Wairarapa Water Use Project

Pre-feasibility Programme – Review Point 1 Summary

May 2014

1. Introduction

This summary report addresses the following issues related to Workstream 1 of the WWUP pre-feasibility work programme:

2. Prefeasibility Activity 1a) - Use of Rivers for Conveyancing
3. Prefeasibility Activity 1b) – On-plains storage investigations
4. Prefeasibility Activity 1c) – Command area review
5. Review point #1

2. Prefeasibility Activity 1a) - Use of Rivers for Conveyancing

WWUP has recently completed an initial investigation and assessment of the Tauweru and the Huangarua Rivers' ability to convey water from the potential reservoirs at Tividale and White Rock respectively. The first of these schemes relies on the river as the sole means of conveyance mainly due the distances involved, such that it would likely be a fatal flaw if it could not do so. On the other hand, the White Rock Road scheme could pipe water from the reservoir.

The investigation measured the concurrent steam flow gauging in the two rivers to identify potential major flow losses (or gains) from the river bed that could affect the viability of flow delivery options. This included an assessment of potential 'leakage' along the reaches of interest by comparing gauged flows and incremental catchment area, accounting for tributary inflows (either gauged or estimated) and any significant abstractions.

To determine their suitability for conveyancing, concurrent low-flow gauging programmes were conducted by GWRC field staff on the Tauweru River between 19 and 24 February 2014 during reasonably low to medium flow conditions. This entailed monitoring the flows of the main stem as well as its major tributaries to establish the nature of flow/losses to groundwater.

Likewise, concurrent low-flow gauging was conducted on the Huangarua River on 13 March 2014 to assess losses to groundwater, time delays in delivery, and flow ramping losses. At that time, the river was under low to medium flow conditions.

The field work approximated the level of losses and gains from flushing flows down channels; the costs and other considerations will subsequently be assessed later in the project to optimise river intake structures locations. These factors will then be built into the relative viability considerations of the schemes.

The details of the methodology, the analysis and interpretation of the gauging can be found in **Appendix 1** of the 31 March 2014 Tonkin & Taylor memo entitled "*WWUP – Potential Use of Rivers for Conveyance; Analysis of Flow Gauging of Huangarua and Tauweru Rivers*".

In addition, the above Tonkin & Taylor memo was independently peer reviewed for WWUP by Mark Gyopari (refer **Appendix 2**)

The second part of this investigation was to review the potential for losses to groundwater, time delays in delivery and behaviour of the water as water is introduced to a catchment system. Refer

Appendix 3, 15 March 2014 Tonkin & Taylor memo entitled "WWUP - *Potential Use of Rivers for Conveyance; Comments on Potential Time lags and Flow Ramping Losses".*

With respect to the Tauweru River, it was concluded that there would be lag times of 1.5 to 3 days mainly depending on the flows in the river. Some of the water released into that river would not be available for irrigation as some will be used in reaching an equilibrium between the body of water in the river channel and the surrounding lands i.e. naturally occurring groundwater.

In terms of the Huangarua River, it was concluded that the travel time from the storage reservoir to the intake would be in the order of 6 to 8 hours, and therefore issues such as time delays, the water used in reaching equilibrium as the flows ramp up and down that will be encountered in the Tauweru River, would not be so evident in the Huangarua River.

2.1 Conclusions

2.1.1 Tauweru River

To quote from the peer review with respect to the Tauweru River characteristics, "the conclusion that there is no significant flow loss (or gain) upstream of Te Kopi Road end is consistent with a hydrogeological understanding of the catchment."

Further, the peer review stated that "It would be advisable therefore to perform additional gauging on the entire river reach considered for conveyance to increase confidence in the suitability assessment."

2.1.2 Huangarua River

Similarly the peer review with respect to the Huangarua River stated, "*Since the valley is relatively restricted and underlain by older alluvial material (lower permeability) above Hikawera Bridge, it is not considered that the river could lose significant quantities of flow to the aquifer*."

It then goes on to add, "… *this assumption should be confirmed through additional investigation. A significant problem in this area is the lack of groundwater level monitoring data – if this conveyance option is considered feasible, monitoring sites need to be established*."

In summary therefore, based on the level of investigation conducted, both the Tauweru & Huangarua Rivers definitely have potential to convey storage waters at least to a point downstream where it is suspected that significant losses may be incurred in each case.

Equally, these initial conclusions are subject to further field investigations being conducted. In addition, based on the information gleaned, it is anticipated that no further field investigations are required with respect to conveyancing for the prefeasibility phase.

3. Prefeasibility Activity 1b) – On-Plains Storage

In response to both political and general public requests spanning several years, the project has undertaken a concept (very high) level investigation of on-plains storage. This work has been conducted by Opus International Consultants to provide the project with another perspective. Refer **Appendix 4** "*Preliminary Assessment of the Option of 'on-plain' storage*", dated March 2014.

On-plains storage is the storage of water in man-made ponds on the Wairarapa plains instead of, or in partnership with, storage in the surrounding hills. On-plains storage is quite different from 'on-farm' storage in terms of the scale, role, economics, water volumes, water source(s), costs, ownership and operation involved.

In the event that one or more of the hill storages proves unviable and there is sufficient demand for water to justify them, then storages on the valley floor may be an option worth investigating.

The report has been informally reviewed by Craig Scott, an experienced Water Resources Engineer, with MWD. In his opinion, Mr Scott concluded that, if anything, the Opus costs might be too high

(i.e. too conservative) especially given that savings would be made building multiple dams, and that land engineering fees, offtake and other costs could be included for the costs given. For the purposes of this investigation, some of the key assumptions were:

- The target command area would be irrigated (57,100 ha gross or approx 40,000 ha net)
- Each pond would hold 2 MCM (a 'single fill' for the season)
- 110 lined ponds, each being 450m square, 10m deep
- The combined live storage would be 219 MCM (based on Variant 1)
- Each pond would nominally irrigate 526 ha
- Filled from by gravity from the nearest available water source
- Gravity & pumped distribution to provide pressurised water at the farm gate.
- Land purchase costs averaging $25,000 per ha (ex a Wairarapa real estate agent)

3.1 Conclusions

This investigation studied just one of many options available. Generally speaking, the larger the pond size, the less cost of water per cubic metre. For example, at the scale of ponds studied, if the pond volume was double the volume assumed, the cost per cubic metre drops by approximately 20%. Compared with Canterbury for equivalent large synthetically-lined ponds, the unit cost is $6 to $15 per cubic metre of water, while in the Wairarapa it is estimated as $3 to $7.

Based on the preliminary information there are associated benefits and disadvantages; in general, the scale of these ponds makes them more flexible, able to easily staged, avoids damming rivers or streams, lower physical profile (averagely 50% below and above ground level), manageable and responsive. Conversely, hydroelectricity opportunities would be few, evaporation losses would be higher, and because they involve multiple sites, multiple functions such as construction sites and operational matters would need to be repeated.

In summary, based on the work conducted, it is concluded that on-plains storage is a potentially viable water storage option in the Wairarapa valley situation. Further high-level work could be usefully conducted on this in parallel with the existing valley storage schemes so they could either supplement or replace dismissed storages.

4. Prefeasibility Activity 1c) - Command area review

Dr John Bright (Aqualinc) has led a brief review to determine whether the target command area (the area within which water could be reticulated) was still appropriate for the project's prefeasibility phase. Refer **Appendix 5** "*Command Area Review*", dated 22 April 2014 (DRAFT).

Dr Bright's work concluded that:
"[*Tonkin & Taylor's*] *method initially used to generate the map of priority areas is logical and that, if anything, is likely to be under-reporting the size of the high priority area. I base this last point on my expectation that few people understand the implications to water supply reliability of the changes in groundwater take management. Water supply reliability will deteriorate for the groundwater takes that will go onto surface water take restrictions. Thus the benefits of reliable scheme supplied water will be greater than I suspect is realised at present*."

The outcome of this review therefore suggests that extent of the target command area with respect to high water demand is more likely to be underrepresented i.e. slightly more conservative than what has been assumed to date. It also concludes that methodology adopted to determine the target command area was rational and therefore defensible.

5. Review Point #1

As discussed above, the three investigations, namely:

- use of rivers for conveyancing
- on-plains storage investigations
- command area review

did not discover anything that would suggest a 'fatal flaw' for any of the five preferred schemes or a change to the programmed investigations at this stage of the pre-feasibility phase. The information gathered in all cases will be most useful background to the remainder of the decision making processes.

Based on the investigations conducted, both the Tauweru and Huangarua Rivers have the potential to convey storage waters as a means of distribution, and will not require any further field work until the feasibility phase investigations.

The concept-level report on on-plains storage concluded that it is a potentially viable water storage option and that a further iteration of work could be conducted during the pre-feasibility phase investigations in order that costs and the practicality of on-plains storage can be compared with the five preferred valley storages.

The target command area remains unchanged, and in particular, the extent of high-priority demand area is likely to be more extensive than initially indicated in previous stages of the project.

Attachments: Appendices 1, 2, 3, 4 and 5 – electronic and hard copies of these are available on request, or from www.wairarapawater.org.nz.