Lake Ohau Alpine Village Community Water Supply

Submission to the Waitaki District Council

from

the Lake Ohau Alpine Village

Residents and Ratepayers Association

Based on the work of the Water Supply Task Force

Prepared by Dr Phil Driver with input from LOAVRRA, the TF, residents and ratepayers

July 29th 2019

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1. Executive Summary

The key conclusions from this submission are:

1. The Lake Ohau Alpine Village (LOAV) water supply must be upgraded and it must be treated at a level that aligns with the water source (surface water or bore water).

2. The currently available scientific and engineering data on the existing water supply indicates it can continue to provide sufficient volumes of water at a quality that is treatable.

3. The currently available scientific and engineering data on the existing water supply and on possible alternative bore-water sources is not robust enough to underpin prudent WDC decisions on major investments in the water supply.

4. But action must nevertheless be taken in the short term to deliver safe, treated water and to collect the robust scientific data necessary to guide investments in the water supply.

5. Option 10 as defined in this submission will rapidly deliver treated water while collecting robust scientific data to inform all subsequent investment decisions.

6. If that data proves that further upgrades are required then the mobile treatment and monitoring unit in Option 10 can be readily re-purposed for all other options. Option 10 *does not exclude any other options – it is a precursor to scientifically inform possible subsequent options.*

2. Introduction

In 2008 the Waitaki District Council (WDC) started discussions with the Lake Ohau Alpine Village (LOAV) community on the legally required upgrading of the community's water supply. 11 years later in January 2019 the WDC held a meeting of the Ohau village and surrounding community and presented an option based on abandoning the current alpine-spring-fed water supply and replacing it with a bore water supply situated on McKinnon reserve. The community did not agree with this option, reaffirming its priority for on-going use of the alpine spring source that had been expressed in 2008 and again in 2014.

Subsequently a Task Force (TF) of community members plus other individuals and groups have intensively reviewed 9 options, discussed them with the WDC and formulated and validated Option 10 (see section 4 of this submission). The 9 options are defined separately in various reports and memos by Fluent Consulting (see 'References' below), the last of which was received by the Lake Ohau Alpine Village Residents and Ratepayers Association (LOAVRRA) only on the 23rd July 2019. The LOAVRRA has responded as fast as possible to these documents from the WDC/Fluent.

The current water source is from an alpine spring which in the 22+ years' experience of LOAV residents and ratepayers (R&R) has never run dry. The consented take is 2.2 litre/second (190,000 litres/day). Inflows of up to 7 litres/second were recorded when the water supply was established. The water supply was originally designed for 136 properties and this was accepted by the Waitaki District Council (WDC). The WDC is now modelling a demand of 250 litres/person with 4 persons per property (136,000 litres/day). This confirms that the current source can supply a sufficient volume of water even if every property were occupied by 4 people = 544 residents.

The LOAV currently has 70 houses and 24 permanent residents plus visitors. A reasonable forecast would be that when all properties have houses that a similar ratio would apply, ie 48 permanent residents plus visitors, maybe 200-300 people at any one time. This is a more realistic level of occupancy than the 544 people modelled by the WDC and would require just 73,000 litres/day. Short-term peak demands could be higher than 2.2 litres/second but these peaks can be accommodated with the existing storage tanks and, *only if necessary*, an application to increase the current consented take and/or the addition of 120,000 litres of storage tanks proposed as a back-up by Option 10 as described in section 4 of this submission.

Water quality from the current *source* is not well documented because almost all water sampling has been in the village, not at the source. Possible sources of any contaminants in the village-sampled water have not been investigated by the WDC who seem to assume that contaminants are in the source water. That assumption is unproven. Given that the current source is about 200 metres from any surface-flowing stream, the source water will be filtered by the intervening gravels and sediments.

The water quality as measured in the village therefore represents a worst-case scenario so the source water is almost certainly purer than has been recorded in the village. Even given this worst case, the water mostly has low levels of contaminants (pathogens; turbidity) that can readily be addressed with Option 10.

The Mt Somers water supply confirms that it is completely viable for a community water supply to be based on a surface water source.

Lake Ohau is a special alpine place with a unique natural heritage and environment which is dear to the hearts of its community. One reason for living here has been the perceived quality of the gravity-fed alpine water that has successfully supplied the village for several decades.

In contrast as clearly expressed at the WDC/community meeting on 3 January 2019, Ohau R&R do not want to drink bore water that risks being contaminated by treated effluent from the lake or sewage plant irrespective of how well it has been treated. Together with an R&R survey conducted just last week, this means that there is a majority (83% in the recent survey) of LOAV R&R who wish to maintain and upgrade the existing, alpine-spring-fed water supply source by way of Option 10: a staged approach to the upgrade of the water supply with two key priorities:

1. Measure all aspects of the water supply to collect the scientific and engineering information necessary to underpin subsequent, prudent, larger-scale investment decisions (if proven to be necessary based on this evolving information)
2. Immediately treat the water supply (UV and filtration with potentially back-up chlorination) using a cost-effective, mobile water treatment and monitoring unit that can be re-purposed for any subsequent investments (if demonstrably required), coupled with selective abstraction at source

This submission compares and contrasts Option 10 with a generalised concept based on bore water supplies which generically represents the other 8 options considered by the WDC.

LOAV R&R were recently consulted by sending them a draft of this submission together with a proposal from APEX Environmental for a transportable water treatment and monitoring module and subsequently the latest Fluent report. Of those R&R who responded, 83% (30) supported this submission and 17% (6) opposed it.

The preparation of this submission was funded from LOAVRRA reserves plus anonymous R&R's donations.

3. Data and information

A council's prudent investment in a community water supply should be based on a wide and complex range of validated scientific, technical, legal and social information. It is seldom possible to collect such a complete and robust set of information. Risks and uncertainties must therefore be assessed using credible risk assessment methodologies.

To do this effectively requires confidence in the validity of the available data.

This section reviews the data on the LOAV community water supply including both historical data and data from models and other predictive techniques. This review evaluates the data on both Option 10 and on the generalised option of using bore water.

Key conclusions are that:

1. there is considerable data of variable quality about the current water supply to indicate that it has sufficient volume and can be treated effectively

2. in contrast there is almost no reliable physical information available on any of the bore water options proposed by the WDC/Fluent
3. overall there is insufficient robust data to justify major, non-recoverable investments in the water supply so it is both essential and urgent to collect reliable data as per Option 10 of this submission

3.1. Water *demand*

3.1.1. Existing demand as measured in the village

The current water source easily meets existing demands. No-one who has contributed to this report has ever run out of water over time periods of up to 22 years living in the village. No robust data has been given to R&R to justify claims of water shortages. The current measured water demand includes water that flows directly to the sewage system to keep it operating (22,000 litres/day in recent times). WDC appears to have now stopped this flow, so future demand-flow measurements will more accurately correlate with actual household water usage. Current demand also includes significant unmetered seasonal demand from the campground and intermittent high demand from Avoca house. These two demands need to be explicitly controlled so as to not disadvantage village R&Rs.

3.1.2. Forecast demand from a fully occupied village

The LOAV has 136 sections. WDC's modelling assumes 250 litres/person/day and each house occupied by 4 people requiring 136,000 litres/day. There are now 70 houses but only 24-30 residents plus visitors. When 136 houses are built it is reasonable to expect a similar occupancy rate (48 permanent residents + visitors – maybe 200-300 in total requiring just 73,000 litres/day). The water supply must recognise this intermittent and modest level of occupancy.

Short-term peak demand must be catered for but until such time as we have accurate data on *actual* average and peak demand in the village we can only speculate on future peak demands, especially given the intermittent and modest level of house occupancy. Option 10 will collect this essential scientific information to inform subsequent prudent investments in the LOAV water supply while minimising up-front costs.

3.2. Water volume *available* from the current source

3.2.1. Permitted take

The current water abstraction consent (valid until 2035) is for up to 2.2 litres/second.
This provides 190,000 litres/day – substantially more than the 136,000 litres required by a fully built up *and fully occupied* village and almost double the 73,000 litres/day required for a realistic occupancy of 200-300 people as noted in 3.1.2 above.

Conclusion: The current water source consent is *more than sufficient* to meet current demand and *to meet demand from a fully built up village* and *to have spare capacity beyond that.*

3.2.2. Actual flows at source and hence what is or could be available

Flows of up to 7 litres/second were historically recorded from the current source. Subsequently, flows have been recorded after the storage tanks. No recent data exists on the amount of water that could be drawn from the existing source or on the varying availability of water season by season.

In the highly unlikely event that the consented flow proves to be insufficient then a consent review could potentially allow an increase in take. Given that community water supplies are first order priorities for Canterbury's territorial authorities as spelled out in the Canterbury Water Management Strategy, such a consent review could grant an increased permitted flow. In the unlikely event that an increase in consent volumes cannot be achieved then *only as a last resort* consideration could be given to *adding* a bore water supply to the existing supply.

Option 10 will monitor actual flows both from the current source and in the village to produce robust data for future prudent investments in the water supply.

3.2.3. Information on water quantities from bore water sources

There is no reliable information on the volume or quality of water that might be sourced from bores near the village.

One attempt to find bore water close to the village was unsuccessful, due (we believe) to downhole 'liquefaction'. There are bores a significant distance from the village and these have modest flows of up to 1.6 litres/second. It is likely that to obtain sufficient high quality water from bores it will be necessary to drill multiple bores – some of which will be failures and a few of which might be successful. At perhaps $30-50,000 per bore (including failed bores) this would be an expensive and risky option to pursue, especially given that there is compelling evidence that the current source has both sufficient quantity and quality of water to meet the foreseeable needs of the village.

Conclusion: Predictions of the amount of water that can potentially be sourced from bores are speculative and insufficient for guiding prudent investments.

3.3. Quality of water available from the current source

3.3.1. Data on quality of the water at source (if any)

The current source was originally agreed to by the WDC because the water was deemed to be of high enough quality for human consumption based on regulations in place at the time. However, there is almost no recent data on the quality of the water, *at source*, from the current alpine spring.

Despite raised pathogens levels measured in the water sampled in the village there appear to have been no investigations into the possible sources of this contamination.

The WDC does not appear to have provided LOAV R&R with any information that correlates turbidity and/or pathogens in the water sampled in the village with source-related factors such as rainfall, river levels, river turbidity, density of animals in the infiltration zone, potential leaks in the system or plumbing being done in the village. If the WDC does have this information then could the WDC please supply it to the LOAVRRA?

Conclusion: It is wrong to assume that the quality of water sampled in the village accurately represents the quality of the source water. The quality of water as sampled in the village therefore represents a worst case scenario. So it would not be prudent to abandon the existing proven water source based on unreliable data on the quality of water samples collected in the village.

3.3.2. Data on the quality of water as measured in the village

This section repeats some of the arguments above. This is deliberate. These arguments are crucially important for underpinning prudent decision-making on rate-payer-funded investments by the WDC.

The WDC appears to infer the quality of the current source water from the quality of water sampled in the village *after* the water has gone through the existing infrastructure which has been insufficiently maintained. Such inference is unscientific and should not be used for making investment decisions.

The existing water supply infrastructure does not appear to have been recently flushed or pressure-checked for leaks or other potential failures or sources of contamination. Consequently, in situations such as a fire in the village, flushing flows may disturb settled sediments, biofilms or other contaminants that then flow to the village including to the water sampling point, thereby giving misleading data about the normal water quality at source.

The considerable amount of plumbing work done to connect new houses to the water supply could have damaged the current system and caused the ingress of contaminants, such as the stones and sediment that came out of the system during fire-fighting testing.

There can therefore be little faith that the current water quality data represents the state of the water *at source* or even that it represents the state of water that *would come through well maintained infrastructure*.

Conclusion: The existing water quality data represents the worst-case perspective on the current water source and infrastructure and should not be relied on to underpin investments in the LOAV water supply.

3.3.2.1. Pathogens

Pathogens could enter the current water through infiltration at source or through damage to the system. Any damage in the system can be found and fixed.

The risk of pathogens entering the infiltration gallery is unknown because it appears that it has not been measured recently. A 'surface' water source (less than 10 metres deep) has the *potential* to be contaminated by pathogens but that doesn't mean that it *will* be contaminated. The current infiltration gallery appears to be between 100 and 200 metres down-flow from any surface-flowing water source (Freehold Creek and some small springs) so this distance should provide significant natural filtering out of pathogens should pathogens enter the area (eg from animals, birds and humans). Appropriate fencing of a protection zone around the source is also likely to reduce the presence of pathogens, if any, at source.

It would be wrong to assume that because pathogens were found in the village water supply *when sampled in the village* that those pathogens originated at source. Even if pathogens are in the source water, the levels that have been recorded are readily treatable by filtration and UV.

Conclusion: It is essential to collect accurate information on the level of pathogens, if any, at the current source, not just in the village. Even in the worst case, the level of pathogens is treatable.

3.3.2.2. Turbidity

Turbidity measurements in the village tell us nothing reliable about the turbidity of the source water. It is reasonable to suggest that the occasional turbidity in water samples in the village is the result of particulates or biofilms that have settled in small quantities in the storage tanks or pipework and then been disturbed and re-suspended due to higher flows, eg during and after fire-fighting.

Manufacturers of modern UV treatment plants say they can treat water with up to 2 NTU and even up to 10 NTU of turbidity. New legislation relating to water treatment may permit turbidity's up to these levels (to be confirmed). Only 3 occasions (21/12/09 when high flow rates were recorded; 27/6/16; 20/3/18) in the decades since turbidity measurements of water were made in the village has the turbidity exceeded 10NTU and on the majority of occasions the turbidity has been low.

It is therefore wrong to claim that the current source of water is regularly or even infrequently too turbid to treat with UV.

Many water supplies measure the turbidity of incoming water and 'selectively abstract' the water so that excessively turbid water does not enter the system. Option 10 incorporates such selective abstraction.

Conclusion: The already low levels of water turbidity measured in the village, the Option 10 installation of a selective abstraction system and the ability of modern technologies to UV-treat water with up to 2 NTU (and perhaps 10 NTU) will almost certainly eliminate all concerns relating to 'apparent' (as sampled in the village) turbidity in the existing source water.

3.3.2.3. Temperature

Ground temperatures are typically around 12 degrees so water samples would be expected to have similar temperatures. Water samples from the LOAV with reported temperatures as high as 21 degrees are cause for concern and call into question the effectiveness of at least some water quality data. Why were the samples so hot? Was the above-ground (and hence potentially hot) sampling point the cause? Were samples not kept cool between sampling and testing? Did pathogens multiply in the warm samples between collection and testing and so lead to incorrect pathogen measurements?

Conclusion: These doubts confirm that before making major investment decisions it is essential to collect *accurate* data throughout the water supply infrastructure as defined in Option 10.

3.3.3. Comparison with the information available on the quality of possible bore water sources

There is no information available on the quality of water from potential new bores close to the village.

There is no robust information on the flow directions of water under and around the village although the WDC has stated that the flow is primarily 'towards the lake'. Water is unlikely to flow freely through the compacted fine sediments under and around the village (as it would in gravels) but rather is likely to travel through cracks/fissures in the sediments. These cracks/fissures can head in any direction – maybe away from or towards bores.

No-one knows where the discharge from the village sewage system flows to underground. Does it flow towards the lake (in which case bores near the lake risk being contaminated)? Does it flow under the gully behind the village (in which case bores behind the village risk being contaminated)? Does it flow in both directions? Is it diluted (as one might expect if it were travelling through water-dense alluvial gravels) or does it stay concentrated (as one might expect if it were travelling through confined channels)?

Of greater concern is that as water is drawn from a bore it will draw in (contaminated?) water from further away from the bore. So a bore might start off 'pure' but get contaminated over time.

Of even greater concern is that as the sewage system produces greater quantities of treated effluent from a growing village, that ground water contamination will increase in concentration and spread. So again, a bore might start off 'pure' but get contaminated over time.

One option that has yet to be fully evaluated and which is strongly favoured by some R&Rs is to install a bore at or near the site of the existing infiltration gallery. This option could preserve the alpine water source while shifting from a surface to bore water source. The WDC has previously advised that this is not an option because it would not be permitted by the existing easements and consents. This should not exclude this option because a renegotiation of the existing easements and permits has not been demonstrated to be impossible.

Conclusion: Any investment in bores near the village would be highly speculative in terms of the probability of finding sufficient flows of high quality water and of their risk of contamination. It would not be prudent to make such investments without robust information on actual (not just modelled or theorised) *long term* groundwater flows and contamination risks.

3.4. Energy requirements for current source

3.4.1. Pumping energy required

No energy will be required for pumping from the existing source so flow will continue during power blackouts. If it becomes necessary to add further raw water storage next to the mobile treatment unit in Option 10 to satisfy peak demands, energy will be required intermittently to pump this raw water through the treatment plant and into the village. In contrast, bore water sources require pumping at all times.

3.4.2. Treatment energy required

UV and filtration of water from either the existing source or a bore source will require electrical power which is readily available at the proposed site for the mobile water treatment and monitoring plant. This power source can be backed up with a generator.

3.5. Legal factors relating to the current source

3.5.1. Potential to increase the permitted take (resource consent)

The current 2.2 litres/second consent is valid until 2035. There is potential to increase the size of this consent by requesting a review of the consent. There is no guarantee that an increased consent would be granted but community water supplies are considered by Canterbury's local authorities to be 1st order priorities and are not restricted when many other consents are restricted.

3.5.2. Easements and land-use permits

3.5.2.1. Existing

The two easements over Don Edward's land are a Right of Way and the Right to Convey Water. Both easements are "forever". There is also a Protection Zone around and above the current intake area and this occupies some of Don Edward's land, DOC land, Sheldon Downs and possibly other private held land. This protection zone must include some fencing, the type and extent of which depends on local topography, geology, the land use and the level of water treatment.

3.5.2.2. Required for the future for the current source

Option 10 appears to not require any new consents or easements on the land of the currently affected landholder. However, it would be polite and professional for whoever installs the solar-powered turbidity sensor and selective abstraction mechanism to discuss with the affected land owner the best way to install and maintain this small and unobtrusive unit. The Option 10 mobile treatment unit will need to be sited on other private land so permissions will need to be gained from the owner plus a building consent *may* be required (but may not be required if the treatment unit is genuinely 'mobile'). So Option 10 is unlikely to face any significant consenting hurdles

3.5.2.3. Legal factors relating to possible bore water sources

Bores will require abstraction consents and land-use easements/permits from affected land holders and they will also require protection zones. The WDC has provided Ohau R&R with limited information on the likelihood that these consents and easements can be obtained and what the costs or other implications would be.

3.6. Urgent need for robust data

The above sections confirm that there is a significant amount of variable-quality data on the quantities and quality of water available from the existing source and effectively none on the proposed bores.

The existing data is incomplete and presents a worst-case scenario for the existing water source, but even despite that worst case, the existing source appears to be able to supply sufficient water for a fully occupied village and that water will be readily treatable.

The WDC needs robust data before making major investments, and where significant investment is required immediately (eg Option 10), that investment needs to be transferrable to any future investments.

Option 10 is the most prudent investment for the Waitaki District Council and Lake Ohau Alpine Village.

4. LOAV R&R's Preferred Option (Option 10)

WDC contracted Fluent to evaluate 9 options. 8 of the options are based on drilling bores near the village whereas option 9 is based on retaining the existing water supply. This submission defines Option 10 which is a variation on option 9. 83% of recently survey R&R's support this submission on Option 10.

4.1. Description of LOAV R&R's preferred option (Option 10)

- A full flush, clean and maintenance of the entire existing water supply infrastructure including the infiltration zone
- A solar-powered turbidity monitor coupled to a selective abstraction valve(s) on the inlet to the system with the option of re-opening the valve and retesting the water every few hours in order to resume inputs when the inflow clears
- A mobile water treatment unit (UV and filtration) installed 'behind' the village adjacent to the power pole with the transformer. This system must continuously monitor total demand-flows plus turbidity, with regular monitoring of biological contaminants. This unit could also include a chlorination back-up module and a backup generator. If the unit proves to drop the water pressure too much then an inline pump could be added, but *only if necessary*
- Regular sampling and measurement of the source water *at source* to determine its true quality and potentially available quantities
- Regular monitoring of input and output flows to detect and fix leakages (if any)
- Address the water use by the campground and Avoca House separately from the village water supply or, as a minimum, control supply to these two seasonal demands so they do not force an otherwise unnecessary upgrade to the LOAV water supply
- Retain the current mix of on-demand and restricted supply until we have quantitative information on supply and demand
- Then possibly switch everyone to on-demand coupled with water-use guidelines and perhaps some rules relating to using water sustainably (e.g. banning sprinklers but permitting trickle irrigation) and maybe adding water meters if demand exceeds supply
- Implement a Water Safety Plan approved by the Department of Health
- Subsequently, *and only if robust data proves it is necessary*,
    - investigate increasing the permitted water abstraction consent
    - install additional raw water storage tanks (with pump and possibly another back-up generator) near the village
    - add a fire fighting reserve near the village (this can use untreated water)
    - add chlorine injection and associated infrastructure
    - add water from bores

4.2. Summary of the key benefits of Option 10

4.2.1. Gravity feed

Gravity feed for the existing water source reduces routine energy consumption which is very important when we must all reduce energy use and emissions to mitigate climate change. Gravity feed also means that water is available at all times including during emergencies such as for fire-fighting and during power blackouts.

4.2.2. Knowledge about the existing source vs other sources

The information we have about the current source is mostly worst-case information collected in the village. Despite that, the current source demonstrably has sufficient water that can be readily treated. In contrast, all potential bore water sources near the LOAV have no reliable data and are at risk of contamination by increasing quantities of treated sewage effluent. Option 10 will generate much of the data that will be required to underpin future prudent investment decisions.

4.2.3. Cost

Option 10 is the least cost option and has the flexibility to be re-purposed for all other options should option 10 prove, over time, to be unacceptable. APEX has provided an estimate of around $470,000 for a fully installed and commissioned mobile treatment plant + selective abstraction unit + an optional 120,000 litres of additional storage as the basis for Option 10. It is recognised that there will be other costs associated with Option 10 (eg fencing of the protection zone).

4.2.4. Timing

Option 10 can probably be implemented quickly (exact timing to be confirmed) because it does not require the consenting and drilling of bores. It will therefore address the overdue legislative requirement to provide a suitable level of water treatment and security of supply for the short to medium term and probably for the long term.

5. Conclusions

The key conclusions from this submission are:

1. The Lake Ohau Alpine Village (LOAV) water supply must be upgraded and it must be treated at a level that aligns with the water source (surface water or bore water).

2. The currently available scientific and engineering data on the existing water supply indicates it can continue to provide sufficient volumes of water at a quality that is treatable.

3. The currently available scientific and engineering data on the existing water supply and on possible alternative bore-water sources is not robust enough to underpin prudent WDC decisions on major investments in the water supply.

4. But action must nevertheless be taken in the short term to deliver safe, treated water and to collect the robust scientific data necessary to guide investments in the water supply.

5. Option 10 as defined in this submission will rapidly deliver treated water while collecting robust scientific data to inform all subsequent investment decisions.

6. If that data proves that further upgrades are required then the mobile treatment and monitoring unit in Option 10 can be readily re-purposed for all other options.

7. References:

1. Review by Steven Simmons of the proposed new Ohau Village water supply report by Fluent Consulting for WDC, January 2019
2. Fluent Consulting report: Ohau Village Water Supply, Issues and Options Report, August 2018
3. Fluent Consulting report: "Ohau Village Water Supply, Option Evaluation Workshop, July 2019
4. Fluent Consulting memo: Ohau Water Supply Upgrade – additional options (DRAFT) 21/5/2019
5. Fluent Consulting memo: Ohau Water Supply Upgrade – Staged Option (RevA) 1/7/19
6. Fluent Consulting memo: Ohau Water Supply Upgrade – Staged Option (RevB) 11/7/19

8. Contacts

Elfrida Carnie, Chair, LOAVRRA, elfridaward@yahoo.co.nz

David Rendall, Secretary, LOAVRRA, rendall.david@gmail.com

9. APEX Environmental proposal and estimate

The following pages provide an estimate for key elements of Option 10 as described by APEX Environmental. It is recognised that the APEX proposal does not include some of the costs that would be incurred when implementing this proposal.

APEX ENVIRONMENTAL
safe water by design

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5 July 2019

Mr. S Simmons
C/- Lake Ohau Ratepayer's Association
LAKE OHAU

Dear Steve

BUDGET PRICE Q190610 FOR OHAU WATER TREATMENT PLANT

Thank you for the opportunity to look at the water treatment requirements for your village in order to bring you in compliance with the NZ Drinking Water Standards.

Information Provided

- Water take consent is for 2.2L/sec and 190m3/day
- Sample results for the village provided for period November 2001 to August 2018, covering *E. coli* and total coliforms, turbidity, pH and temperature
- We understand Vodafone cell reception is available

Design Basis

We offer this proposal on the following basis:

- Turbidity in the water supply from the gallery to the existing storage tanks will be monitored in a side stream and an actuated valve will close the supply should the turbidity be above a high level set point
- A cut in will be made to the existing gravity feed to the village at the proposed location of the treatment plant (feed into the treatment plant and discharge from the plant)
- A containerised treatment plant is offered that provides bacterial and 3-log protozoal compliance (99.9% removal) through:
    - Pre-filtration with 10-micron nominal filters
    - Final filtration with 5-micron nominal filters
    - UV disinfection with a dose of 40mJ/cm^2
    - Chlorine dosing system to provide a residual in the post-treatment storage tanks and network
- A dual pump pressure booster set will be installed in the container, together with six 20,000L concrete tanks installed on site, to provide treated water storage and maintain pressure in the network

Additional log credits can be obtained, if required, by changing the type of filters installed. This will have a minor impact on capital cost and may require more frequent filter changes.

Scope of Supply

Our scope of supply is as follows:

- Feed water monitoring
    - Supply and install one (1) motorised valve in the feed line between the gallery and the existing storage tanks

- Supply and install one (1) turbidity sensor in a side stream off the feed line, with solar power and telemetry back to the containerised treatment plant
- Cut in to existing gravity feed line to the village
  - Supply and install three (3) manual valves, one for the feed to the new plant, one for the discharge from the new plant, and one bypass valve in the main line
  - All required work by an approved contractor to flush and disinfect the line
- Containerised treatment plant
  - One (1) 20' shipping container, lined with access door and lighting
  - One (1) pressure control valve and one (1) motorised isolation valve in the feed to the plant
  - Two (2) housings with 10-micron nominal filters
  - Two (2) housings with 5-micron nominal filters
  - One (1) turbidity sensor on the outlet of the filters
  - One (1) flow meter
  - One (1) UV unit validated to ÖNORM with a minimum dose of 40mJ/cm2 at a UVT above 80%
  - One (1) UV intensity sensor
  - One (1) chlorine dosing pump with all required accessories including one (1) flow meter for feed-forward proportional dosing and chemical containment
  - One (1) safety shower
  - All required pipe work (schedule 80 PVC), fittings and valves
  - Electrical control panel including PLC, HMI and with telemetry system
- Treated water storage system
  - Six (6) 20,000L concrete storage tanks connected to the treatment plant, together, and to the pressure boosting pump set, with PVC pipe including all required valves and fittings
  - One (1) level transmitter
  - One (1) Grundfos dual-pump set with integrated controller and tank mounted within the container (40m^3/hour at 5 bar)

Budget Price

The total budget price to design, supply, install, commission and validate all works described above is **$470,000+GST**. This consists of the following parts:

- Feed water monitoring and cut in to existing pipe line - $80,000+GST
- Containerised treatment plant (including booster pump set and freight to site) - $315,000
- Water storage system (including freight to site) - $60,000+GST
- Plinths for location of container - $15,000+GST

Please note this is a budget price only and this letter does not constitute an offer capable of acceptance. We would welcome the opportunity to further develop this into a fixed price offer for you.

Regards

DR STEVE KROENING
BUSINESS DEVELOPMENT MANAGER

Memo to: The Waitaki District Council (WDC)

From: The Lake Ohau Alpine Village Residents and Ratepayers Association (LOAVRRA)

For presentation to the WDC Assets Committee at a public session on Tuesday 27th August 2019

Regarding the following report prepared recently for the WDC:

> Lake Ohau Alpine Village Water Supply Upgrade - Consideration of Design Options
> D C Brown, 2nd August 2019

This report was not sent to the LOAVRRA until the 22nd August 2019 despite, presumably, being in the WDC's hands since about the 2nd of August.

Therefore this presentation to the WDC Assets Committee from the LOAVRRA has been prepared at very short notice by Dr Phil Driver, advisor to the LOAVRRA and to the Task Force and a Trustee for a property in the Lake Ohau Alpine Village.

Introduction

I'm a professional working internationally with all levels of governance and management in the public and private sectors.

It is very rare that I get angry.

The WDC's continuing gross misrepresentation of the Lake Ohau Alpine Village water supply makes me very angry. It also makes many of the village's very well qualified people very angry.

The recent report by Brown is derogatory about village residents, blaming them for not understanding the issues when in fact many of the residents are highly qualified and do fully understand the issues.

LOAVRRA request to the Assets Committee and the WDC

> ***LOAVRRA requests an apology from the CEO of the WDC for these inflammatory comments.***

The following pages highlight just some of the key issues relating to the Lake Ohau Alpine Village community water supply that have been mis-represented by WDC staff and their consultants. These comments parallel many submissions to the WDC from individual, well qualified residents, ratepayers and LOAVRRA.

Summary of supply and demand for the Lake Ohau Alpine Village water supply

The following table demonstrates that the current source of water for the Lake Ohau Alpine village is more than sufficient to meet *all* future demands. This table also demonstrates that the demand forecast by Fluent Consulting Ltd is grossly in excess of what is required to supply water at a level that meets the average water use by New Zealanders.

The current supply	**Daily supply**
The current water source can supply "2.2 litres/second *even in the driest years*" (Brown, 2nd August 2019)	190,000 litres/day available *even in the driest years*
Forecast demand	**Daily water available per person**
A worst case scenario: 136 properties, each with a home and each permanently occupied by 4 people = 544 people	1,396 litres/property/day = 349 litres/person/day = 1.5 times the average water use by New Zealanders *even in the driest years*
A realistic scenario of 136 properties averaging just 1 person/house (which is higher than the current village occupancy rate)	1,396 litres/property/day = 1,396 litres/person/day = 6 times the average water use by New Zealanders *even in the driest years*
The current demand from about 40 residents and visitors on average occupying about 30 properties	6,333 litres/property/day = 4,750 litres/person/day = 21 times the average water use by New Zealanders *even in the driest years*
WDC's and Fluent Consulting's proposed level of demand	**352,000 litres/day at about 4.1 litres/second**
A worst case scenario: 136 properties, each with a home and each permanently occupied by 4 people = 544 people	2,588 litres/property/day = 647 litres/person/day = 2.8 times the average water use by New Zealanders
A realistic scenario of 136 properties averaging just 1 person/house (which is higher than the current occupancy rate)	2,588 litres/property/day = 2,588 litres/person/day = 11 times the average water use by New Zealanders
The current demand from about 40 residents and visitors on average occupying about 30 properties	11,733 litres/property/day = 8,800 litres/person/day = 38 times the average water use by New Zealanders

Conclusion: The current water supply has more than sufficient water quantity to meet current demands and even the worst-case future demands. Fluent's and the WDC's specification for the quantity of water required for the village water supply is a gross over-estimate as has been repeatedly pointed out to both Fluent and the WDC and has been repeatedly ignored.

So the WDC's staff's and Fluent Consulting Ltd's assertion that the current water source is insufficient for current future demand is, based on D C Brown's independent report to the WDC, patently wrong.

Therefore the WDC's entire basis for its recommendation to replace the existing water source with bore water is seriously flawed and would not withstand scrutiny by a professional engineering body.

The option that WDC staff are recommending to the WDC Assets Committee is demonstrably many times larger than necessary.

The WDC's Assets Committee would therefore be acting imprudently to recommend the WDC's recommended option to the full WDC Council.

LOAVRRA requests to the Assets Committee and the WDC

> ***LOAVRRA requests that the Assets Committee does not make the decision as recommended by the WDC staff but instead insists on a recommendation that accurately represents the true supply and demand facts and clearly distinguishes them from the WDC's unsubstantiated assumptions in the hypothesised bore-water source for the Lake Ohau Village water supply.***
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> ***LOAVRRA further requests that this new recommendation be based on best practice for community water supplies and in particular recognises realistic water demand for an alpine holiday village that is currently only half built and which will always be only partly occupied with few houses having as many as 4 residents (many have 1 or 2 bedrooms).***
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> ***LOAVRRA further requests that the WDC's Asset Committee accept LOAVRRA's recent submission in support of what LOAVRRA calls 'Option 10' which will use a relocatable unit to treat and monitor the existing water supply to generate robust information to justify investment decisions. Option 10 will:***
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> - ***effectively treat the water to meet the required standards***
> - ***confirm the quantity of water available from the current course***
> - ***confirm the quality of water available from the current source***
> - ***confirm the true level demand***
> - ***avoid making major investments in a new water source based on hypothetical and unsubstantiated data***

In relation to the WDC's preferred option: Fluent specifies a peak flow of 12.7 litres/second for any water supply to the village that does not have storage – such as the WDC's preferred option. However the WDC's preferred option specifies 2 bores hypothetically producing a total of just 6 litres/second.

So the WDC's preferred option does not meet Fluent's and the WDC's own specification.

To achieve a peak flow of 12.7 litres/second would require 4-6 bores spaced out along the length of McKinnon reserve – with all the associated well-head equipment and ugly fencing taking up most of the village frontage.

McKinnon Reserve has the same "natural" environmental status as has Moeraki Lookout Reserve, Kakanui Beach Reserve, Kakanui Esplanade Reserve, Moeraki Beach Reserve and Shag Point Picnic Area. (Waitaki Reserves Management Plan 2014, Page 15.)

So installing bores on McKinnon reserve:

- is incompatible with the reserve's designation for recreation and environmental protection
- would breach the WDC's own criteria that infrastructure can only be placed on reserves *when no other option is available*
- means some of the bores would be significantly closer to the sewage ponds and at considerable risk of contamination

LOAVRRA request to the Assets Committee and the WDC

> ***LOAVRRA requests that the WDC Assets Committee note the above major flaws in the WDC staff's recommendations and does not approve the WDC's recommendation but instead requests a new recommendation that is based on robust information and data***

Turbidity

- The WDC has no data on the turbidity of water at the current source.
- The only turbidity data relates to samples collected in the village where water has demonstrably been contaminated in the past due to contractors and other actions in the village. For example stones were in the pipework during firefighting exercises yet these could not have come from the source. Also, turbidity of water in the village can easily come from tiny amount of turbidity that has settled in the current tanks and pipework that have not been properly flushed and cleaned and which can be re-suspended during high flows such as during fire-fighting.
- The current source is filtered through about 300 metres of ground before it enters the current water infrastructure. This filtering is highly likely to remove turbidity, if any, from upstream.
- In contrast, bores near the lake are almost certain to draw on lake water which is regularly highly turbid with ultra-fine particles. Fluent and WDC staff say that this turbidity will be filtered out through the ground between the lake and the proposed bores (less than 100

metres) while simultaneously saying the 300 metres of ground between the current source and surface water is insufficient to filter out the turbidity in the existing source.

- Any turbidity in the existing source can easily be avoided by a standard method of selective abstraction.
- Any turbidity in bore water cannot be avoided so the WDC staff's current recommendation has a very high risk of failure

LOAVRRA request to the Assets Committee and the WDC

- ***LOAVRRA requests that the WDC Assets Committee note that the WDC <u>has no data at all on the turbidity of the current water source</u> and therefore that the Committee does not approve the WDC's recommendation but instead requests a new recommendation that is based on robust information and data on the turbidity (if any) in the existing water source***

Further comments, especially in relation to Brown's 'independent' report to the WDC

In the time available to make this presentation to the WDC Assets Committee it is not possible to address all the following issues. However, many of these issues cast serious doubt on the recommendation that has been presented to the Committee from WDC staff.

LOAVRRA request to the Assets Committee and the WDC

- ***LOAVRRA requests that the WDC Assets Committee note that there are many more aspects of the WDC's staff's recommendation to the Committee that do not stand up to technical, scientific and legal scrutiny, so LOAVRRA requests that the Committee does not approve the WDC's recommendation but instead requests a new recommendation that is based on robust information and data on the existing water source and on the proposed bore water sources***

- Brown engaged with the WDC and Fluent to prepare his report.
- Brown did not engage with anyone from Lake Ohau Alpine Village in preparing his report.
- Brown's report is therefore not independent.
- Brown makes the following statements in relation to Lake Ohau Village residents and ratepayers: "An inability to gain sufficient community understanding... this remains an impediment...." insults Ohau folks implying we took a long time to understand the issues. In reality many of us are highly qualified and fully understand the technical, environmental, social and legal factors. As noted above, LOAVRRA requests an apology for these insults.
- LOAVRRA's experience is that the WDC appears to have done everything it can to denigrate the existing water supply and to overestimate the potential of totally unproven bores beside the lake on reserve land.
- In New Zealand, the average person uses 227 litres of water per day: Toilet = 86 litres per day. Bathing and hygiene = 68 litres per day. Laundry = 36 litres per day. The above table assumes people each use 230 litres/day. In an era when New Zealanders are being encouraged to use less water and when mitigation of climate change means we need to use less energy, it makes sense

to use a gravity-fed system which *may* require pumping in exceptional circumstances, rather than continuous pumping as required for the WDC's preferred option. It is also better to promote water conservation rather than enable and encourage excessive water use, especially in an alpine village like at Lake Ohau.

- The existing storage tanks hold almost enough water for a full day's supply so are readily able to buffer short-term peak demands followed by refilling when the demand drops off. Historically, in the data that the WDC has shared with the LOAVRRA, peak flows of around 7 litres/second have never lasted as long as an hour so the existing storage is more than sufficient to buffer such flows. The existing tanks could buffer flows of 12 litres/second for over 4.5 hours.
- Brown's 'independent' report mis-represents the LOAVRRA submission by including pumping and storage by default in LOAVRRA's Option 10 when in fact the LOAVRRA had additional storage as optional ONLY if necessary (LOAVRRA believes pumping and additional storage will probably never be necessary).
- Brown's report challenges the turbidity of existing source water (which can be addressed by the standard method of selective abstraction) but ignores the likely very fine turbidity of water in bores near the lake – turbidity that is so fine that it is unlikely to be filtered out by the gravels around the lake and so could make this water untreatable. Such water cannot be bypassed, unlike the existing source that can be selectively abstracted when there is turbidity. As at Otemetata, there is a significant risk that turbid water will enter bores located near the lake.
- The hydrologist's report to the WDC notes that lake-influenced ground water (ie the proposed bores in the WDC's preferred option) "has increased vulnerability to storm-induced turbidity....land use changes... risks of contamination...". However the WDC and Fluent have provided no evidence to refute these statements and are promoting an option that is directly exposed to these risks.
- Further, if the bores produce turbid water, not only will it be difficult to treat with UV but it will also cause abrasive wear throughout the water reticulation system.
- ***Brown's report claims that: "The location of the bores is not affected by the location of the sewerage pond" but provides no evidence for this extraordinary and crucially important claim.***
- Brown's report is therefore speculative and based on non-existent data about the water quality and quantity available from bores by the lake (which is regularly highly turbid) whereas data (even flawed data) on the existing the source is more meaningful, even if in most instances the water was measured in the village, not at source.
- It is of considerable concern that in 2018 WDC saw fit to engage Fluent at ratepayers' expense to determine a solution with zero consultation to the community. Fluent only tabled and asserted one solution in that report – a bore-based solution. Furthermore, WDC only started stake holder engagement after this was finished. This ineffective approach to stakeholder consultation is a key reason that has dragged out the consultation process. It has been totally back to front, with the final solution being presented to residents and ratepayers at the start and being told that the solution is not up for negotiation.
- ***WDC has wasted a lot of ratepayers' money pursuing unrealistic options because the council has seemed determined to do everything it can to discredit the existing water source. If the WDC had focused on achieving what is possible with the existing source it could rapidly have come up with the LOAVRRA's preferred option and saved 10s of thousands of dollars of ratepayers' money.***

- It is of further concern that WDC are using correspondence from 2003 relating to the water supply (a drop in pressure, not a lack of water) at a time when the O'Brien's were also taking water from close to the existing community water supply. It is understood that the O'Brien's property has changed hands and the new owners have installed a bore so are no longer abstracting water from near the community supply. Therefore 2003 data and correspondence about possible water shortages is irrelevant.
- Legally there are strong arguments that it will be possible to add minor infrastructure on Don Edwards' land so there should be minimal impediment to adding a small, solar-powered selective abstraction and monitoring unit at the site of the current source.
- The WDC's track record with the water supply at Otemetata does not give Ohau residents confidence that the WDC fully understands the science, engineering and legal factors at Lake Ohau Alpine Village.
- Brown's report implies that Ohau residents have taken a long time to accept that the current water source needs treating. This is generally incorrect. A few residents may believe that treatment is not required but in LOAVRAA's experience, most people accept and welcome UV and filtration treatment.
- Re section 15.1 in Brown's report: LOAVRRA's Option 10, ie the current source + supplementation IF REQUIRED has both the lowest Capex and lowest NPV – and given that supplementation probably will not be required for perhaps 10 years (and maybe not then either), the NPV for this option should be much lower

Appendix: Skills and experience of Lake Ohau Alpine Village residents and ratepayers

Brown's 2nd August report makes a number of statements that infer that Lake Ohau alpine village residents have slowed down the consultation process because they didn't understand the issues. This is insulting and inflammatory and LOAVRRA questions where these perceptions came from because Brown did not consult with villagers to determine if these statements are true. Presumably the WDC made these statements to Brown who incorporated them into his report.

The Lake Ohau Alpine Village residents and ratepayers are well qualified to understand the community water supply. We have engineers, scientists, health and safety experts, solicitors and environmentalists who have all contributed to building our comprehensive understanding of the water supply.

Solely as an example, here are just some of Dr Phil Driver's credentials and current and previous roles (other Lake Ohau Alpine Village residents and ratepayers also have comprehensive and relevant knowledge and experience):

1. PhD in engineering
2. Committee member, Pareora Catchment Society Inc
3. Committee member, OTOP Zone Committee of the Canterbury Water Management Strategy
4. Committee member, Regional Committee of the CWMS
5. Facilitator of the 2007-09 stakeholder engagement for the CWMS
6. Drafted the Fundamental Principles and the 1st and 2nd order priorities of the CWMS
7. Former manager of the groundwater team at Lincoln Ventures and who subsequently became Aqualink Ltd
8. Established and ran a TELARC-certified laboratory for testing water and food-grade chemicals
9. Secured ISRS safety accreditation for a multi-million dollar chemical company that supplied water treatment chemicals around NZ
10. International lecturer, facilitator, consultant and author of 3 books on the OpenStrategies system for multi-stakeholder strategies with clients including:
    a. Environment Canterbury
    b. The UK Cabinet Office
    c. The UK Sustainable Development Commission
    d. British Telecom
    e. Unilever head office, London
    f. Numerous UK territorial authorities
    g. The Broads Authority (UK)
    h. Atkins Ltd (Major UK engineering consultancy)
    i. NSW Family and Children's Service
    j. Wellington Regional Council
    k. Christchurch City Council
    l. Building Research Association of NZ
    m. Land Information New Zealand