Gore District Council

Gore and Mataura Water Sources and Treatment
Future Options Report

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1 Introduction

Opus Consultants (Opus) has recently worked with Gore District Council (GDC) to complete Public Health Risk Management Plans (PHRMPs) for the Gore and Mataura water supplies. The PHRMPs and the catchment assessments that accompanied them highlighted that there are a number of areas where the supplies could present health risks to their communities. The plans identified mitigation measures that might be undertaken as improvements.

In both PHRMPs the failure to provide an adequate barrier against protozoal contamination was identified as the most extreme risk and in need of mitigation. The resulting action the PHRMPs recommended as a priority was that options be investigated for:

- Alternative, safer raw water sources that could reduce the number of protozoa barriers required.
- Additional treatment processes that could increase the number of protozoa barriers provided.

This investigation has therefore been undertaken to assess engineering options (with rough order costs; that are available to GDC for improving the raw water quality and/or for treating the water adequately. The requirements for protozoa removal of the Drinking-water Standards for New Zealand 2005 (Revision 2008) (DWSNZ) have been used as guidelines.

This report presents the outcomes of the investigation. It is envisaged that this report will give direction to GDC when planning upgrades to the water supply systems for Gore and Mataura.

2 Water Demand

Water demand is the key input to determining how much source water and treatment capacity should be provided. Future water demands for Gore and Mataura have previously been estimated and documented in a number of places.

The demand assumptions that have been adopted for this assessment are taken from the ‘Gore District Council – Water Supply Activity Management Plan, December 2008’. The plan presents demands extrapolated to 2021 which assume:

- Gore’s demand will grow to 6.6 MLD (6,600 m³/day)
- Mataura’s demand decline to 1.4 MLD (1,400 m³/day)

The total demand for Gore and Mataura will therefore be 8.0 MLD (8,000 m³/day).

It should be noted that these estimates do not include for additional water that may be needed to supply industrial development or significant domestic growth fuelled by industrial development in the district. They provide only for the existing demand with allowance for moderate residential growth (in the case of Gore) or moderate residential decline (in the case of Mataura).
3 Water Quality

It is assumed that the groundwater water quality from any new sources will be the same as that which has been observed for the existing Jacobstown and Coopers well fields.

Existing surface water quality from the Pleura Stream and the Mataura Rivers is assumed to remain typical of these sources.

4 Options for Gore

The follow subsections describe the source and treatment options that have been considered for Gore.

Flows available from each source have been assumed so that indicative upgrade costs can be estimated. Actual source capacities should be proved by field testing and should be used for any design.

4.1 Option 1A

Bore Water from Coopers and Jacobstown and Treatment at Wentworth Street and Hilbre Avenue

This option assumes that it will be possible to extract all the water required for Gore (6.6 MLD) from the Coopers (4.2 MLD) and Jacobstown (2.4 MLD) bores fields. Since a new and successful production bore at a depth of between 20-30 m has now been drilled at Jacobstown it will be necessary to:

- Drill a second 20-30 m deep production bore at Jacobstown
- Drill two new 20-30 m deep production bores at Coopers

A rough order cost estimate for these bore field investigations is $0.30M. This is based on the fact that so far it has cost $0.05M to establish the existing new Jacobstown Bore. A contingency has been allowed for two unsuccessful bores.
Figure 3.1: Existing Temporary Nature of the New Jacobstown Production Bore

A rough order cost estimate for putting submersible pumps in these four bores, securing the well heads and providing pumping electrics, drives and controls is estimated at $0.20M.

If the bores are constructed and developed, so that they are low in turbidity, only 3-log credits of treatment barriers against protozoa will be required. No filtration will be necessary. The treatment requirements to achieve 3-log credits will be:

- Ultraviolet disinfection at Hilbre Ave for the Jacobstown raw water
- Ultraviolet disinfection at Wentworth Street for the Coopers raw water

The treatment would be constructed at the existing treatment plant sites. The estimated cost of providing ultraviolet treatment across the two treatment plants for a capacity of 6.6 MLD is $1.30M.

The total cost estimate of this upgrade option for Gore is therefore $1.80M.

4.2 Option 2A

Bore Water from Coopers, Jacobstown and South-West Gore (New Site) and Treatment at Wentworth Street, Hilbre Ave and South-West Gore (New Facility)

This option assumes that it will be possible to extract most of the water required for Gore (6.6 MLD) from the Coopers (3.6 MLD) and Jacobstown (2 MLD) bores fields but not all of it all of the time. Therefore a new bore (1 MLD) will be required. From discussions with South Drill the most appropriate location for attempting to find a new source will be in the south-west of Gore, in the vicinity of the Central Saleyards (approx 2.5 km from Gore) or even further south-west, near the Gore Aerodrome (approx 5.0 km from Gore) which is owned by GDC. Ideally the new site should be located where Gore's low electricity rates apply.
Since a new and successful production bore at a depth of between 20-30 m has now been drilled at Jacobstown it will be necessary to:

- Drill a second 20-30 m deep production bore at Jacobstown
- Drill two new 20-30 m deep production bores at Coopers
- Drill a new 20-30 m deep production bore at a new site to the South-West of Gore Township.

A rough order cost estimate for these bore field works is $0.35M. This is based on the fact that it has so far cost $0.05M to establish the existing new Jacobstown Bore. A contingency has been allowed for two unsuccessful bores.

A rough order cost estimate for putting submersible pumps in these five bores, securing the wellheads and providing pumping electrics, drives and controls is estimated at $0.25M.

If the bores are constructed and developed so that they are low in turbidity only 3-log credits of treatment barriers against protozoa will be required. No filtration will be necessary. The treatment requirements to achieve 3-log credits will be:

- Ultraviolet disinfection at Hilbre Ave for the Jacobstown raw water
- Ultraviolet disinfection at Wentworth Street for the Coopers raw water
- Ultraviolet disinfection and pH correction at the new site

The estimated rough order cost of providing treatment for a capacity of 6.6 ML/d is $1.40M.

In addition pumping and a supply pipeline will be required to connect the new facility to the existing reticulation at the correct pressure.

To deliver water to Gore from the aerodrome vicinity it is estimated that the supply would require:

- A 250 m$^3$ buffer tank located at the source extraction site in the south-west of Gore
- A booster pump station located to the south-west of Gore with the capacity to pump approximately 15 L/s to 60 m pressure.
- A DN150 PN12.5 pumping main, approximately 5.5 km long, from the booster station to the Gore reticulation.

Figure 3.2 is indicative of the pipe route. A rough order cost estimate for these works is $0.90M.

The total cost estimate of this upgrade option for Gore is therefore $2.90M.
4.3 Option 3A

Surface Water from the Mataura River and Treatment at a New Treatment Plant

This option assumes that in the future it may not be possible to extract any useable water from the Coopers and Jacobstown bores fields. This could occur due to issues such as poor groundwater quality or problems with adjacent land use. It represents the option of entirely abandoning shallow groundwater and using surface water (6.6 MLD). The existing two treatment plants would also be abandoned and treatment would occur at a single new plant (6.6 MLD) located to best suit the surface water source.

A rough order cost estimate for a treatment plant treating surface water from the Mataura River and providing potable water for Gore is $7.50M. This estimate includes construction of an intake but does not include purchase of land or gaining resource consents for a water take and beckwash discharge.
5 Options for Mataura

The follow subsections describe the source and treatment options that have been considered for Mataura.

Flows available from each source have been assumed so that indicative upgrade costs can be estimated. Actual source capacities should be proved by field testing and when available should be used as the basis for any design.

5.1 Option 1B

Bore Water from Coopers and Jacobstown, Treatment at Wentworth Street and Hilbre Avenue and Pumping to Mataura

This option assumes that it will be possible to extract all the water required for Gore and Mataura from the Coopers (5.0 MLD) and Jacobstown (3.0 MLD) bores fields. Mataura is therefore no longer an independent water supply. Since a new and successful production bore at a depth of approximately 20-30 m deep has now been drilled at Jacobstown it will be necessary to:

- Drill a second 20-30 m deep production bore at Jacobstown
- Drill two new 20-30 m deep production bores at Coopers

A rough order cost estimate for these additional bore field investigations is $0.30M. This is based on the fact that it has so far cost $0.05M to establish the existing new Jacobstown Bore. A contingency has been allowed for two unsuccessful bores.

A rough order cost estimate for putting submersible pumps in these four bores, securing the wellheads and providing pumping electrics, drives and controls is $0.20M.

If the bores are constructed and developed so that they are low in turbidity only 3-log credits of treatment barriers against protozoa will required. No filtration will be necessary. The treatment requirements to achieve 3-log credits will be:

- Ultraviolet disinfection at Hilbre Ave for the Jacobstown raw water
- Ultraviolet disinfection at Wentworth Street for the Coopers raw water

The treatment would be constructed at the existing treatment plant sites. The estimated cost of providing ultraviolet treatment across the two treatment plants for a capacity of 8.0 MLD is $1.50M.

To deliver water from Gore to Mataura it is estimated that the supply would require:

- A 250 m$^3$ buffer tank located in the south of Gore.
- A booster pump station located in the south of Gore with the capacity to pump approximately 20 L/s to 100 m pressure.
- A DN150 PN12.5 pumping main, approximately 11.5 km long, from the booster station to the Mataura Reservoirs.
Figure 4.1 is indicative of the pipe route required.

Figure 4.1: Indicative Gore to Mataura Pipeline Route

A rough order cost for these pipeline works is $2.00M. This estimate excludes the cost of purchasing land for a booster pump station.

The total cost estimate of this project is estimated at $4.00M. In this option the additional cost to upgrade the Mataura supply in conjunction with upgrading the Gore supply is estimated at $2.20M.

5.2 Option 2B

Bore Water from Coopers, Jacobstown and South-West Gore (New Site), Treatment at Wentworth Street, Hillre Ave and South-West Gore (New Facility) and Pumping to Mataura

This option assumes that it will be possible to extract the majority of the water required for Gore and Mataura from the Coopers (3.6 MLD) and Jacobstown (2 MLD) bores fields - but not all of it and all of the time and therefore two new bores (2.4 MLD) will be required. From discussions with South Drill the most appropriate location for attempting to find a new source would be in the south-west of Gore, in the vicinity of the Central Saleyards (approximately 2.5 km from Gore) or even further south-west near the Gore Aerodrome.
(approximately 5.0 km from Gore) owned by GDC. Ideally the new source should be located where Gore's low electricity rates apply. Mataura is therefore no longer an independent water supply. Since a new production bore at a depth of between 20-30 m has now been drilled at Jacobstown it will be necessary to:

- Drill a second 20-30 m deep production bore at Jacobstown
- Drill two new 20-30 m deep production bores at Coopers
- Drill two new 20-30 m deep production bores at a new site to the south-west of Gore Township.

A rough order cost estimate for these bore field works is $0.40M. This is based on the fact that it has so far cost $0.05M to establish the existing new Jacobstown Bore. A contingency has been allowed for two unsuccessful bores.

A rough order cost estimate for putting submersible pumps in these six bores, securing the wellheads and providing pumping electrics, drives and controls is estimated at $0.30M.

If the bores are constructed and developed so that they are low in turbidity only 3-log credits of treatment barriers against protozoa will be required. No filtration will be necessary. The treatment requirements to achieve 3-log credits will be:

- Ultraviolet disinfection at Hilbre Ave for the Jacobstown raw water
- Ultraviolet disinfection at Wentworth Street for the Coopers raw water
- Ultraviolet disinfection and pH correction at the new site

The estimated rough order cost of providing this treatment for a capacity of 3.0 ML/d is $1.50M. This estimate excludes the cost of purchasing land for a new treatment and pumping station.

In addition, pumping and a supply pipeline will be required to connect the new facility into the existing reticulation at the correct pressure.

To supply water to Gore from the aerodrome vicinity it is estimated that the supply would require:

- A 250 m³ buffer tank located to the south-west of Gore
- A booster pump station located to the south-west of Gore with the capacity to pump approximately 15 L/s to 60 m pressure
- A CN150 PN12.5 pumping main, approximately 5.5 km long, from the booster station to the Mataura Reservoirs

A rough order cost estimate for these pipeline works is $0.90M.

To supply water to Mataura from the aerodrome vicinity it is estimated that the supply would require:

- A booster pump station located to the south-west of Gore, at a new site, with the capacity to pump approximately 20 L/s to 80 m pressure.
• A DN150 PN12.5 pumping main, approximately 5.9 km long, from the booster station to the Mataura Reservoirs

Figure 4.2 is indicative of the pipe route required.

Figure 4.2: Indicative Aerodrome to Mataura Pipeline Route

The rough order cost for these pipeline works is $0.80M.

The total cost estimate of this project is estimated at $3.90M. For this option the additional cost to upgrade the Mataura supply in conjunction with upgrading the Gore supply is estimated at $1.00M.
5.3 Option 3B

Surface Water from the Mataura River, Treatment at a New Treatment Plant and Pumping to Mataura

This option assumes that it will not be possible to extract any useable water from the Coopers and Jacobstown bores fields due to issues such as poor groundwater quality or problems with adjacent land use. It represents the option of entirely abandoning shallow groundwater to use surface water (8.0 MLD). The existing three treatment plants would be abandoned and treatment would occur at a single new plant (8.0 MLD) located to best suit the source.

The rough order cost estimate for a treatment plant treating surface water from the Mataura River and providing potable water for Gore and Mataura is $9.00M. This estimate includes construction of an intake but does not include purchase of land or gaining resource consents for a water take and backwash discharge to the Mataura River.

To deliver water from Gore to Mataura it is estimated that the supply would require:

- A 250 m³ buffer tank located in the south of Gore
- A booster pump station located in the south of Gore with the capacity to pump approximately 20 L/s to 100 m pressure
- A DN150 PN12.5 pumping main, approximately 11.5 km long, from the booster station to the Mataura Reservoirs

The rough order cost for these pipeline works is estimated at $2.00M. This estimate excludes the cost of purchasing land for the booster pump station.

The total rough order cost estimate of this project is $11.0M. For this option the additional cost to upgrade the Mataura supply in conjunction with upgrading the Gore supply is estimated at $3.50M.

5.4 Option 4

Upgrade the Existing System – Pleura Stream and Mataura WTP

This option assumes that the existing Pleura Stream source and the emergency Waitana and Mataura River sources will continue to be used to supply Mataura Township. This maintains Mataura as an independent water supply.

To continue to deliver water from the Pleura Stream to the Mataura WTP a replacement gravity pipeline is required. The Pleura is at a level of approximately RL 200 and the Mataura WTP at a level of approximately RL 110. Therefore it is calculated that a DN150 PN12.5 gravity feed pipeline approximately 7.8 km long will be required. An indicative pipeline route is shown in Figure 4.2. The rough order cost for this pipeline is estimated at $1.10M.
Figure 4.2: Indicative Pleura to Mataura Pipeline Route

A catchment assessment has shown that this water supply needs 5-log credits of protozoa removal barriers. The existing coagulation, sedimentation and filtration treatment process can provide up to 3-log credits. The remaining barriers could be provided by ultraviolet disinfection.

The estimated rough order cost of providing treatment for a capacity of 1.4 MLD at Mataura is $0.50M.

The overall cost of this project to Mataura is therefore estimated to be $1.60M.

5.5 Option 5

New Mataura River Source and Treatment at the Mataura WTP

This option assumes that a new raw water source is found and that this is treated at the existing Mataura WTP. The purpose of this source would be to replace the potential loss of the Pleura or Waitana takes through problems that may occur with contamination, capacity or consents. The most likely replacement source would be the Mataura River. For example this might be a permanent intake located adjacent to the existing emergency take.

The Mataura is at a level of approximately RL 55 and the Mataura WTP at a level of approximately RL 110. Therefore it is calculated that a DN150 PN12.5 pressure pipeline approximately 1.3 km long will be required. An indicative pipeline route is shown in Figure 4.3. The rough order cost for this intake and pipeline is estimated at $0.30M.
A catchment assessment has shown that this water supply needs 5-log credits of protozoa removal barriers. The existing coagulation, sedimentation and filtration treatment process can provide up to 3-log credits. The remaining barriers could be provided by ultraviolet disinfection.

The estimated rough order cost of providing treatment for a capacity of 1.4 MLD at Mataura is $0.50M.

The overall cost of this project to Mataura is therefore estimated to be $0.80M.
6 Summary

Table 5.1 summarises the options investigated and the rough order costs estimated.

Table 5.2 summarises the advantages and disadvantages of each of the options.
<table>
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<th>Option</th>
<th>Source</th>
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<th>B (Gore and Mataura)</th>
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<td>Improves on existing sources The existing treatment and distribution infrastructure continues to be used. May have problems with insufficient capacity</td>
<td>Sharing of pumping and treatment resources with Gore leading to cost savings Reduction in resource consents and consent compliance Reduction in DWSNZ compliance Potential for use of Gore’s inexpensive electricity</td>
<td>The existing treatment plant, excepting reservoirs, will be used no longer used High capital cost for a pipeline Reliance on Gore’s water resources Reliance on a single feed pipeline into Mataura</td>
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<td>Bore water from Cooper, Jacobstown and a new site south-west of Gore</td>
<td>Improves on existing sources Sharing of pipeline capital costs with Mataura - particularly if new source is midway between townships Additional source and treatment site reduces the risk of a total loss of supply There is a probability that finding a new additional new source or treatment plant site will be unsuccessful</td>
<td>Sharing of pumping and treatment resources with Gore leading to cost savings Sharing of pipeline capital costs with Gore - particularly if the new source is midway between the two townships Reduction in resource consents and consent compliance Reduction in DWSNZ compliance</td>
<td>The existing treatment plant, excepting reservoirs, is no longer used Reliance on a single feed pipeline into Mataura Reliance on treatment processes alone to provide protection</td>
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<td>Surface water from the Mataura River</td>
<td>Unlikely to have capacity problems High project capital cost Difficulty getting new consents for the new treatment plant Existing water treatment plants, excepting reservoirs will no longer be used Reliance on one plant Water quality and is treatment is more complicated</td>
<td>Unlikely to have capacity problems Sharing of pumping and treatment resources with Gore leading to cost savings Reduction in resource consent and consent compliance Reduction in DWSNZ compliance</td>
<td>The existing treatment plant, excepting reservoirs, will be used no longer used High project capital cost. Reliance on a single feed pipeline into Mataura</td>
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<td>The probability of getting a water take consent is totally unknown</td>
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<td>The Mataura River exposes the WTP to a more variable water quality</td>
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<td>There may be periods when the Mataura River is totally unacceptable for treatment</td>
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7 References

2. Gore District Council, Mataura Water Supply Public Health Risk Management Plan
4. Gore District Council, Master Water Planning Project. Demand and Infrastructure Issues and Options Report