AQUALINC RESEARCH LIMITED

Manuherikia Catchment Study: Environmental Impacts

Prepared for Manuherikia Catchment Water Strategy Group

Report No C12119/8

December 2012

CENTRAL OTAGO DISTRICT COUNCIL

Ministry for Primary Industries
Manatū Ahu Matua

Otago Regional Council

AQUALINC RESEARCH LIMITED

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EXECUTIVE SUMMARY

The Manuherikia catchment is a farming district where the local economy is based on agriculture. Extensive irrigation has been occurring in the Manuherikia Catchment for over 100 years. The area contains some of the oldest schemes in the country. The irrigation schemes are based on open race infrastructure, some of which was installed for gold mining and dates back to the 1860s. The purpose built irrigation infrastructure was constructed in the period from 1912 to 1936. In addition to the schemes there are a number of private water permits. Currently, about 25,000 ha of the catchment is irrigated. Irrigation is an integral part of farming in an area that can be subject to severe droughts.

Irrigation and associated infrastructure is an integral part of the natural environment. Under the RMA, because of the long-history, irrigation and associated infrastructure form part of the base-line natural environment, not the pre-European state of the catchment.

We have identified a number of infrastructure upgrade options that would allow up to an additional 21,000 ha to be fully irrigated (a third of which is already partially irrigated). All development options are not green-field developments; rather they are an upgrade of existing water infrastructure. Almost all irrigation would be within current irrigation scheme command areas or areas irrigated with private water rights. Upgrading water infrastructure will simply allow these areas that are already irrigated to be more completely and reliability irrigated.

Irrigation development has the potential to have impacts (positive or negative) on iwi, social, environmental and recreational values. Because irrigation is already an integral part of the catchment, effects are generally less than would occur in regions without a history of extensive irrigation.

We have developed options that can provide for both water security for agriculture and environmental needs. Options which may have had a significant environmental impact (such as damming Dunstan Creek) were excluded early on in investigations.

The most significant upgrade option is raising Falls Dam, which would allow an additional 15,000 ha to be fully irrigated in the Upper Manuherikia Valley. This option will impact on the flow regime in the Manuherikia Main Stem, and may impact (positively or negatively) on water quality.

Raising Falls Dam gives significant flexibility for achieving a flow regime that provides for both irrigation and environmental needs. Falls Dam allows for a ‘designer flow regime’, with the flow regime dependent on dam release rules.

Low flows are the most important aspect of the flow regime for protecting in-stream values. Long periods of low flows in summer and autumn are a natural occurrence due to the semi-arid climate, although the low flow level is significantly below natural levels in the Lower Manuherikia River due to irrigation abstraction. Increasing Falls Dam storage allows excess winter and spring water to be released in summer. Raising Falls Dam would allow flows in the Lower River to be increased 3 fold above current

levels. Higher minimum flows should improve the trout fishery, the aesthetic value, and other recreational opportunities such as swimming and canoeing.

Safe-guards that ensure high water quality is maintained is probably the most challenging environmental issue that needs to be worked through as part of feasibility investigations. A shift away from sheep and beef farming to a more diverse and intense range of land uses can be expected. Land use diversity is important since it provides for greater community resilience to commodity price fluctuations, in a region where farming underpins the economy. However land use intensification can pose a risk to water quality. To minimise this risk it is important that development is carefully managed, with a particular focus on good riparian management, efficient irrigation, minimising irrigation runoff, good nutrient management, and possibly limits on the proportion of higher risk land uses such as cropping and dairying. Mitigating factors include the conversion of existing surface irrigation to spray irrigation, higher minimum flows and potentially artificial fresh flows.

Minimising risks to native fish will probably primarily involve good riparian management. Native fish primarily occur in smaller tributary streams where irrigation has depleted flows. Predatory trout pose the greatest risk to native fish, so in general it is important to maintain the low flows in these tributaries to discourage trout habitat.

A formal assessment of visual impacts will be required as part of feasibility investigations. We expect impacts should be limited given that most new irrigation would occur on the Manuherikia and Ida Valley floor, in areas that have been irrigated and farmed to a moderate intensity for at least 80 years. No irrigation of hill country or high country is proposed.

There are a large number of archaeological and heritage sites in the Manuherikia area. A formal assessment will be required as part of feasibility investigations. We do not expect the proposals to impact on these sites because irrigation infrastructure development is largely a retrofit of existing schemes and existing races are largely retained.

Improvements in irrigation efficiency will reduce groundwater levels in some areas. The area most at risk is the Dunstan Flats. Efficiency improvements on the flats will result in some bore supplies becoming unreliable. New rural water supply schemes, on Dunstan Flats and in other areas, are a cost effective method of providing an alternative reliable supply of safe water for domestic use and stock.

A significant amount of further work is required to assess the proposals to a level that would be appropriate for a resource consent hearing. Early indications are that investment in existing water infrastructure has the potential to provide for both economic and environmental sustainability. To achieve this good management of environmental risks associated with land use diversification will be necessary.

1 Introduction

The Manuherikia Catchment Water Strategy Group (MCWSG) was set up to develop and oversee the implementation of a water strategy for the catchment. The MCWSG envisages that the project will provide information to help the community make informed decisions, leading to a comprehensive Manuherikia Catchment water strategy. Figure 1 provides an overview of the study.

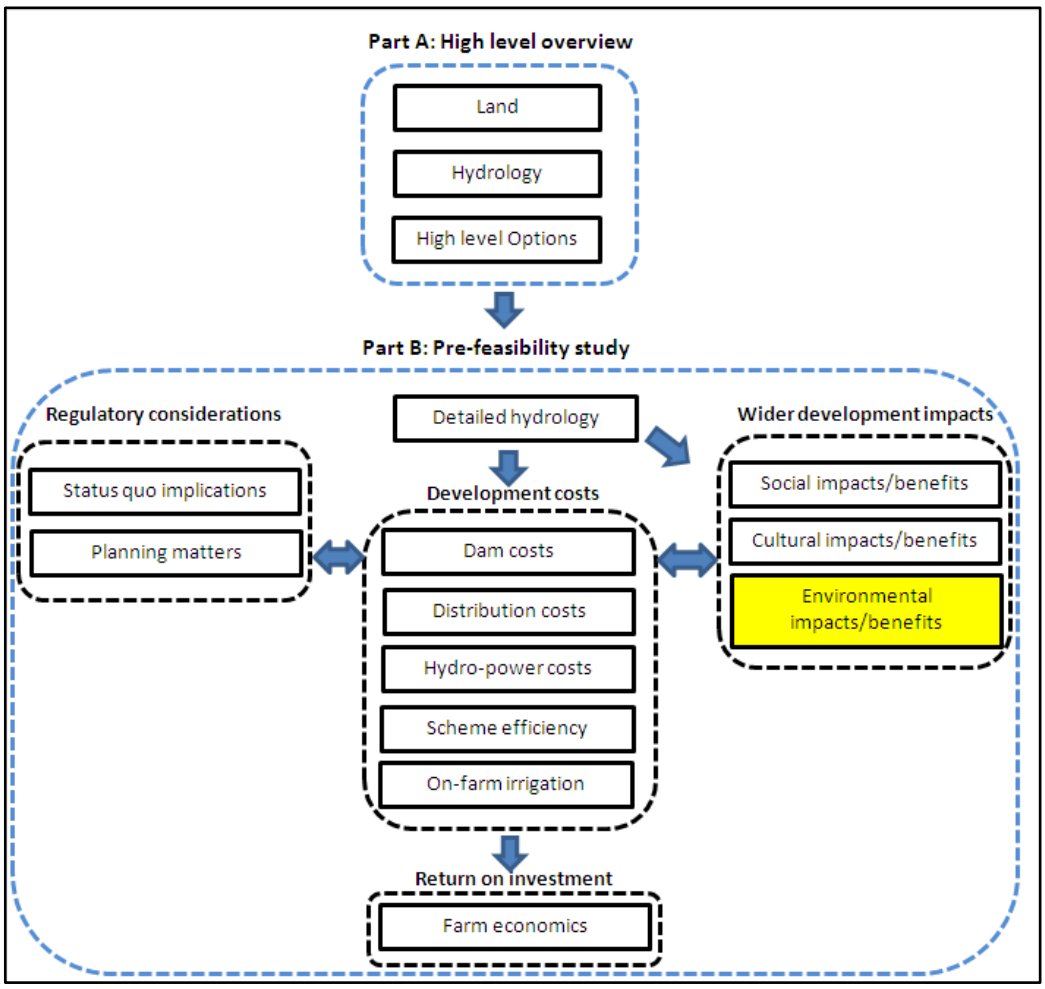

Figure 1: Manuherikia Catchment Study overview

This report covers environmental and recreational values and impacts. A separate report focuses on flow regime and water quality impacts of the Falls Dam +27m proposal.

This study has been made possible by the generosity of the following who have contributed by way of direct funding or by in-kind contributions. MCWSG are grateful for this support and wish to thank the following:

- Ministry of Primary Industries with funding via the Irrigation Acceleration Fund.
- The Otago Regional Council (ORC).
- The Central Otago District Council (CODC).
- The Manuherikia Community.

2 Background

The Manuherikia catchment is a farming district with a local economy based largely on agriculture. The catchment has a continental climate characterized by cold winters and warm summers. Much of the catchment is classified as semi-arid (NIWA 2001).

Land use in the upper Manuherikia catchment is primarily extensive sheep and beef grazing. Due to irrigation of the mid and lower reaches of the catchment the land use is dominated by higher intensity farming with higher stocking rates relative to the upper catchment. In addition horticulture and viticulture are established near Alexandra with many fruit orchards and vineyards. There is also some grain cropping within the catchment (ORC 2004).

Currently about 25,000 ha is irrigated within the Manuherikia Catchment. Of this, about 15,000 ha is fully irrigated. Water scarcity means that the remaining 10,000 ha is only occasionally irrigated and in some cases only 2 or 3 times a year (Aqualinc 2012a). Irrigation water comes from a number of schemes (Blackstone, Galloway, Hawkdun – Ida Burn, Ida Valley, Omakau, and Manuherikia) and private water rights.

Aqualinc has identified a number of infrastructure upgrade options that would allow up to an additional 21,000 ha to be fully irrigated (Table 1); about a third of this irrigated area would include land that is currently partially irrigated. All development options are not green-field developments; rather they are an upgrade of existing water infrastructure. Almost all irrigation would be within current irrigation scheme command areas or areas irrigated with private water rights. Upgrading water infrastructure will simply allow these areas that are already irrigated to be more completely and reliability be irrigated. Actual irrigated areas will depend on the scale of infrastructure development.

Table 1: Irrigation development options in the Manuherikia Catchment.

Option	New irrigated area
Raise Falls Dam 27m	14,500
Lower Manuherikia efficiency improvements	1,500
Hope Creek Dam	3,000
Mt Ida Dam (pressurised supply)	2,200
Total	**21,000**

This report is a ‘first cut’ at describing the environmental values and the potential environmental impacts from irrigation development. A significant amount of further work is required to assess the proposals to a level that would be appropriate for a resource consent hearing. This report focuses on the most significant upgrade option: raising Falls Dam. The environmental impact of the other three upgrade options should be relatively minor.

The command area for the Falls Dam +27m option is shown in Appendix A.

3 Manuherikia River Flow regime and water quality

Low flows are the most important aspect of the flow regime for protecting in-stream values. Long periods of low flows in summer and autumn are a natural occurrence due to the semi-arid climate, although the low flow level is significantly below natural levels in the Lower Manuherikia River due to irrigation abstraction. Increasing Falls Dam storage allows excess winter and spring water to be released in summer. Raising Falls Dam 27 m would allow flows in the Lower River to be increased 3 fold above current levels. Higher minimum flows should significantly improve the trout fishery, the aesthetic value, and other recreational opportunities such as swimming and canoeing.

Flow variability, and in particular fresh flows and floods, help to clear out water ways. The Manuherikia River naturally has long periods (up to 11 months) between fresh flows. Raising Falls Dam and increasing the irrigated area has the potential to further reduce the period between fresh flows. One possible mitigation approach is to allow for additional disturbance or rejuvenating flows to be provided from storage. Further work is required to understand the role high flows have in removing algae, and to determine the amount of flow that is necessary to effectively disturb the river.

Safe-guards that ensure high water quality is maintained is probably the most challenging environmental issue that needs to be worked through as part of feasibility investigations. A shift away from sheep and beef farming to a more diverse and intense range of land uses can be expected. Land use diversity is important since it provides for greater community resilience to commodity price fluctuations, in a region where farming underpins the economy. However land use intensification can pose a risk to water quality. To minimise this risk it is important that development is carefully managed, with a particular focus on good riparian management, efficient irrigation, minimising irrigation runoff, good nutrient management, and possibly limits on the proportion of higher risk land uses such as cropping and dairying. Mitigating factors include the conversion of existing surface irrigation to spray irrigation, higher minimum flows and potentially artificial fresh flows.

Further details on water quality impacts are provided by Aqualinc (2012d).

4 Domestic and stock water

4.1 Upper Manuherikia Valley

Most houses in the Upper Manuherikia Valley source their domestic water from bores or wells. Yields are generally very low, perhaps only 50 l/hr. Water security is already an issue in some areas, with some bores becoming unreliable as efficiency improvements are made up gradient. Water quality is good in some places and poor in others.

Most stock water is currently sourced from small streams. Most of these small streams are probably supplied from irrigation runoff water, and as efficiency improvements are made, some of these streams may become more unreliable.

Groundwater is used in a few places. Some farms have invested in on-farm dams and piped systems.

In some circumstances the reduction in reliability of existing water sources may require farmers to invest in new stock water infrastructure such as farm dams. Rural water supply (RWS) schemes are another option. RWS schemes could provide either treated or untreated water. If untreated water were reticulated, individual houses could install their own water treatment system. Dairy Sheds are another place where treated water could be required. Again, if untreated water were reticulated Dairy Sheds could have their own treatment system.

Indicatively an untreated piped restricted RWS scheme would cost in the range of $200 - $300/ha. Costs would be higher if there were a high proportion of dairying, because per hectare water requirements for dairying are significantly higher than for other land uses. Stock and domestic water requirements are generally only 1% or less of irrigation requirements and therefore water availability is not an issue. Sourcing water from streams such as Dunstan, Lauder, and Thompsons Creek, at the base of the Dunstan Range, would provide good quality reliable water as well as minimising pumping requirements.

Piped restricted RWS schemes are common in other parts of Canterbury and Otago. However in Central Otago there are very few schemes given the size of the district. This may have been due to a lack of interest from the District Council and community in the early 1980's, when many schemes were installed in other parts of New Zealand; part funded by a government subsidy. By a restricted scheme we mean that each turnout has a restrictor unit that causes water to trickle into a tank. Each property needs to have a tank large enough to hold 2-4 days water. A restricted scheme is the logical solution in a rural setting. Much smaller pipe sizes are required compared with supplying a pressurised supply. A RWS delivery requires that farmers install a piped stock water system on-farm.

RWS schemes are cost effective and offer a number of advantages over the status quo. They provide security of supply. Cleaner water is delivered, resulting in safer domestic supplies and improved stock health. They also avoid the need for stock to be in water ways. Stock in water ways is a major issue since there is a strong push by both ORC and Central Government to exclude stock from water ways to improve water quality in streams. We would strongly recommend investigating the option of RWS schemes.

An expansion in the irrigated area will in itself not have a negative impact on existing stock or domestic supplies. To the contrary, the additional irrigation will help to off-set some of the reduction in stream flows and groundwater levels caused by existing irrigation becoming more efficient.

New irrigated areas will need a source of water for stock, domestic, and possibly dairy shed use. Ideally stock and domestic water would be supplied from RWS schemes. If RWS schemes are not installed, stock water could be supplied with irrigation water during the irrigation season. Incorporating a stock water supply with spray irrigation is easier than surface irrigation, since water would be delivered on a continuous basis. Outside of the irrigation season stock water could be sourced from streams. While it would be possible for the irrigation scheme to operate outside of the irrigation season,

generally it is desirable to have a period of time when the scheme is shut down to allow for any maintenance. Houses could source water from groundwater or rain water.

4.2 Lower Manuherikia Valley

Most houses in the Lower Manuherikia Valley source their domestic water from bores or wells. Yields are generally low, but a lot higher than Upper Valley yields. Water security is already an issue in some areas, with some bores becoming unreliable as efficiency improvements are made up gradient.

Irrigation efficiency improvements will impact on some domestic bore supplies. The area of greatest impact would be Dunstan Flats. Shallow bores closer to the Airport Hills would be most at risk.

On the Dunstan Flats a restricted RWS scheme, supplied with treated Clyde Township water, should be a cost effective solution to mitigate the reduction in ground water reliability. Such a scheme is particularly attractive given the large amount of life-style blocks. High quality treated Clyde Township water should offer a significant improvement in water quality compared with existing bore supplies, some of which will be at risk of contamination from the likes of septic tanks. The risk of bore contamination will only increase as more dwellings are built on the flats, as a result of the Flats being zoned "Rural Residential". Installing RWS pipes in the same trench as a piped irrigation supply would minimise costs. If pipes for a RWS scheme were installed after irrigation pipes, there is a risk that during installation irrigation pipes could be damaged. Indicatively, installing a parallel potable pipe supply alongside irrigation pipes would add 5-10% to the cost of the scheme.

The high proportion of life-style blocks around Springvale and Galloway also make these areas attractive for installing a treated restricted RWS scheme. A RWS scheme would provide safer and more secure water, and would allow for further development in the area.

Stock water in the Lower Manuherikia is mostly sourced from streams and irrigation races. Some of these streams will become less reliable with efficiency improvements. Like in the upper valley, a pipe RWS scheme together with on-farm infrastructure is an attractive option to supply stock water. It offers a number of advantages over the status quo, including improved security of supply, improved stock health, and avoiding the need for stock to be in water ways.

5 Recreational fishing

Otago Fish and Game provided a description of the recreational fishery values of the Manuherikia River.

The Manuherikia River is one of the largest tributaries of the Clutha River/ Mata-Au. Angling is the most common recreational pursuit carried out on the river.

The Manuherikia River and its tributaries are noted as having high natural fishery values and is a recognized brown trout fishery (NIWA 2003). The Manuherikia River

supports a diverse fish fauna, with 11 species of introduced and indigenous freshwater fish and one species of freshwater crayfish listed on NIWA's NZ Freshwater Fish Database (ORC records).

The ORC Regional Water Plan identifies significant ecosystem and habitat values for the Manuherikia River main stem, ecosystem values include trout spawning habitat, juvenile habitat, adult trout and Long Fin Eel habitat. The Manuherikia tributaries of Chatto Creek and Pool Burn Creek have significant trout spawning and juvenile habitat values (ORC 2011).

The river is popular with local and visiting anglers; angling activity ranges between 2070 and 5630 angler days per season according to National Angler Surveys.

The Manuherikia River was rated as the fourth most important trout fishing river in Otago in 2003 (ORC 2011). As a result of Creel Surveys in the 2009/2010 Sports Fishing Season the catch rate for the Manuherikia River was calculated at 0.52 fish per hour, with both Brown Trout and Rainbow Trout being caught.

The popularity of the fishery was recognized in 2003 with bag limits for the lower river reduced from six to three per person per day, the bag limit has been further reduced and currently stands at one fish per person per day, recognizing the growing popularity of the fishery.

The lower and mid river sections are very popular with locals, while the upper river sections are frequented by anglers targeting larger fish (and by fly fishermen). Rainbow trout appear frequently above the Lauder Gorge and are particularly common in Dunstan Creek. (Gabrielsson 2010).

Irrigation development has the potential to have both positive and negative impacts on the recreational fishery.

Raising Falls Dam 27 m has the potential to significantly improve adult trout habitat in the lower Manuherikia River by raising the minimum flow. A study by NIWA using the in stream flow incremental methodology (IFIM) found that in the Lower Manuherikia suitable habitat for brown trout falls sharply when flows are below about 2.5 m^3/s (ORC 2006). Currently low flows in the Lower Manuherikia range from about 150 l/s below the Manuherikia Irrigation Scheme intake, to 650 l/s at the Campground recorder. Raising Falls Dam 27 m would increase the minimum flow at Campground to about 2.3 m^3/s; a 3 to 4 fold increase from current levels (Aqualinc 2012d). IFIM modelling suggests this would increase adult brown trout habitat by a factor of 3.5.

Increasing the height of Falls Dam would flood the huts adjacent to the reservoir. These huts are used by anglers, amongst others. Fish and Game would like the huts to be relocated and recreational access to the enlarged reservoir to be provided, if Falls Dam is raised.

Figure 2: Huts adjacent to Falls Dam reservoir

Niall Watson of Fish and Game provided the following information on the impact of the increased Falls Dam inundation area.

The Manuherikia above the dam is a backcountry fishery but an increased dam height is only likely to flood a small section of the main stem immediately above the existing reservoir. There is significant spawning and rearing water within the upper catchment and an increased area of inundation will not impact significantly on trout spawning and rearing habitat or on adult trout habitat in my view. The fishery values of a new reservoir would depend on its operating regime.

The reservoir inundation area for the Falls +27m option is shown in Appendix B.

The proposed new High Race intake would be the only location where new water was taken. The intake would need to be designed to provide fish passage. The exclusion of fish from the race may also be necessary although this requires further investigation. If the decision is made to exclude fish from the intake possible options include gallery intakes (e.g. similar to the RDR intake on Ashburton South Branch), stainless steel screens, or physiological deterrents such as bubble screens.

Water quality and riparian strips has the potential to be impacted by irrigation development. Development would need to be carefully managed to minimise these risks. Significant work is required during feasibility investigations to quantify the risks and develop a robust management strategy that will minimise these risks.

Further comments from Fish and Game are provided in Appendix C.

6 Other recreational values

The spectacular scenery of Central Otago and good summer climate makes the Manuherikia area a popular holiday destination.

The upper reaches of the Manuherikia River provide areas of four wheeling driving on the east and west Manuherikia tracks. The east track follows the east branch of the river as far as Little Omarama Saddle which carries on past the initial reaches of the river to the hill country of Omarama. The west track follows the western branch where Boundary Creek Hut and Top Hut are located. Parts of the 4WD tracks are located on private land however most of the tracks are located in either the Oteake Conservation Park or Public Conservation Land areas.

In the upper catchment there are various areas where shared use tracks have been established for tramping and mountain biking near the Manuherikia River. A DoC campsite has been established in the last couple of years on Hawkdun Runs Road. This is the only DoC campground located in the upper reaches of the river. The Blackstone Hill area is also used for camping in the upper catchment – although this is not as popular as the downstream sites due to particularly low flows.

In the lower sections of the Manuherikia River camping is very popular and in many areas families' camp in the same location annually for their summer holidays. The low flow in the river at this location makes it ideal for swimming.

Local farmers grant access across their properties to many locations along the river making it accessible not only for camping but also day trips and picnicking.

Due to low flow in the river in summer time boating is not generally undertaken on the river. However in the river gorge just downstream of Ophir, kayaking is carried out by a few enthusiastic recreationalists. This can only be undertaken when flows are suitable.

Raising Falls Dam would allow the minimum flows in the lower reaches of the Manuherikia River to be increased. We expect this would be valued by campers and those visiting the river for picnics. Consultation needs to be undertaken to assess how higher minimum flows would affect swimming opportunities, particularly for families with young children, where the safe environment is valued.

7 Groundwater

In general there is little groundwater available in the Manuherikia Valley. Of the groundwater that is available, most occurs in the lower valley, in three aquifers: Dunstan flats, Manuherikia Claybound, and Manuherikia Alluvium (Figure 3). These aquifers are described in detail in "Alexandra Groundwater Basin Allocation Study" (ORC 2012). Further details are provided in Appendix E.

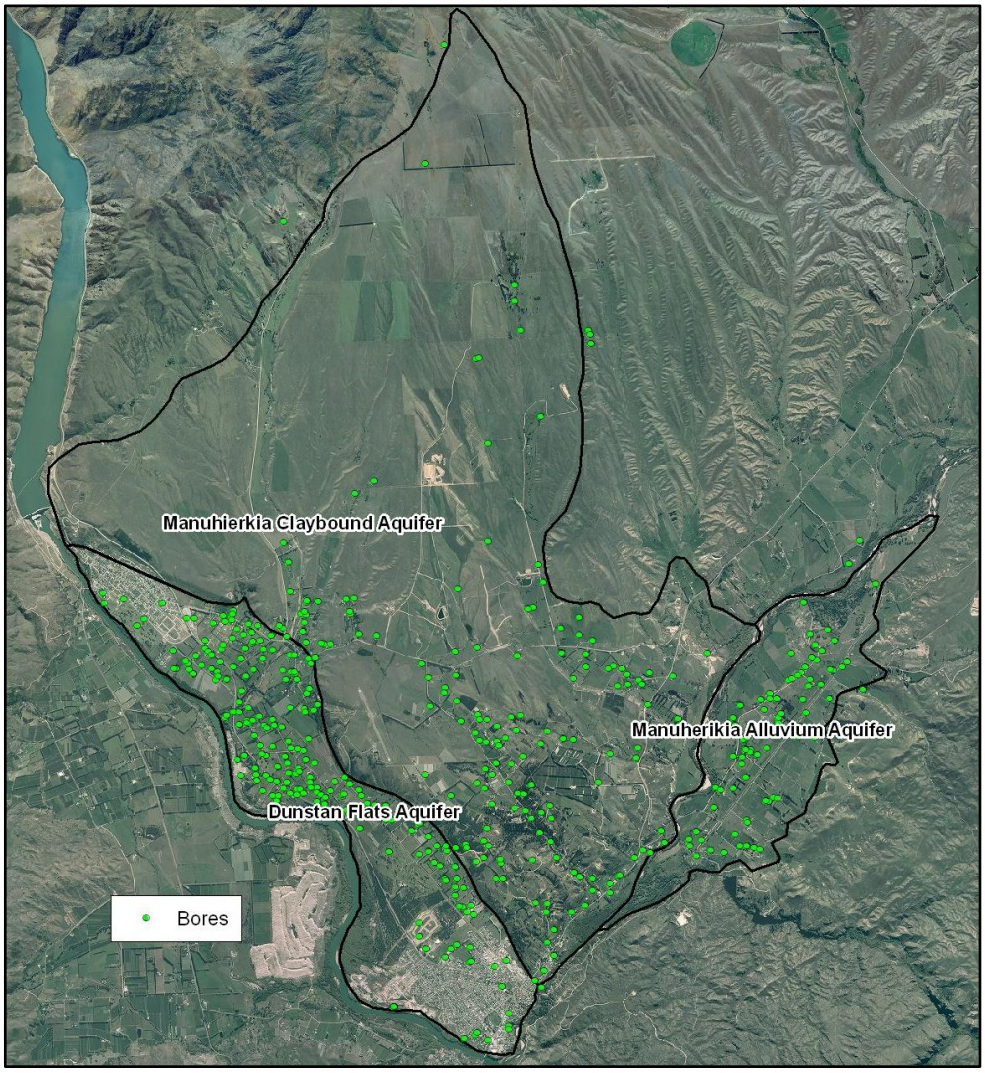

Figure 3: Lower Manuherikia Valley Aquifers (ORC 2012).

In the Upper Manuherikia Valley there is little groundwater. Groundwater yields are very poor (pers comm J. Rekker, ORC). Bore yields are generally only sufficient to supply domestic water. Recorded bores are shown in Figure 4.

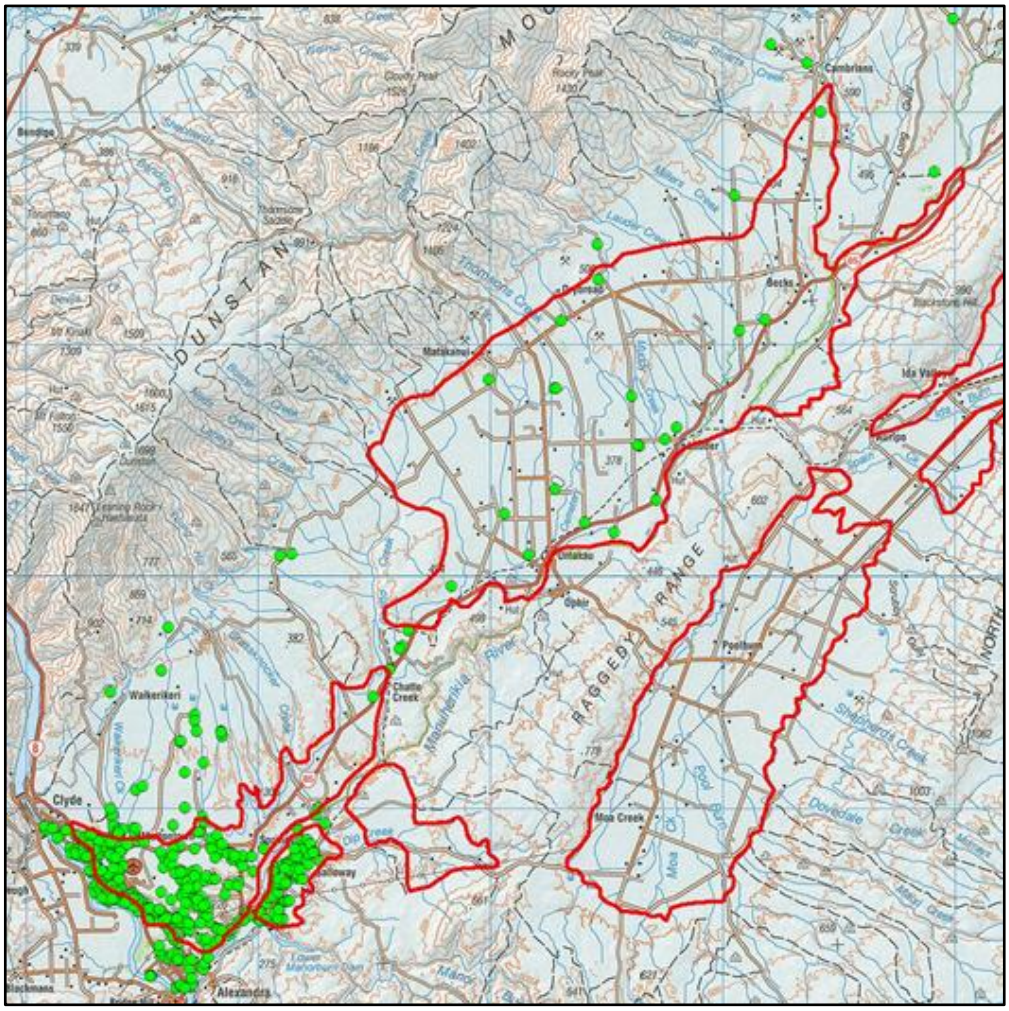

Figure 4: Recorded bores in the Manuherikia Valley (ORC 2012)

Existing irrigation efficiency improvements will reduce groundwater recharge, lowering groundwater levels. Lower groundwater levels will reduce supply reliability to some existing groundwater users.

Reduced irrigation recharge will have the greatest impact on the Dunstan Flats groundwater system. At present, most of the recharge to this aquifer is irrigation bywash and drainage water (ORC 2012). On the Flats there is heavy reliance on groundwater for domestic water supplies, with most if not all of house-holds sourcing their domestic water from groundwater. A significant number of these bores [perhaps 30%-50%] may become unreliable as irrigation becomes more efficient. A piped restricted RWS scheme, supplying the whole of the Flats, sourced from treated Clyde water, should be a cost effective solution.

Efficiency improvements will have essentially no impact on either Clyde or Alexandra's water supplies, since both have bores/galley intakes very close to the Clutha River.

Impacts on the Galloway groundwater system (the Manuherikia Alluvium Aquifer), and the Springvale groundwater system (the Manuherikia Claybound Aquifer) are expected to be less than the Dunstan Flats Aquifer. A few bores could become unreliable. Again, a RWS scheme would be a cost effective mitigation measure.

Limited and low yielding groundwater resources in the Upper Manuherikia Valley means irrigation efficiency improvements will probably have a relatively limited impact on groundwater. The impact of efficiency improvements on surface water will generally be a greater issue in the Upper Valley.

8 Biodiversity

The Otago Water Plan lists many natural values for the Manuherikia River and tributaries are of high natural value particularly for roundhead galaxiids and invertebrate diversity. Also, the area upstream of Falls Dam is recognised as important habitat for the internationally uncommon black fronted tern (ORC 2006).

A number of native fish surveys have been undertaken in the catchment, including surveying the location and abundance of galaxiids (e.g. Dungey 2000, 2001). This information, together with other biodiversity data needs to be collated during feasibility investigations.

As part of feasibility investigations, areas of significant indigenous vegetation, habitats of indigenous fauna and wetlands, and waterways with significant galaxiids populations need to be identified and mapped. In addition to collating existing data sources (e.g. sites identified in the District Plan), a biodiversity survey of the irrigation command area may be required. Where such areas falls within the proposed irrigation command area management plans to provide for the protection of these habitats will need to be prepared.

9 Landscape and heritage

The Manuherikia has some excellent amenity and landscape values. This area has a reputation as an outdoor playground and has spectacular riverscapes, some unique conservation values and numerous recreation and tourism options. An description of the landscape is provided in "Central Otago District Rural Review: Landscape Assessment – Report and Recommendations" (CODC 2008a) and in the District Plan (CODC 2008b).

Visual impacts have not been assessed. A formal assessment will be required as part of feasibility investigations. We expect impacts from irrigation should be limited given that almost all new irrigation would occur on the Manuherikia and Ida Valley floor, in areas that have been irrigated and extensively farmed for at least 80 years. No irrigation of hill country or high country is proposed.

The Manuherikia catchment above Falls Dam is identified in the Central Otago District Plan as being an area with outstanding natural features and landscape. The area represents large scale remote back-country with impressive, varied and highly visible landform clothed in dominant homogenous tussock from valley floor to the high altitude. There is a high degree of naturalness in land scape. Raising Falls Dam may have some impact on these values, although given the existing dam forms part of the base-line environment we expect these impacts to be limited.

There are a large number of archaeological and heritage sites in the Manuherikia Catchment. We do not expect the proposals to impact upon these sites because irrigation infrastructure development is largely a retrofit of existing schemes and existing races are largely retained. A formal assessment, including the mapping of any archaeological or heritage sites within the proposed irrigation command area will be required as part of feasibility investigations.

Feedback from Forest and Bird is included in Appendix D, and includes their views on landscape, heritage, and biodiversity issues they would like to be addressed as part of a feasibility study.

10 Cultural

A preliminary description of some of the values and issues of iwi in relation to irrigation infrastructure is provided by Tipa (2000). Kai Tahu ki Otago are currently preparing a more up to date cultural impacts study, with a particular focus on the impact of current irrigation development proposals.

11 The social environment

A description of the social environment, and the potential impacts on the social environment from irrigation are described in "Manuherikia Catchment Study: Social Impacts Report" (Aqualinc 2012c).

Graye Shattky of the Central Otago Environmental Society (COES) has provided an alternative social and economic perspective (see Appendix F).

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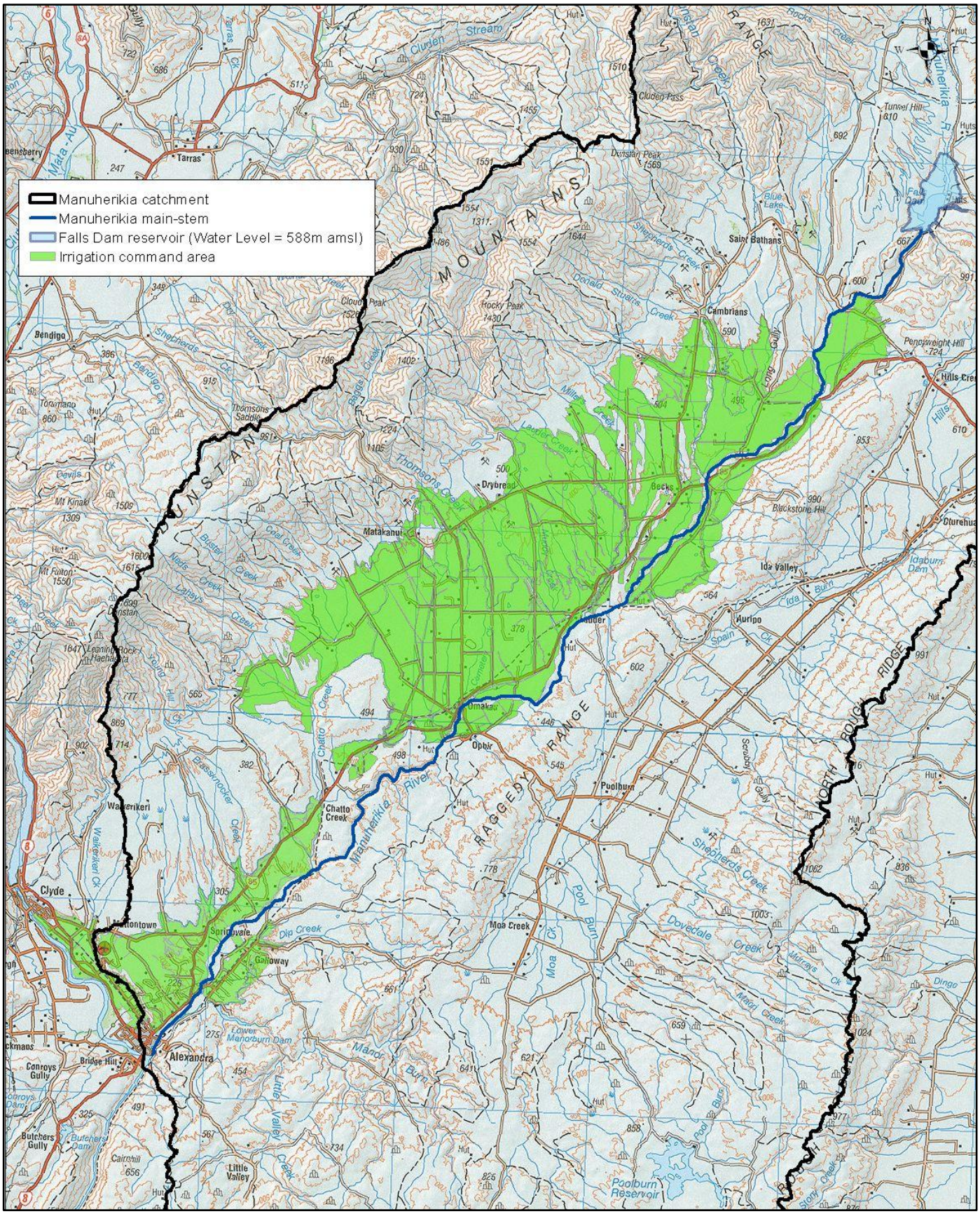
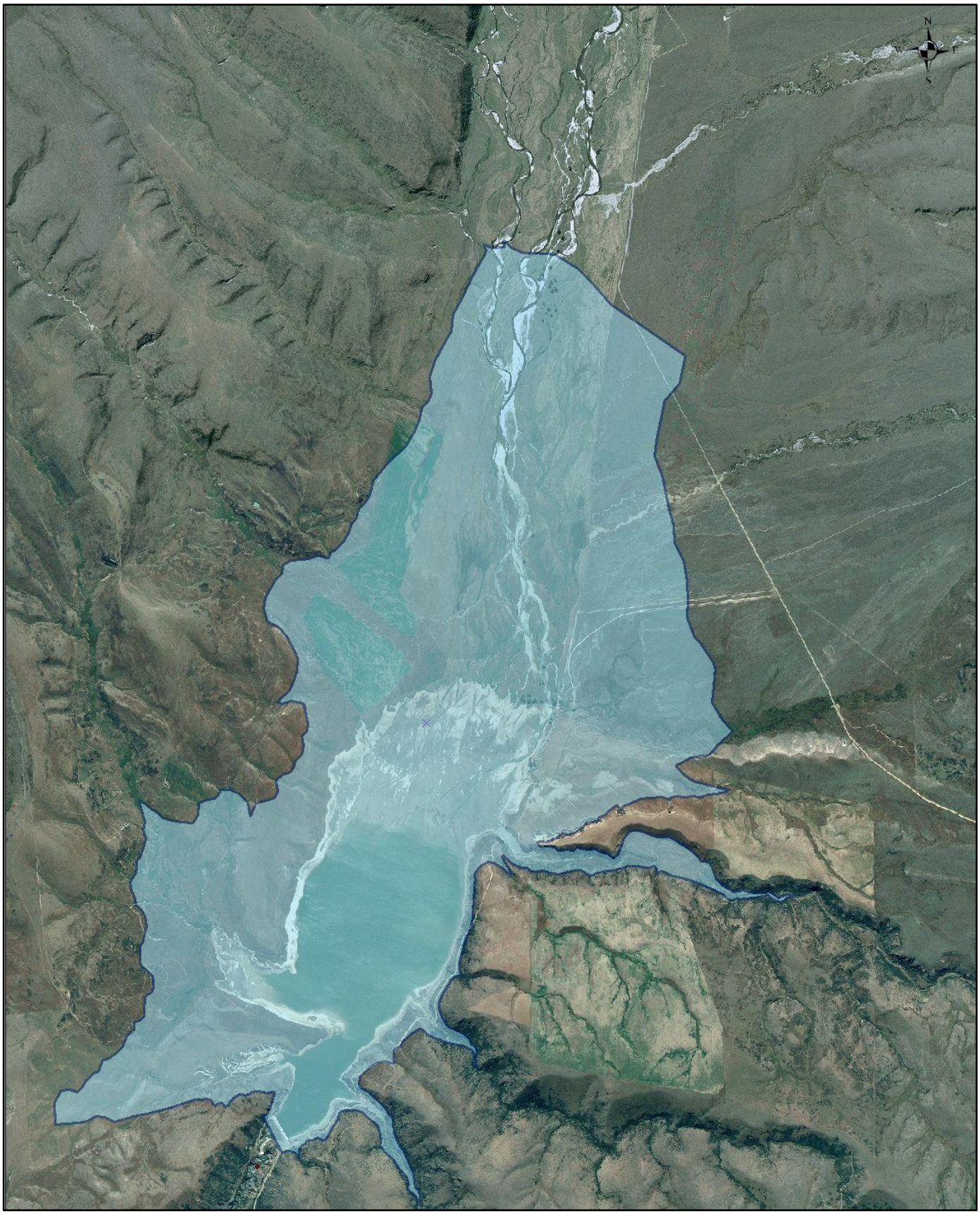
Appendix A: Falls Dam +27m option



Appendix B: Falls Dam inundation area



Falls Dam inundation area given a water level of 588 m AMSL

Appendix C: Feed-back from Fish and Game.

Preliminary response on increased water storage and irrigation in the Manuherikia catchment

Otago Fish and Game Council.

Introduction

The present health and productivity of the Manuherikia River ecosystem reflects a combination of catchment land use, past patterns of water allocation and use (some of which are longstanding), and waterway management (main stem river, tributaries and wetlands) . River health can be measured in terms of various parameters including species assemblages, biodiversity, productivity, water quality and through the public perceptions.

The Manuherikia River is important to the community and to visitors for a range of 'in-stream values' - trout fisheries, game bird population, native fish and protected wildlife, natural landscape characteristics and recreational amenity. The 'community' in this context needs to be defined broadly to include people who reside within the catchment and close by (eg. the Alexandra area) as well as residents from Central Otago and Otago region. Visitors' perceptions of the river also need to be considered given the increasing importance of domestic and international tourism in Central Otago.

There are a number of current river management issues which need to be considered in evaluating increased catchment water storage and irrigation namely:

- The adequacy of river and stream flows. This includes existing minimum and residual flows; the transition from mining privileges to RMA consents; and the setting of future minimum and residual flows. Fish and Game's view is that existing minimum flows are inadequate for the maintenance of in-stream values and that they need to be revisited. They are masked at present by the use of the main-stem for transportation if water.
- Local impact of water takes on flows and fish passage. The current storage and use of catchment water has a number of adverse and beneficial impacts on the river system. Some river reaches have been flooded beneath reservoirs. Some reaches are dried up or severely depleted over summer by diversions or takes while flows in the main-stem are maintained through the use of the river to transport irrigation water down the catchment from Falls Dam. Flows in some small tributaries may be maintained by 'losses' from irrigation races and so may be at risk from more efficient conveyance of water. Downstream migrating fish may be lost into water race diversions and in-stream structures may obstruct upstream migration.
- The tenuous position of some native fish populations. The viability of some sub populations of rare native fish appears to rely on depleted reaches of catchment streams where trout cannot permanently establish.
- Management of riparian zones and small streams. Modification of small streams through channelization and allowing stock access to water are degrading freshwater habitats and increasing non-point inputs. Mainstem riparian zones require careful management to buffer effects of adjacent land use and to complement in-stream habitat values

Recent changes in land use

In recent years patterns of catchment land use have been changing towards high intensity use of valley floor lands and lower terraces with increasing pasture development on steeper country. At present the availability of irrigation water appears to limits land development but additional water storage within the catchment will result in a significant increase in water available for irrigation so that either the area of irrigated land or the intensity of irrigation will increase . The most significant environmental issue arising from the proposal is the likely impact of intensified land use on water quality and aquatic life, but there are other issues which make an integrated approach to catchment management essential including impacts arising from the increasing efficiency of water use on flows in small streams and the direct impacts of reservoir construction.

Trout Fishery Values

From a Fish and Game perspective the Manuherikia River is regarded as a regionally important trout fishery. The fishery is sustained by natural spawning, rearing and recruitment so it is necessary to protect habitats for all life stages in the trout life cycle if the fishery is to flourish. Spawning and rearing occurs in both the mainstem and in a number of tributary stream reaches. The potential of spawning grounds needs to be maintained and improved. The upper river, above Falls Dam, and Dunstan Creek have backcountry fishery characteristics because of their largely unmodified settings, while the middle and lower reaches are mostly rural in character. The amenity value of a trout fishery is based to a large extent on its productivity and so the abundance of adult trout available to anglers is important.

The catchment also contains five irrigation reservoirs - Upper Manorburn, Poolburn, Idaburn and Lower Manorburn Reservoirs and Falls Dam. The first two are highly regarded recreational fisheries, the others less so.

Angler use and fishery characteristics are well defined through NIWA's National Angler Surveys and Fish and Game creel surveys.

Other Values

The catchment's rivers, wetlands, water races, and still waters collectively sustain healthy populations of wildlife, including waterfowl, and duck hunting is a popular recreational activity in the game season. While statistics on other recreational uses are limited the river has a reputation as a recreational setting for swimming, picnicking, camping, and hunting particularly during the summer holiday period. Its moderate size and accessibility contribute to its popularity as a relatively safe recreational environment.

Public expectations of rivers generally are well defined through the Lincoln University survey series "Public perceptions of NZ freshwater and its management" These confirm that the public expects clean healthy rivers. The strong local interest in both the natural environment and the Central Otago landscape complement and reinforce the view that the river is a vital element in the natural landscape.

Proposed increases in water storage and irrigation

It is important that any increased water storage within the catchment and associated intensification of land use is planned and implemented to improve the existing river environment in terms of water quality, quantity, natural character, fish diversity and productivity, and recreational amenity. This will not happen without very careful planning at both the catchment and individual farm level and appears to require a fundamental shift in on-farm management of off-site impacts.

The history of land use intensification in New Zealand over the last 10 to 15 years has been characterised by significant deteriorations in water quality and reductions in river flows from Northland's Wairua River in the north to Southland's Waituna Lagoon in the south. That must not be allowed to happen in the Manuherikia

In Otago, we have entrenched water quality problems in areas of intensive agriculture (the Pomahaka and Tokomariro catchments for example) despite a decade of non-regulatory activity and increasing compliance monitoring by ORC. At this point there is no proven formula for the successful management of non-point source pollution from intensively farmed land. Recent Otago University research with the Manuherikia catchment suggests that to maintain healthy trout populations the proportion of high intensity farmland within each sub-catchment should not exceed 40%. Researchers also consider dryland rivers such as the Manuherikia may be less resilient to the adverse effects of intensification than rivers in wetter parts of the Otago.

Conclusion

The kind of catchment wide development envisaged for the Manuherikia has significant environmental challenges and appears to require integrated land management at the catchment level as well as buy in at the individual farm level if adverse impacts on the river system are to be avoided. The river needs to be managed actively for quality, quantity and natural character or channel form and intensive land use may have to be limited to achieve required environmental outcomes.

Niall Watson
17 October 2012

The following was provided by Niall Watson of Fish and Game by email on 24 April 2012. The email was in response to the High Level Options report (Aqualinc 2012b).

Thank you for the opportunity for input on identified water supply options for the Manuherikia catchment. The following preliminary comments relate to sports fishery values only.

1. Dams on Dunstan Creek. Dunstan Creek is a highly regarded small stream fishery which is largely in its natural state. Dam construction on Dunstan Creek would be controversial and is likely to run into strong opposition.

2. Raising Falls Dam. Falls Dam supports a locally important trout fishery and there is an angler's camp composed of a number of huts adjacent to it. The Manuherikia above the dam is a backcountry fishery but an increased dam height is only likely to flood a small section of the main stem immediately above the existing reservoir. There is significant spawning and rearing water within the upper catchment and an increased area of inundation will not impact significantly on trout spawning and rearing habitat or on adult trout habitat in my view. I generally agree with your environmental assessment in Section 4.1.6.

Relocation of angling huts and providing recreational access to an enlarged reservoir is likely to be an issue which would need to be addressed. The fishery values of a new reservoir would depend on its operating regime.

The flow regime in the river below the dam is an issue. The current use of the Manuherikia mainstem as a conduit for irrigation water results in more generous flows than are presently provided by minimum flows. This is a beneficial impact. At the same time in in-stream diversion structures for water takes deplete specific reaches and may impede fish passage.

I consider raising Falls Dam has a low to moderate environmental sensitivity from a sports fishery view point.

3. Manor Burn Dam Sites. There is little information on trout fishery values or angler use for Hope Creek or Little Valley Creek. Raising the height of Lower Manorburn Dam is unlikely to be controversial and may result in an improved still water habitat.

Overall I consider the Manor Burn catchment dam sites have a low environmental sensitivity from a sports fishery view point

4. Efficiency Improvements. Improvements in irrigation scheme efficiency and piped supplies have some potential to have secondary impacts on trout fisheries but, with management, issues should not become significant. Fish and Game considers increasing irrigation efficiency is desirable but fisheries impacts may arise in the Manuherikia where water is presently transported from Falls Dam to the lower catchment in the mainstem river. The setting of minimum flows in the Manuherikia at Ophir in 2000 was controversial but the community is buffered from the reality of low summer flow because of the transportation of irrigation water. In some cases irrigation returns resulting from inefficiency may also be bolstering flows in tributaries during summer.

I consider efficiency improvements have a low to moderate environmental sensitivity from a sports fishery view point

5. Mt Ida Dam Site. The proposal for a dam on the upper Ida Burn, above the main road will not impact significantly on sports fishery values because the affected river reach currently goes dry in summer.

I consider the Ida Burn dam site has a low environmental sensitivity from a sports fishery view point

In conclusion Fish and Game considers that construction of new or improved reservoirs, new supply arrangements and efficiency gains must lead to improvements in environmental values (biodiversity and amenity) as well as increases in irrigation water availability.

Kind regards

Niall Watson
Chief Executive
Otago Fish and Game Council

Appendix D: Feed-back from Forest and Bird

Central Otago-Lakes branch

Forest and Bird

PRELIMINARY SCOPING PAPER

PROPOSED ENVIRONMENTAL IMPACTS REPORT – Aqualinc

This scoping paper sets out a range of aspects that we think ought to be considered in the pre-feasibility stages of the Manuherikia Catchment Water Management Strategy, in the pre-feasibility Environmental Impacts Report to be prepared by Aqualinc in 2012.

This is a high- level preliminary paper as fuller consultation with our members needs to be undertaken over time. It is expected a more comprehensive advisory paper would be prepared for the next stage, Feasibility Study.

1 Introduction

The Manuherikia and Ida valleys lie in the middle of the Central Otago Lakes (COL) Forest and Bird (F&B) branch area. Although highly developed for farming, there remain significant natural values in the rivers and streams, wetlands and remaining dry valley/basin floor areas.

Forest and Bird's purpose is to protect New Zealand's native species, habitats and ecosystems through fostering knowledge and understanding; undertaking or supporting active conservation work; and advocating for policy, strategy and planning legislation that promotes and achieves protection. Forest and Bird has around 70,000 members nationally and the COL branch has around 240 members.

Central Otago Forest and Bird branch welcomes the opportunity to contribute to the development of the Manuherikia Water Management Strategy in a way that best meets the needs of environment and community.

2 Potential Impacts and Environmental Issues

From a F&B perspective, the following aspects need to be fully considered in the pre-feasibility and/or feasibility stages of the strategy development:

2.1 Potential Direct Impacts on Existing Indigenous Biodiversity, Natural Landscape and Nature Conservation Values

These impacts may arise or be associated with the construction of dams and impounded storage lakes (Falls Dam, Manorburn) and the construction of new distribution and other infrastructure (water races, roads)

- Impacts of Falls Dam;
  - Effect of extended inundation under all options. Assess significance of braided river bed habitat above Falls Dam and significance of <u>further</u> loss of habitat. Cumulatively, around 40% of the braided river system that previously existed between Kirkwoods Creek at the top of the valley and Home Hills gorge would be lost under the highest dam option. Braided riverbeds are a naturally rare ecosystem surrounded by threatened low altitude land environments (LENZ[1]).
  - Likely inundation of valued dry shrubland and grassland communities in small side valleys around the northeast to southeast periphery of proposed lake, also lizard and insect habitat. These are areas of significant inherent value identified under the Home Hills tenure review, and are part of a conservation area and covenanted area (CA1, CC1 in Home Hills Tenure Review). Need to assess values of dryland short tussock and/or shrubland (including distinctive rock outcrop assemblages) with all storage options, possibly including threatened species (eg coral broom, dwarf native broom at Falls Dam), and supporting insect, bird and lizard populations.
  - Possible effects on galaxiid populations in side streams with raised lake levels generally, changing salmonid access. Equally there may be opportunities for restricting salmonid access.
  - Impacts of new road around Falls Dam on rock outcrops and dryland habitat
  - Visual effects on natural landscape character associated with inundation, erosion and drawdown from Home Hills Runs Road and the Oteake Conservation Park; replacing braided riverbed with a lake (acknowledging already a storage lake present with existing effects).

- Impact of enlarged lower Manorburn Dam and other storage sites in the Manorburn catchment:
  - Inundation of dryland habitat – grasslands, shrublands, rock communities; these are likely to be threatened land environments and ecosystems; may include threatened species. No Recommended Area of Protection (RAP) are present in the affected areas but pastoral lease land has not been through tenure review so no comprehensive survey of values available. Need to survey/assess existing habitat and species.
  - Visual impacts on natural landscape character – erosion, draw down (acknowledging already a small storage lake present with existing effects) – need to assess.
  - Possible impacts of new water race development (Hopes creek option) on rock outcrops and dryland habitat – need to assess.

- New Mainrace Construction:
  - Possible impacts on relict native communities through construction of new main race and any secondary distribution systems
  - Visual impact. It is expected through good design and remedial works this issue could be easily addressed

[1] Land Environments of New Zealand. Landcare Research.

- Sedimentation – possible impacts during construction. Requirements for good site and construction management for each area should resolve this issue.

- Downstream Effects on Main Stem Manuherikia River:

- Changes to flow regime will have impacts on the existing aquatic ecosystems downstream of storage dams. Impacts could be negative or positive regarding low flows, flood events, flushing, sedimentation, etc.
- May also affect regimes of tributaries including galaxiid habitat.

Indirect Effects as a Result of more Intensified Farming

- Effects on water quality and aquatic ecosystems – potential for nutrient and sediment loading of inflows to existing streams and rivers via surface water; loss of wetlands, seeps, wet swales, ditches, etc. due to drainage and earthworks/cultivation for pivot or other forms of spray irrigation.
- Equally there is opportunity to "clean up" water quality issues and improve habitat, and create new habitat through better practice, consent conditions, farm management plans, etc.
- Effects on groundwater with distant/lag effects on "downstream" water quality and aquatic habitat; need to know about aquifers, groundwater flows, lag times especially with regard to diffuse nitrates from cow urine and N fertiliser. Break feeding needs particular attention (high to very high concentration of cow urine, no plants to uptake N, possible high loss to groundwater).
- Opportunities for enhanced biodiversity as part of farm development (eg robust riparian buffers, new wetlands, new connecting corridors and patches). These could be required as conditions of consent and serve environmental "cleansing" purposes as part of good farming practice dealing with surface runoff of sediment, phosphorus, faecal matter.
- Loss of remaining dryland indigenous habitat in even very modified areas which might be regarded as "waste land", eg small saline's, short tussock remnants, spring annual sites.

Relict short tussock and saline vegetation, Central Otago.
Photo: Bill Lee

- Loss of tree and shrub cover generally due to clearance for spray irrigation – although mainly exotic provides habitat for birds and insects, may affect essential ecosystem services such as pollination. Equally there can be opportunities to replant areas in diverse species mixes e.g. riparian buffer zones, low "soft" hedges under pivot irrigators

What Needs to be Covered in a Pre-Feasibility or Feasibility Environmental Impact Report:

- Effects on existing terrestrial indigenous species and habitat through construction and inundation. Require survey of species and habitats in affected areas, assessment of significance, identification of threatened/at risk species and habitats and threatened/at risk land environments, significance of loss or modification.

- Assessment of likely changes to existing aquatic environments and effects of the various scenarios on native species and type/quality of habitat (lake and river/stream, wetland). Require survey of species and habitats in affected areas, assessment of significance, identification of threatened/at risk species and habitats, significance of loss or modification. Both positive and negative effects need to be identified

- Identification of and assessment of effects on natural landscape character (visual assessment). This is particularly important if a principle is to avoid any adverse effect on existing landscape character, as the potential change to existing dry to partially irrigated character to a fully irrigated character would be marked. Dairy vs sheep and beef. CP irrigator vs other systems and effects on existing vegetation.

- Identify range of possible impacts of intensified farming on remaining indigenous terrestrial species, habitats and ecosystems. Including development of remaining uncultivated or regenerated areas; loss of or effects on saline patches (a distinctive ecosystem of this dry district); loss of existing network of tree belts, hedgerows, stands of woody vegetation cleared for irrigated farming (although predominantly exotic important for birds and insects especially as corridors and linkages)

- Identify range of impacts on water bodies and aquatic ecosystems through surface flow nutrient enrichment, groundwater contamination (esp N), and sedimentation. Loss of wetlands/wet areas and other existing water bodies (eg ditches, races, ponds) due to development and change in irrigation practice.

- Identify range of ecological and environmental enhancement opportunities enabled by the proposed scheme.

- Overall assessment of positive and negative impacts on indigenous species, habitats, biodiversity and overall ecological sustainability; and how well the scheme would meet the National Biodiversity Strategy and the National Priorities for Biodiversity Protection on Private Land as well as Regional and district objectives and policy around protection and enhancement of indigenous biodiversity, species and habitat.

Anne Steven
for COL F&B
October 18 2012

Comments on Heritage & Recreation values of the Manuherikia Catchment

This is only a preliminary paper as fuller consultation with community needs to be undertaken.

The Manuherikia and Ida valleys lie in the middle of the Central Otago area. Although highly developed for farming, there remain significant natural values in the rivers and streams, wetlands and to a much lesser degree in remaining dry valley/basin floor areas. These are valued for their recreational and amenity opportunity.

The Manuherikia and Ida Valley have some Maori history and occupation relating to the various tool making sites sparsely distributed across the catchment area. Dry land pastoral farming is rich with long generational family occupation. In tandem the area has a rich chequered gold mining history and like the pastoral heritage significant examples and elements remain today both in public and private ownership.

The current irrigation system and infrastructure are integrally linked to the previous hydraulic network that powered gold mining and recovery.

The heritage landscapes are intertwined and make for a unique cultural mix in what defines the rural communities and families of this region. Aptly defined by the Central Otago 'World of Difference' brand its associated values.

From this perspective I think the following aspects to be fully considered in the pre-feasibility stages of the strategy development:

Potential Direct Impacts on Existing recreation & amenity values

- Water quality & volumes.
  - Swimming & picnicking & camping
    - On-going water quality decline
    - Targeted water application may lead to higher fire risk e.g high dry matter loadings along streams water ways
    - Industrial harsh domination. Loss of naturalness
  - White water canoeing – reduced or improved flows and frequency
  - Risk to yet untapped or unidentified recreational activity – the new mountain bike phenomena?
  - Extension/development of walking and cycle trails up the Manuherikia river
  - Private gain and capture of and from a public resource
- Amenity loss
  - Tree removal along water ways
  - more intensive land use reducing public amenity areas

Potential Direct Impacts on Existing heritage & cultural values

- new owners /land managers
  - disconnect with past history; lack of value and association for past
- destruction/modification of old race features

- Early dry land pastoral farming systems and related farm buildings, machinery and related domestic dwelling/s maybe affected/lost through new land intensification choices.
- This is likely to have a cultural heritage effect with some generational farming families choosing to decline more intensive farming practises and move away. This is likely see a loss to Community heritage and knowledge of the past.
- Destruction, loss and modification of old pastoral dry land farming landscapes; buildings; machinery etc.
    - Inventory and Assessment significance required so sites recorded and or preserved.
- Community & cultural history – documented and recorded
- Effects on heritage – upgrades of reticulation systems; old dams, increased land use and land values leading to loss of extensive pastoral farming and associated farm heritage and buildings to more intensive land use
- Archaeological assessments are likely to be required as gold workings; early water distributions networks and infrastructure are likely to be disturbed and or modified or made obsolete.

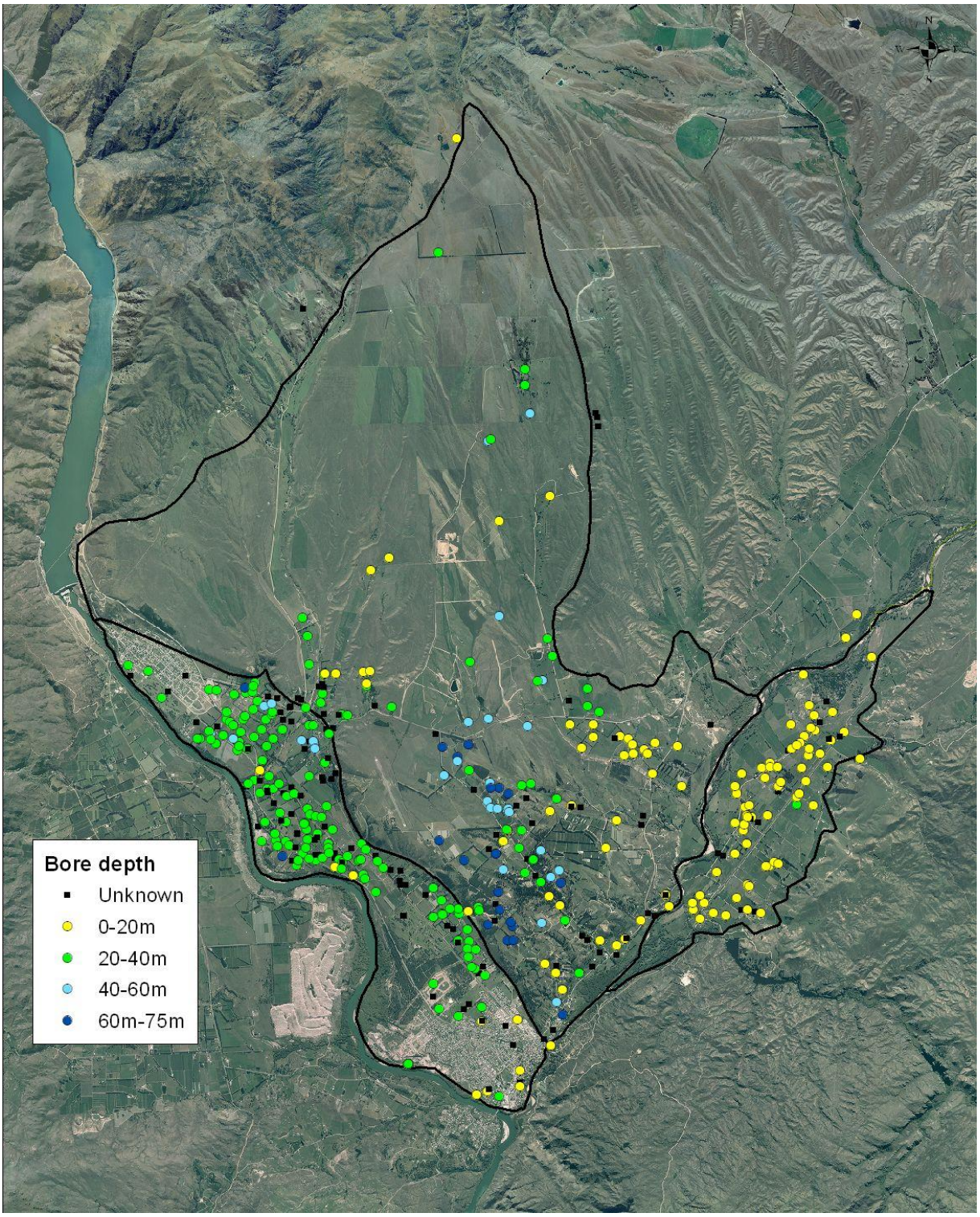
Indirect Effects and or opportunities

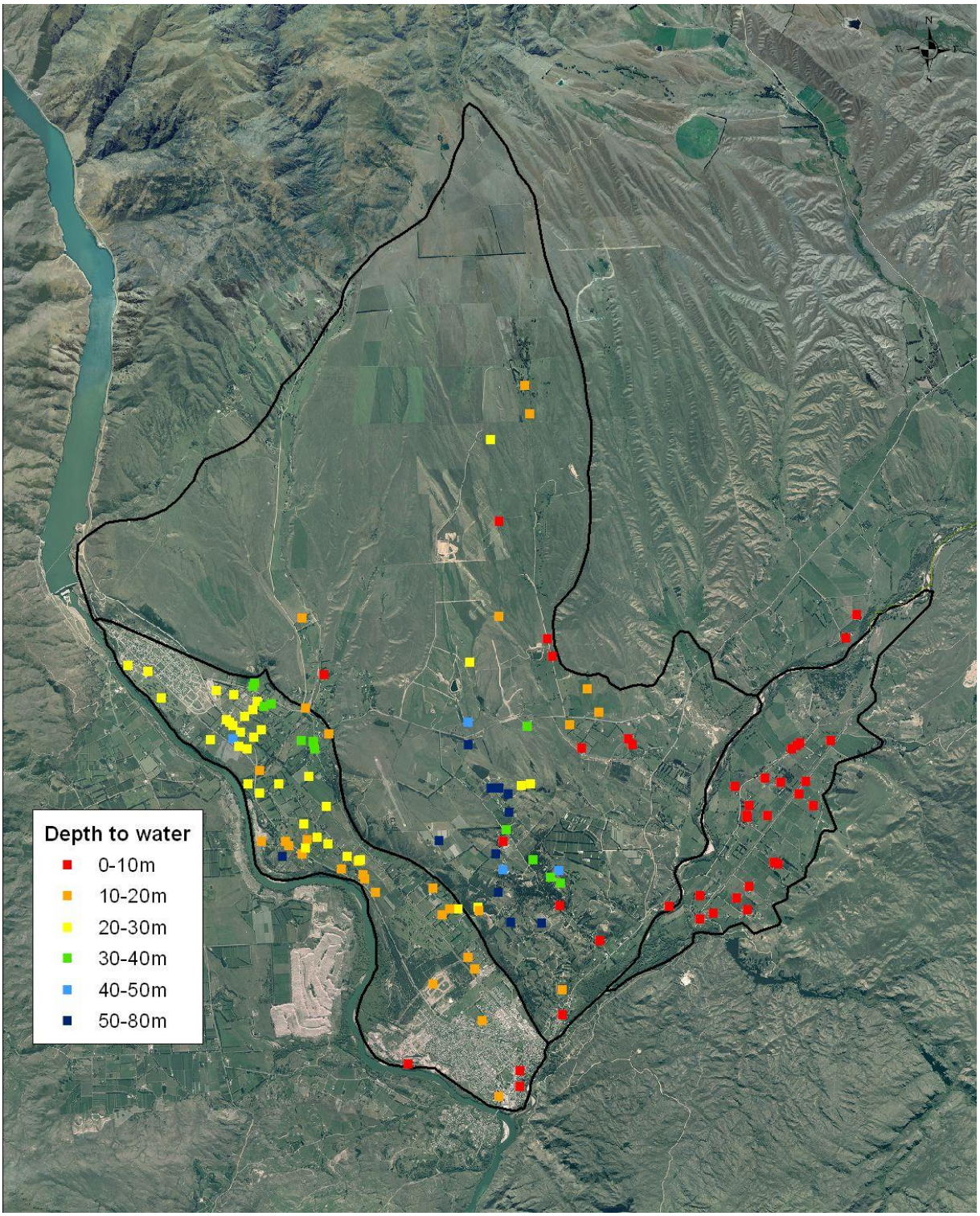
- The valley floor ecological system has suffered significantly from extinction. With a significant amount being endemic – unique to Central and nowhere else on the planet. There is an opportunity for eco restoration within riparian margin development and needs for endemic flora and fauna restoration opportunity.
- Loss of remaining dryland indigenous habitat even very modified areas which might be regarded as "waste land", eg small saline's, short tussock remnants, spring annual sites.

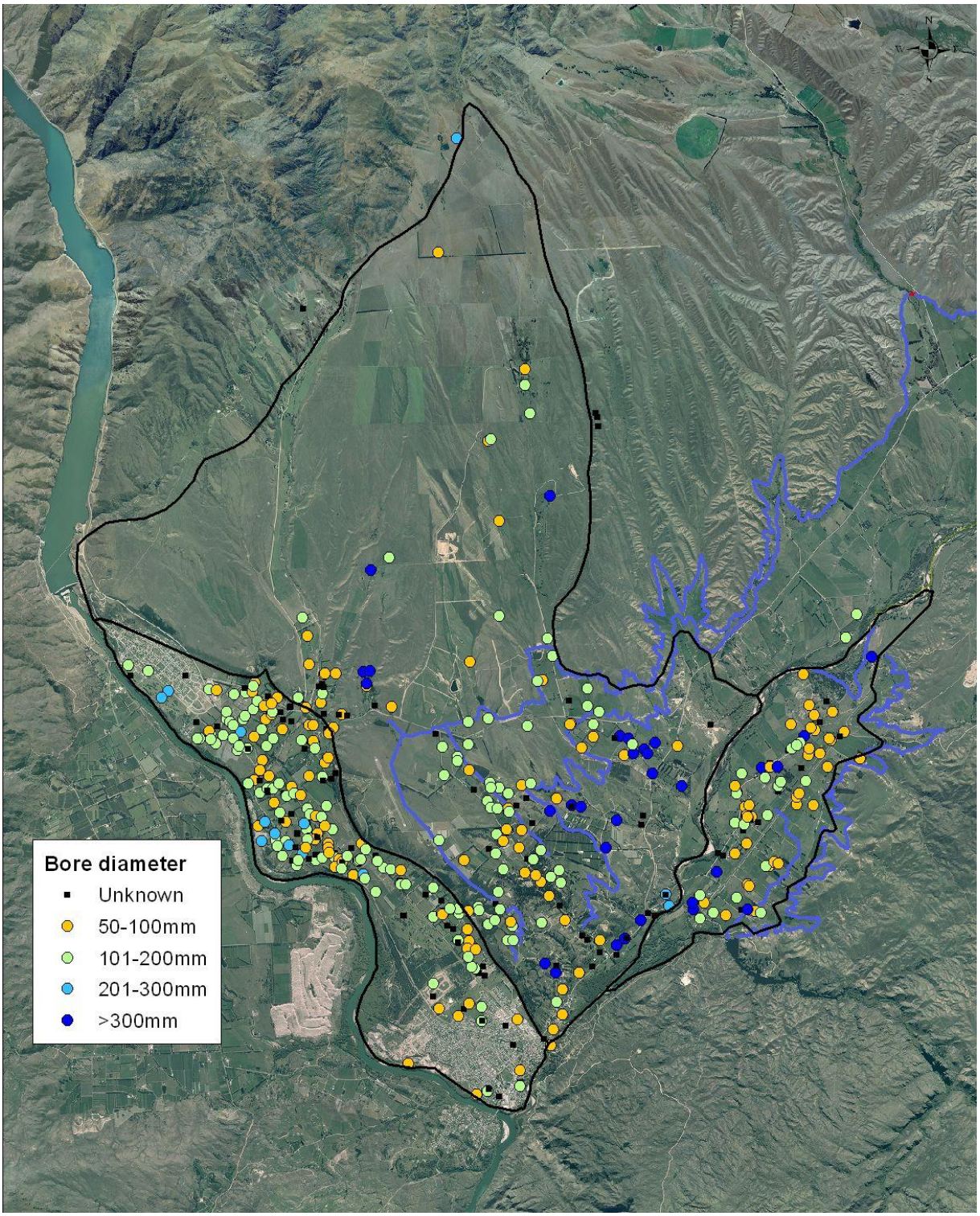
Mathew Sole

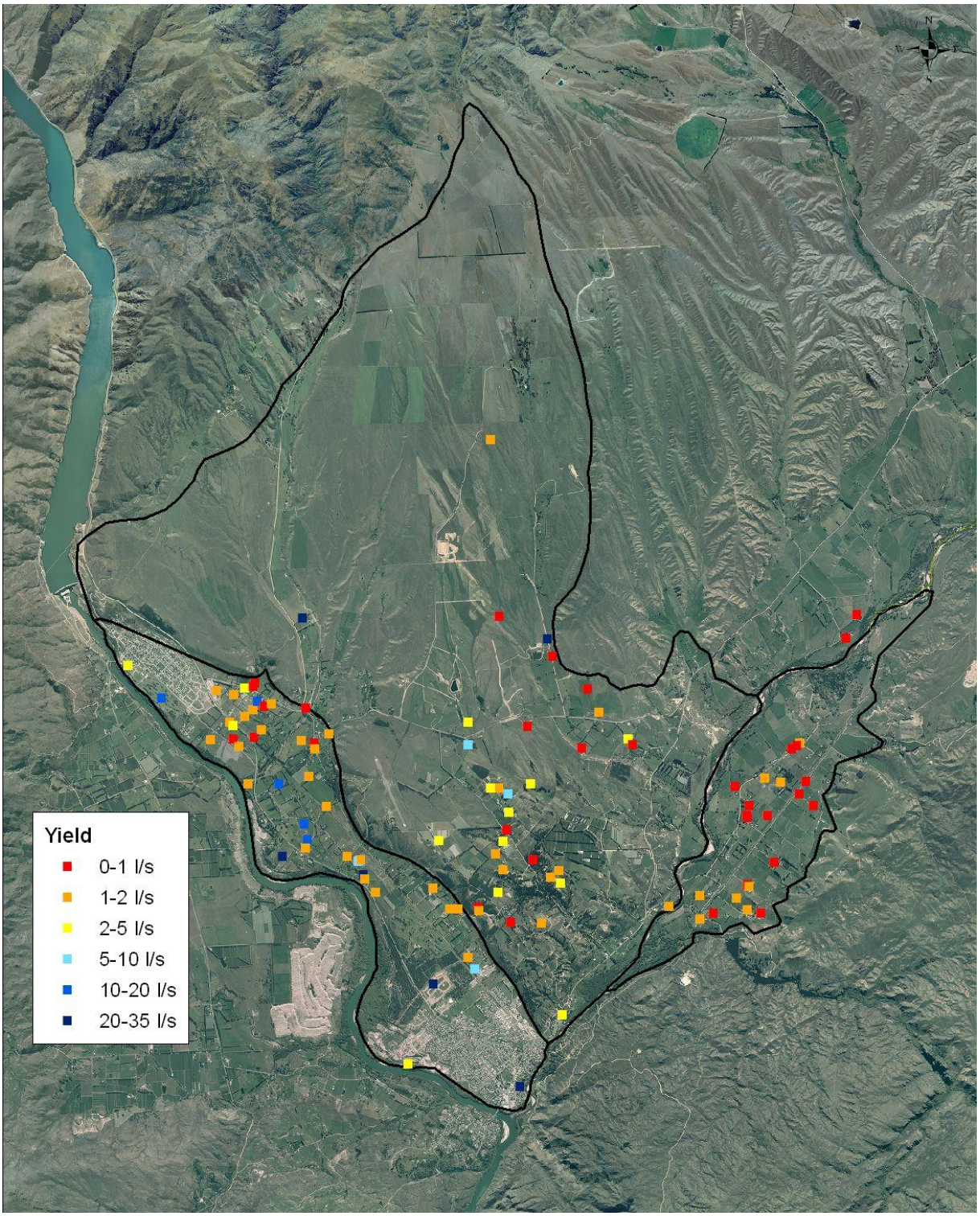
18 October 2012

Appendix E: Lower Manuherikia Valley Aquifers









Appendix F: Comment from COES

The Manuherikia Irrigation Strategy – an Alternative View

This brief commentary is intended to draw attention to wider contextual issues and concerns regarding the proposed initiative to secure water for irrigation purposes in Central Otago. The draft Social Impact Report (Aqualinc 2012c) claims that a major water scheme would, *"create jobs, increase household income, provide population growth, and promote investment",* but fails to acknowledge that like any commercial venture, these outcomes are dependent on assumptions subject to external factors beyond our control.

Likewise the report notes other consequences, including land use intensification, changes of farm ownership, social change and loss of community cohesion, inferring that such changes are inevitable but necessary, in the interest of the District's economic development.

The report subscribes to the prevailing economic model - that economic security relies on ceaseless expansion and that the current economic crisis is but a temporary impediment which will be removed by our continuing to expand and consume resources. There is however, an increasing awareness (note comments by entrepreneur Dick Smith last week) that 'growth' is no longer economic and that its continued pursuit will only incur unsustainable debt, social destabilization, more pollution and accelerate the loss of biodiversity.

The proposition that the finite resources of the planet cannot accommodate either the promise or the theory of infinite growth, leads inevitably to replacing the current economic model with a new reality. Adaptation to a new order is likely to be painful and involve considerable decentralization, requiring communities to provide for their own sustenance, security, education, financial systems and self-governance. Not everyone will concede this alternative reality but at the very least, prudence dictates that any major development proposal such as that to secure water for irrigation in Central Otago, must be evaluated against all possibilities.

To some degree, the wider context has been captured by the CODC's Long Term Plan (LTP) which draws on various studies and community consultative processes, including the Central Prospects study (2002), the Rural Study (2006) and various individual community plans. All of these documents convey the strong sense of place and the deep feelings that people have for the Central Otago environment, culture and landscape: "*The uniqueness of the landscapes, the openness, the big country feel, and the mix of historic, pastoral, and horticultural heritage were all seen as features worth preserving*." (Rural Study Final Report 2006).

The LTP is intended to reflect what it is that Central Otago residents value about the District and their vision for the future. The Plan emphasises the need for sustainable management of the District's resources and specifically notes the capture, storage and wise use of water as being fundamental to its future. It follows then that any plan to secure water for irrigation is only likely to be realised if it is widely viewed as accommodating all of the community's needs, and contributing to the overall well-being by furthering the district vision.

It is worth noting too, that the LTP considers Council to have an important, albeit indirect role "to facilitate the 'economic development' of the District, by way of "*providing a policy framework, infrastructure and perhaps some development funding*" (CODC LTP 2012 -22). It might be sensibly assumed that such facilitation and contribution is more likely to be forthcoming for a water supply scheme perceived as providing widespread community benefits rather than one designed for the benefit of irrigators and power generation companies.

It might do so by ensuring that the scheme also secures water for domestic purposes (household supply, fire fighting, stock water and individual micro-hydro schemes). Environmental enhancement measures by the supply scheme restoring minimum flow levels in local streams and creeks, by irrigators adopting management measures to preserve and enhance water quality and farmers acknowledging their community obligations by retiring suitable areas for the establishment of new wetlands, eel habitats and using scheme water for the regeneration of native flora.

In 2006, the Central Otago Rural Study focussed on whether it was desirable that farm land be broken up for residential subdivisions and life style blocks; were those same discussions to take place now, six years later, it is highly likely that the focus would be on land use intensification issues and whether controls might be necessary to maintain the character and values of Central Otago. That discussion has yet to take place so it is wrong to assume that all irrigators, let alone the wider community will necessarily consider the outcomes forecast by the Social Impact Report, as being desirable or inevitable. Indeed, it can be assumed that there will be considerable resistance to any proposal that threatens the prevailing notion of Central Otago as a "World of Difference".

The wider Central Otago community is likely to support a proposal which establishes a baseline objective that secures the District's future water supply by way of "capture, storage and wise use". Accordingly, it may be advisable to recast the proposal as a 'reliable storage and supply scheme' in which the community has some say regarding the allocation of water. In doing so, the scheme's architects must not overlook that the capture and storage of water may of itself, result in unacceptable environmental damage. Finally, consideration should also be given to the notion of minimising irrigation requirements by pursuing robust on-farm solutions which will allow farmers to sustain the traditional dry country, low input /impact agricultural model perhaps better suited to the alternative economic scenario presented above.

Graye Shattky Sep 2012

St Bathans