the July 2017 flood event on the Taieri Plain.

35 people attended the meeting in Mosgiel, 16 people attended the meeting in Momona and 9 people attended the meeting in Balclutha. Representatives of the Dunedin City Council (DCC) addressed the meeting in Mosgiel.

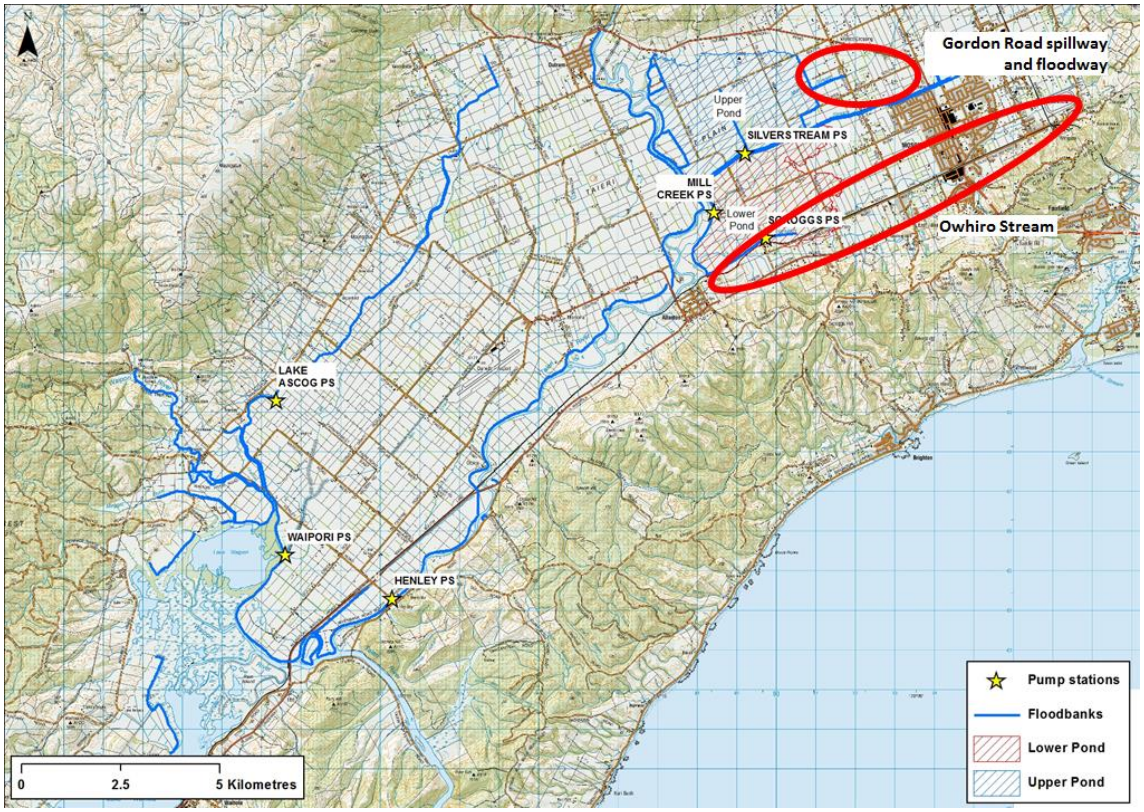

Figure 1: Lower Taieri Flood Protection Scheme with the Gordon Road spillway and floodway and the Owhiro Stream areas highlighted.

The meetings were timed so public feedback could be received through the 2018-28 Draft Long Term Plan consultation process that closed on 11 May.

In Mosgiel, questions and discussions were focussed around storm water management in the Owhiro catchment (Figures 1 and 2) and on the effects of climate change on the different schemes operations. Issues around pumping operation and land drainage were mainly discussed during the meeting in Momona and the accumulation of sediment in the Clutha River near Balclutha was the main topic raised during the Balclutha meeting. Staff have proposed the development of "target" bed profiles so that there is more direct monitoring of flood channel capacity.

Figure 2: Owhiro Stream at Mosgiel during recession of the July 2017 flood.

A meeting with the residents likely to be affected by the Gordon Road Spillway (Figure 1) was also held on 16 May at the 12 Oaks Golf Club, East Taieri. This meeting, attended by 35 people, was organised by the Mosgiel Taieri Community Board Chair with ORC and DCC representatives. The purpose of the meeting was to raise awareness around the role, operation, and effects of the Gordon Road Spillway, to present the ORC flood management process and Civil Defence response during a heavy rainfall event and the different sources of information available during these types of situations. Questions and discussions were focussed around options to mitigate the effects of the Gordon Road spillway and the swales and overland flowpaths to the north of the Silver Stream (Figure 3). ORC staff outlined the extensive investigations that had been undertaken in the past and the inability to identify solutions that were technically feasible and economically acceptable.

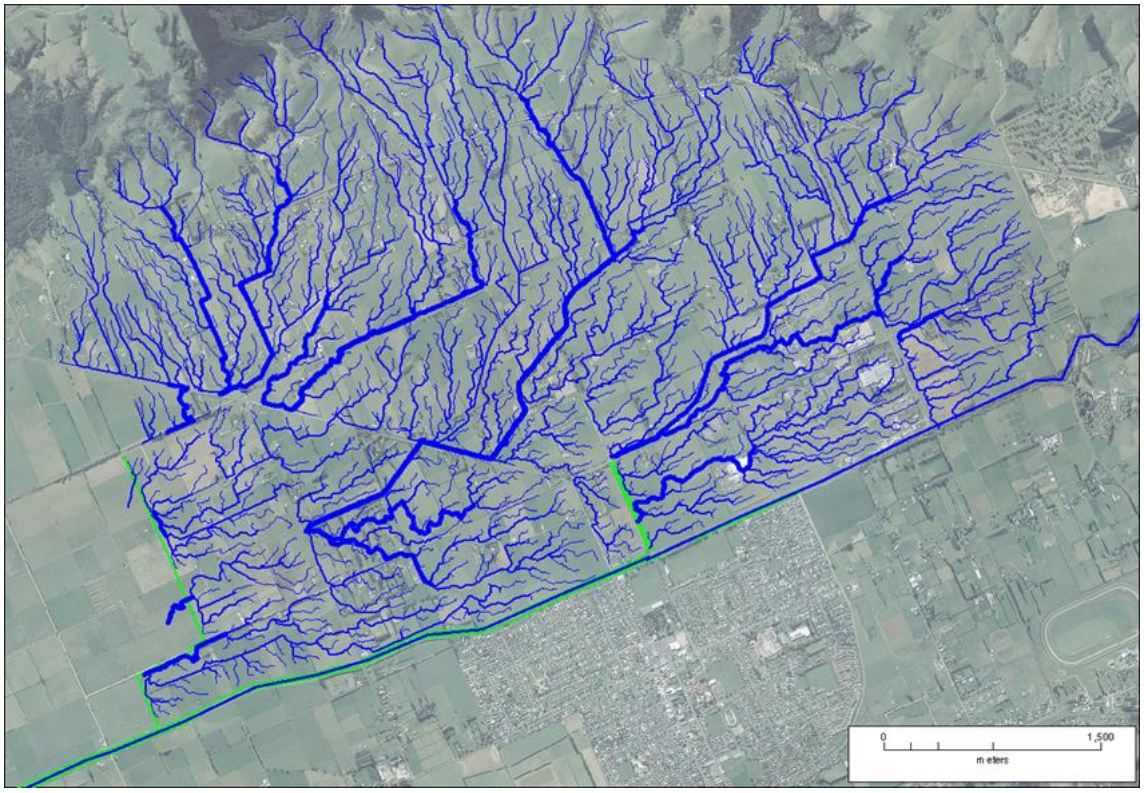

Figure 3: Swales and overland flowpaths on the northern side of the Silver Stream, Mosgiel.

An information session with residents and families of Chatsford Retirement Village (Mosgiel) was also held on 18 May. The session organised by the retirement village Chief Executive was attended by approximately 20 people. Flood hazard and civil defence information was presented by ORC staff in addition to future improvements to the storm water infrastructure in the area presented by DCC staff. It was agreed that a joint site visit including ORC and DCC staff and Chatsford Village residents will be undertaken to identify and discuss localised flooding issues and possible adjustments to the storm water network servicing the area.

3. Leith Flood Protection Scheme

Engineering works on the Union to Leith Footbridge stage of the Leith Flood Protection Scheme are progressing. The work is focused on the walls on both sides of the channel and reconstruction of the weirs (Figures 4 and 5). A value engineering workshop with the main contractor, Downer New Zealand Ltd, identified ways of advancing the programme; however, the congested work site limits the ability to make significant changes to the works sequence. The weather has caused further delay. The works will be suspended during the mid-year examination period to avoid disruption to university students and staff. Options for staging the completion of the works are being considered by the contractor. The works proposed for the Dundas Street stage of the Scheme are the subject of a separate paper to Committee.

Figure 4: Construction of walls and terraces upstream of and beneath the Information Technology Services (ITS) building (north side of channel).

Figure 5: Construction of walls and terraces upstream of and beneath the Information Technology Services (ITS) building (north side of channel).

4. Roxburgh debris flow hazard

On 8 May, ORC held a public meeting in Roxburgh to review the November 2017 Debris Flow event. On 26 November 2017, Roxburgh experienced heavy rainfall which saw streams near the town fill with debris and inundate adjacent areas. GNS Science presented results from research ORC commissioned following the event. Key findings included that up to 150mm of very localised rain fell in the affected catchments over three hours, and that the debris was primarily mobilised channel sediment, rather than from landslides. Impediments to flow, such as bridges and culverts, were the primary sites of avulsion, where the flows escaped the channel and deposited across the alluvial fans. The large concrete lined channel at the base of Reservoir Creek in northern Roxburgh

confined most of the sediment and large bounders to the channel, but as it filled up finer sediment flowed out of the channel and caused some property damage.

ORC staff presented options for managing the ongoing risk of debris flows in the area, and the ORC is seeking feedback from the Roxburgh community on a range of potential measures. Once feedback is received, ORC will assess the preferred options. Representatives from NZTA also addressed the meeting, and staff from Civil Defence described the draft Teviot Valley community response plan. Approximately 80 people from the community were in attendance.

5. Mt Roy (Wanaka) mudflow hazard

Approximately 200 hectares of hill country immediately south of Wanaka was burnt in a wildfire in early January 2018. ORC staff had concerns about the potential for mudflows coming of the burnt slopes, due to the loss of vegetation, and potential changes to soil properties as a result of the fire. Landcare Research assessed the site for ORC, to determine whether the fire had increased the risk of mudflows. The Landcare assessment has concluded that the fire has not increased the risk of mudflows due to a low burn intensity, and the lack of a developed stream network on the slope. The authors did note a pre-existing mudflow hazard exists at the site, and documented old mudflow deposits on the lower slopes. A rain gauge has been installed near the top of the burnt area to monitor rainfall intensity, and data is available via the ORC's Waterinfo website. A letter will soon be sent to affected residents outlining these findings, and the report will be made available.

6. ORC participation in NIWA's air quality project launch

On 23 May, staff participated in the launch of NIWA's CONA (Community Observation Networks for Air) at the Alexandra Primary School. The CONA initiative was presented by Dr Ian Longley (NIWA) at an air quality workshop for councillors held on 3 May.

The winter-long project aims to teach students about air quality in their community and engage them by actively participating with scientists. As part of the launch, students got a close-up view of Council's PM_{10} monitor and the newly-installed $PM_{2.5}$ monitor.

Figure 6: Warren Crawford (left) from NIWA and Deborah Mills (right) from ORC work with students, showing them air quality and weather monitoring instruments.

NIWA is deploying approximately 100 of their low-cost monitors around town this winter along with a dozen indoor monitors. They will return to Alexandra once during the winter and again after winter to discuss the results.

ORC will gain benefits from this project including an enhanced understanding of the geographic distribution of pollution across town and an awareness of some of the health implications that may affect residents; this information will feed into the development of the air quality strategy's implementation plan. In addition, having this detailed understanding of Alexandra's air quality provides a platform for engaging the community with future educational and stakeholder activities.

6. Recommendation

a) *That the report be received and noted.*

Endorsed by: Dr Gavin Palmer
Director Engineering, Hazards & Science

Attachments
Nil

11.3. Lake Hayes Restoration

Prepared for:	Technical Committee
Activity:	Environmental - Regional Plan: Water Quality
Prepared by:	Dr Ben Mackey, Manager Natural Hazards (acting) Dr Jean-Luc Payan, Manager Resource Science (acting)
Date:	30 May 2018

---

1. Précis

Three remediation options to improve the water quality in Lake Hayes are currently being assessed by Otago Regional Council[1]. At this stage Council has made no decision on whether it would pursue any particular option as it has not yet completed the public consultation on technical and funding options.

One option is to augment the flow of Mill Creek with water from the Arrow Irrigation Company pipeline where it crosses Mill Creek. Installing the offtake and discharge structures to implement the water augmentation option needs to occur in September 2018, to fit with the construction a golf course development by the land owner (Millbrook Resort). Meeting the September timeframe will ensure the Arrow water augmentation option is retained, whereas it may not be possible once the golf course is developed. This paper discusses the work that would be needed to coincide with the Millbrook development schedule, and the indicative costs of that work. It is noted that additional work, costs, and approval will be needed to make the offtake operational.

2. Background

Lake Hayes is a 2.7 km^2 lake 10 km east of Queenstown. Set in the middle of the rapidly developing Wakatipu basin, the lake is picturesque, and has traditionally been a drawcard for tourists, fishermen, and recreationalists. Historic fertilizer use in the catchment contributed to an accumulation of phosphorous in lake-bed sediments[2]. Under certain conditions phosphorous is released into the water column, feeding algal blooms. There is a strong community desire to prevent algal growth, and improve the water quality in the lake for aesthetic, environmental, and recreation reasons. Over 50 submissions on the Draft 2018-2028 Long Term Plan were received on this matter.

The Otago Regional Council (ORC) has identified three potential interventions with the goal of inhibiting algal growth. The three intervention options are:

- Augment inflow to the lake with water from the Arrow irrigation scheme (flushing).
- Cap and bind the phosphorous in the bed sediments by spreading an activated clay material across the lake (capping).
- Enhance vertical mixing of the water column to prevent the development of unmixed layers of water and anoxic conditions which cause the release of phosphorous (destratification).

---

[1] *Directors Report on Progress*, Report to 31 January 2018 Technical Committee, 25 January 2018.

[2] Schallenberg, M., and Schallenberg, L., 2017. Lake Hayes Restoration and Monitoring Plan. Report prepared for the Friends of Lake Hayes Society Inc. 52p.

As part of the 2017-18 Annual Plan, these options are being investigated. This work includes a review by a lake expert from NIWA[3], an economic assessment of each option, and development of a lake model. A timeline is shown in Appendix 1. These studies will inform public consultation about the options and potential funding mechanisms. That consultation is scheduled to occur in September. This will inform decisions by Council on whether to progress implementation of one or more of these options. This may include an application for part funding from the government's Freshwater Improvement Fund.

3. Arrow Irrigation Option

The first option, augmenting the lake inflow, involves taking water from the Arrow Irrigation Company's pipe and feeding it into Mill Creek near the corner of Malaghans Rd and Dennison Way (Fig. 1). The site of the proposed offtake is being developed by Millbrook as a new golf course and residential area. Construction of the golf course and surrounds is scheduled for September 2018. Installation of the Arrow Offtake structure will need to fit in with this schedule so as to avoid disturbance to the golf course at a later date.

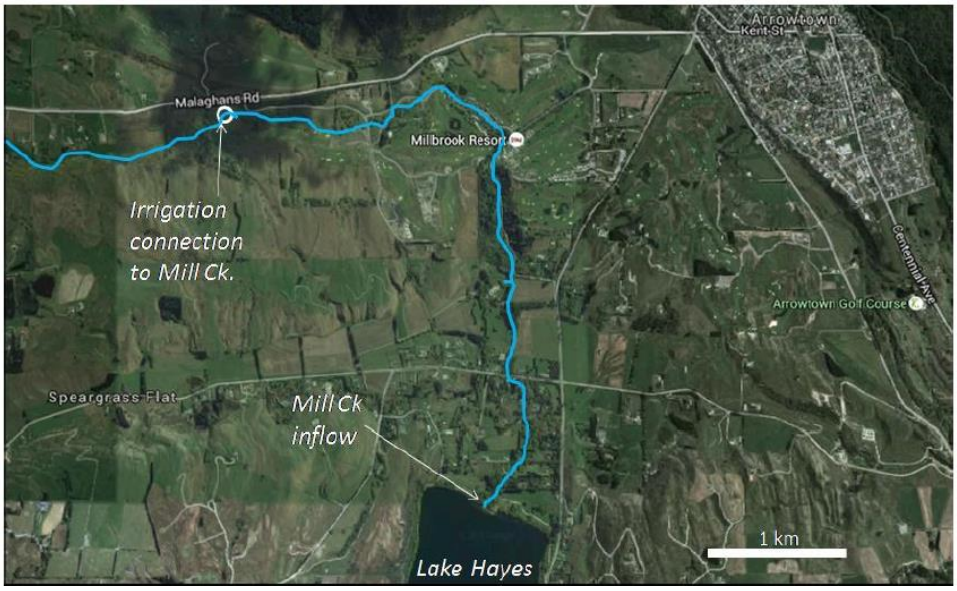

Figure 1. Mill Stream in relation to the proposed irrigation offtake, and Lake Hayes (from Schallenberg and Schallenberg, 2017)

Concept plans for the offtake have been produced for Friends of Lake Hayes by Stantec. Physically, the offtake involves a flange on the main Arrow Irrigation pipe which has already been installed by Millbrook. The water is then piped ~200m across the golf course down to Mill Creek in a buried 450mm plastic pipe. At Mill Creek, the water is discharged via a submerged concrete well structure, designed to minimise noise and surface water disturbance. Control systems to regulate the timing and rate of flow would be incorporated near the offtake from the Arrow Irrigation Pipe. This would be designed to augment the flow of Mill Creek by up to 200 l/s. This rate of flow is seasonally available from the Arrow Irrigation Company (Schallenberg and Schallenberg, 2017).

The cost of installing those components of the offtake system which can not be done easily once the golf course is developed has been estimated by Friends of Lake Hayes

[3] Gibbs, M., 2018. Lake Hayes Water Quality Remediation Options. Report prepared for Otago Regional Council by NIWA. 61p.

at $75,000 - $100,000. This includes engineering design ($20,000), 200m of 450mm pipe ($40,000), and the concrete discharge structure ($15,000). The control components (valve, telemetry) can be installed at a later time and are not contingent on meeting the golf course development schedule. The full costs of an operational offtake and discharge system have yet to be determined.

4. Benefits of Water Augmentation

Two recent reports on remediation options[4] for Lake Hayes have been favourable for the Arrow Water augmentation option. The potential benefits of enhanced flushing include:

- Increased through-flow, which will reduce lake water turnover time, and speed up the flushing of nutrients from the Lake. Schallenberg and Schallenberg (2017) estimate the augmented flow will flush 11% of the phosphorous in the surface water annually.
- Add cold oxygenated water to the lake, which can plunge and prevent the formation of anoxic conditions in bottom waters (and subsequent release of Phosphorous).
- Augmentation of a natural process, and will complement other remediation options.

Water augmentation is also the least disruptive of the three identified options, with the fewest secondary effects. It is the lowest risk option, and can be turned off. If Lake Hayes is to be restored it is likely that flow augmentation would be a component of any remediation programme.

5. Other Considerations

Ownership and maintenance of the asset will need to be decided between ORC, Millbrook and the Arrow Irrigation Company. A licence to occupy agreement may be required from Millbrook.

Water permits, and consents to build the discharge structure, and add water to Mill Creek will need to be obtained. Agreements will be needed with Arrow Irrigation Company regarding the amount and timing of water take. Water used in the augmentation will need to be purchased from the Arrow Irrigation company. The cost of this has been estimated at ~$30,000 annually. Responsibilities for these matters and how they are funded have not yet been determined.

Millbrook have stated the augmentation should have no detrimental effect on flooding of Mill Creek, or the ambience of the waterway. Mill Creek will need to be monitored to ensure the augmented flow does not cause stream erosion, which could mobilise nutrient-rich sediment.

The outflow of Lake Hayes will increase commensurate with the rate of water augmentation. As the increased flow will displace lake water (Schallenberg and Schallenberg 2017), nutrients leaving Lake Hayes and flowing to the Kawarau River are expected to be at concentrations comparable to the present outflow.

6. Summary

Flow augmentation is one of the options preferred by Friends of Lake Hayes and technical experts to improve water quality in Lake Hayes, and work to date suggests it is a leading option, with few detrimental secondary effects. The golf course construction timeline requires a decision on whether to install an offtake system before the full assessment of the options for water improvement is complete. A decision needs to be made as to whether to install an offtake from the Arrow Irrigation Pipe to Mill Creek now,

[4] Schallenberg and Schallenberg (2017), and Gibbs (2018).

when there is a favourable opportunity to do so. This installation would be on the understanding that flow augmentation may not be the preferred option to improve Lake Hayes water quality, and the infrastructure may ultimately not be used as intended. Conversely, by delaying a decision, the opportunity to add an offtake to the pipe may be lost, and the flow augmentation option may become impractical. While it precedes the full assessment of restoration options, it provides an element of future proofing if flow augmentation is confirmed as the preferred option for Lake Hayes remediation.

7. Recommendation

This report is received and noted.

Endorsed by: Gavin Palmer
Director Engineering, Hazards & Science

Attachments

1. Lake Hayes Timeline **[11.3.1]**

12. NOTICES OF MOTION

13. CLOSURE