greater WELLINGTON
REGIONAL COUNCIL

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Committee **Utility Services**
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Water Source Development Strategy

1. Purpose

To outline the results of recent investigations into future water sources and indicate a direction for the next stages of investigation.

2. Significance of the decision

The matters in this report do not trigger the significance policy of the Council or otherwise trigger section 76(3)(b) of the Local Government Act 2002 at this stage.

3. Introduction

Historically, significant water supply infrastructure in Wellington has been built at infrequent intervals of 25/30 years but each project has been costly. The largest recent project was the Stuart Macaskill lakes, completed about 20 years ago. These lakes and the associated water treatment plant catered for a significant growth in the population.

4. Growth projections

Based on the 1 in 50 year drought standard adopted by the Council, the existing infrastructure can supply a population of 377,000, and this is expected to be reached in about two year's time (June 2007), when the "Best Guess" population reaches 377,000 (see Figure 1).

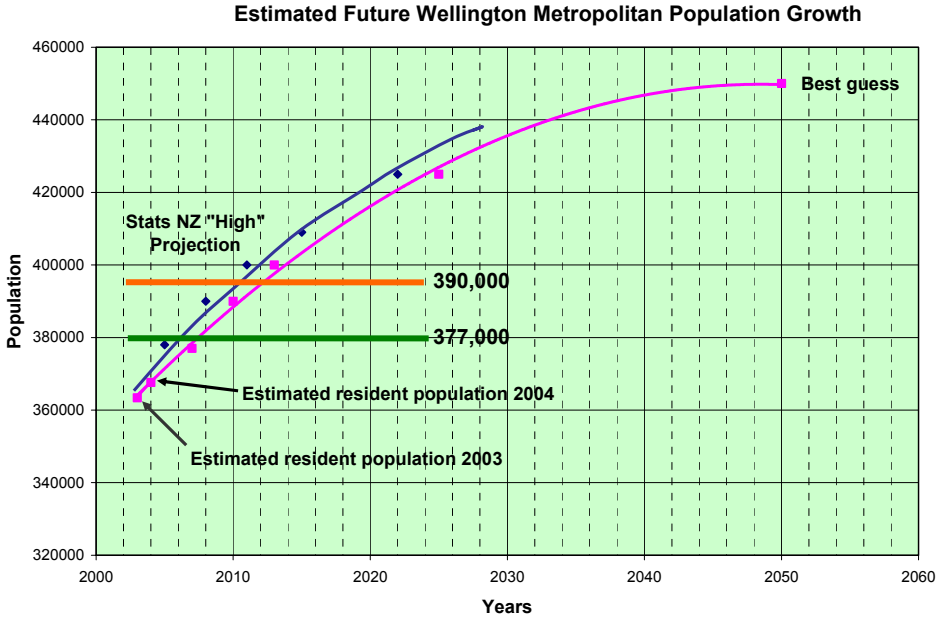

Figure 1 – Estimated Future Wellington Metropolitan Population Growth

Projections of the population that can be supplied by the current infrastructure come from Greater Wellington Water's (GWW) sustainable yield model which uses historical river and climate data to model supply and demand. The model does not make any provision for changes in the climate. If there is an expectation of more extreme wet and dry periods in Wellington than has been experienced in the last 100 years, then this can be factored into the design of a future source development.

The problem of sourcing water for an increasing population is essentially one of meeting summer demand. The Waiwhetu aquifer and the rivers where water is abstracted currently have considerable spare capacity to provide water for about nine months of the year, but not during hot summer periods, when heavy reliance is placed on the Stuart Macaskill Lakes.

As explained in section 6.5, GWW and the four City Councils are preparing a Wellington Water Management Plan. If the initiatives in the plan are effective, then the rate of increase in water demand will slow, deferring the time when a new major water source development is required. It is unlikely though to impact on the need for a source development in about two years to supply a population in excess of 377,000.

5. Planning framework

The Council is required to meet the provisions of the Local Government Act 2002 which require various options to be evaluated. The specific provisions of the Wellington Regional Water Board Act 1972 (the Act) are also relevant for the wholesale water supply function. The Greater Wellington Regional Council (GWRC) now assumes the role of the Board.

Section 26(1) of the Act states:

> It shall be the function of the Board to investigate, construct, extend, enlarge, maintain, and repair waterworks for the bulk supply of pure water to constituent authorities.

That is, the GWRC has a statutory duty to provide adequate water to the constituent authorities.

At present, the constituent authorities are the four city councils in metropolitan Wellington.

Various parcels of land were transferred to the Board to use for water catchments (or for future use as water catchments) and for forestry purposes so the Board could carry out its water supply function. While some of the areas of land set aside for future water catchment are currently being used for recreational purposes, their prime purpose of water supply remains. This prime purpose is recognised in GWW's management plan covering future water catchment areas.

6. Investigation into new water sources

With the original water supply infrastructure dating back to the 1880s, there have been several studies in the past to look at new sources of supply. Recent studies have built on this earlier work by adapting it to the current circumstances. Some new options have also been evaluated.

6.1 Source options – immediate

(i) Te Marua Intake and Pumping Station

Developing a river intake and pumping station at Te Marua is, in relative terms, a low cost solution to obtain more water. Prior to the Council's Freshwater Plan being adopted in 1999, a consent was held to take water from the Hutt River at Te Marua.

(ii) Kaitoke Weir

An alternative is to apply to take more water at the existing Kaitoke weir by reducing the residual flow downstream. For an application to succeed, the effects on the river system would have to be fully evaluated and shown to be minor or at least acceptable. The additional abstraction would, at times, leave a residual flow over the weir of less than required by the Freshwater Plan. The main advantage would be the avoidance of several million dollars of capital expenditure and the electricity costs associated with operating the Te Marua Intake pump station.

(iii) Wellington CBD Reservoir

Wellington City Council (WCC), Capital and Coast District Health Board and GWW are investigating the development of a combined 35 ML reservoir on the fringe of the Wellington central area. GWW and WCC will share 15 ML with 20 ML reserved as a hospital emergency supply. While not a source as such, an additional reservoir in Wellington City would increase the yield of the bulk supply system by storing water for use on occasional peak days.

(iv) Outcome

A combination of additional water from either a Te Marua intake or the Kaitoke weir plus the new Wellington reservoir storage would provide sufficient water to supply a population of 390,000 without increasing the risk of shortfalls.

6.2 Source options – medium term

There is an aquifer in the Upper Hutt area between Te Marua and the State Highway 2 bridge at Silverstream. It is an unconfined aquifer and therefore any water taken for public supply will require full treatment. A new treatment plant could be built, or alternatively the water could be pumped to the existing Te Marua water treatment plant (WTP) for treatment.

This aquifer could be developed as an alternative to, or in addition to, development at Te Marua or Kaitoke. Without a major upgrade at the Te Marua WTP, the maximum additional population that can be supplied is approximately 23,000 (that is, total population supplied 400,000). If the aquifer was developed as well as the Te Marua intake or the Kaitoke weir option, and the aquifer water treated at a stand alone plant and pumped into the Kaitoke main, a sustainable population increase of approximately 38,000 (that is, total population supplied 415,000) may be possible.

However, there are a number of risks associated with this aquifer. The interaction between it and the Hutt River is poorly understood. Abstraction from the aquifer may impact on the residual flow in the Hutt River, effectively reducing the amount of water available from both the Upper Hutt aquifer and the Waiwhetu aquifer. Similarly, additional abstraction at Kaitoke or Te Marua may reduce the yield of the Upper Hutt aquifer. Further investigations are required to resolve this issue and confirm whether the Upper Hutt aquifer is a viable development.

There are also risks associated with the quality of the water. The aquifer is very shallow and therefore vulnerable to contamination from surface sources. This risk could be guarded against by additional treatment or by sophisticated monitoring and automatic shutdown in the event that contamination was detected.

6.3 Source options - long-term options

In the longer term, after sources described in 6.1 and 6.2 are developed or found to be unsuitable, there is minimal surface water or groundwater available. This implies the need to store more water to use in summer, use less water during summer or embark on desalination in order to supply any further increase in the population. If the sources mentioned in 6.1 are developed, then the system could supply a population of 390,000, which is expected to be reached about 2010-2011 (see Fig. 1).

The Wellington Regional Strategy study which GWRC has contributed to, considered populations of up to 450,000.

On a simplistic basis, a population increase of 60,000 people (i.e. 390,000 to 450,000), using 550 litres/day over a 90 day summer period requires in total about 3000 million litres (ML) of stored water, (assuming the Upper Hutt aquifer is not suitable for a development). For the period 10/1/01 to 4/4/01 the average daily consumption per person was 490 litres.

The usual way to store water is to construct a dam where untreated water is stored prior to the summer period and then treated as required. A nominal storage volume of 5000 ML has been chosen for study as a dam will silt up over time, there may be a requirement to enhance the river flow under very low conditions and there is always a small amount of inaccessible storage. A lead time of eight or more years for a dam project and the high fixed costs favours building a structure that will meet storage requirements for many years, and the studies outlined below consider this aspect.

As a comparison, the Stuart Macaskill lakes at Te Marua have 3000 ML of available storage.

6.3.1 Skull Gully dam site

This site is near where the Skull Gully tributary joins the Wainuiomata River, just upstream of the Wainuiomata intake and about two kilometres upstream of the Wainuiomata WTP. All the land within the Skull Gully catchment is owned by the GWRC. Public access to the land is restricted.

Because the catchment area is not extensive, the storage lake would also receive water from the Orongorongo River by a pipeline. A branch can be taken from the pipeline already feeding the Wainuiomata WTP, and the water would flow under gravity. Water storage volumes of both 5,000 and 11,000 ML have been considered.

Of the three locations considered for dams in this report, this site, because of the valley width, would require the most construction material.

A major advantage is the ability to utilise spare capacity of the existing Wainuiomata water treatment plant during the summer period.

At present, the water treatment plant closes in a drought situation because of lack of raw water, or if the water in the rivers is very dirty.

A disadvantage of the site is the high quality of the native bush that would need to be cleared before a dam is filled.

6.3.2 Pakuratahi dam site

This dam site is on the Pakuratahi River about six kilometres upstream from where State Highway 2 crosses the river at Kaitoke.

The dam site would be on part of the land set aside as a future water catchment. The area that would be flooded is mainly planted in pine trees with the balance in regenerating native bush. The Rimutaka railway incline walking track passes through the dam site and the area is popular for recreational purposes. Hence, a new link walkway would be required to bypass the section of the incline that would be flooded.

Two dam options have been considered - 5,000 ML and 15,000 ML of storage. The prospective dam site is more confined than the Skull Gully site and the valley widens upstream, so that the quantity of material required to build a dam for an equivalent storage volume is less.

Water from a dam would be piped to the Te Marua WTP for treating. In the longer term, the capacity of the Te Marua WTP and the pipeline south of the WTP would have to be increased.

6.3.3 Whakatikei dam site

The Whakatikei River flows into the Hutt River about 1.5km north of the Moonshine Bridge on State Highway 2. About 5km upstream of this confluence, there is a gorge about 1km long. There are possible dam sites at each end of this gorge. Access to the lower site can be obtained from Bulls Run Road. Access to the site at the upper end of the gorge is more difficult. The catchment area is 45 square kilometres and the land is owned by the Council and designated as a future water catchment.

Because of the steep sides of the gorge and the narrow river width, the construction volume for a dam to provide 5,000 or 15,000 ML of water storage is quite small. Hence, the possible dams at the site will cost considerably less than the other sites. The area to be cleared where a lake would be formed is mainly in pine trees with some native bush.

A significant part of the cost for a development at this site would be in building a new water treatment plant and a pipeline along Bulls Run and Moonshine Roads to connect with an existing pipeline near Judgeford. Most of Bulls Run Road and part of Moonshine Road would be upgraded as the first phase of a development. Porirua and Upper Hutt City Councils would be consulted about this work.

A major advantage of a development at Whakatikei is that it provides a new source and water treatment plant to the west of the Wellington fault line. This would enable faster recovery of the supply of water to Porirua City and the western areas of Wellington City following a fault movement.

6.4 Other options considered but set aside

6.4.1 Orongorongo River

This is a steep dynamic river with a high material bed load which would build up behind a dam. A dam on this river is more costly than the Skull Gully dam and offers no advantages.

6.4.2 Local watersheds

For example, Horokiri Stream, Duck Creek. Several small watersheds in the Wellington area have been investigated. However, these catchments are all too small to provide a worthwhile volume of stored water.

6.4.3 Wainuiomata dam on private land

Some sites on private land in Wainuiomata (Moores Valley) were evaluated to see if there is an alternative to the Skull Gully site with a lesser ecological impact. One or more sites appear to be suitable. However, very extensive earthworks and a long pipeline result in a high costs, precluding them at this stage.

6.4.4 Te Marua

A third storage lake is possible on private land on the west side of the Hutt River. Storage capacity available from using all of the site is 1500 ML, too small to meet the projected demand. The cost on a per ML of storage basis is much higher than some of the other options.

6.4.5 Desalination

The main advantage of a desalination plant is the ability to position a plant near Wellington City where the main population growth is expected. The disadvantages are high initial and operational costs and high energy use. Energy costs for the process would be considerably higher than for existing plants.

6.5 Water conservation

Water conservation is to be encouraged and could defer the development of a new source. Conservation issues are being addressed through the Wellington Water Management Plan which is being developed with the four City Councils and will discuss a wide range of possible conservation mechanisms, including metering.

7. Summary of projects and costs

Source Options - Immediate

- Te Marua River intake (incl. pipeline to plant) $ 6M
  Or increase Kaitoke weir abstraction nil
- Distribution network upgrading for either of the above $ 4M

Source Options – Medium Term

- Upper Hutt aquifer, as an alternative to the Te Marua intake or taking more water from the Kaitoke weir, to supply a population of approximately 400,000

			$/ML
o With on site treatment plant	$	28M	1.8
o Piped to Te Marua WTP for treatment	$	22M	1.5

- Upper Hutt aquifer (in addition to development at the Te Marua intake or taking more water from the Kaitoke weir)

o With on site treatment plant (supply to 415,000)	$	34M	2.1
o Pumped to Te Marua for treatment** (supply to 400,000)	$	13M	2.0

Source Options – Long Term

- Skull Gully dam and pipeline to Wainuiomata WTP

o 5,000 ML storage dam	$	42M	1.1
o 11,000 ML storage dam*	$	55M	

- Pakuratahi dam and pipeline to Te Marua

o 5,000 ML storage dam	$	71M	1.8
o 15,000 ML storage dam*	$	86M	

- Whakatikei dam, 40 MLD WTP, pipeline

o 5,000 ML storage dam	$	67M	1.7
o 15,000 ML storage dam*	$	72M	

* cost allows for increased storage only without a corresponding increase in water treatment and distribution costs

** this is a reduced scale wellfield compared to the $22M option

Various progressive system improvements (e.g. boost pump stations) are included in the costs for medium and long term options developments. Costs range from $2M to $14M depending on the scheme considered and the population to be supplied.

7.1 Comment

The options described above can be mixed and matched to some extent. Costs are first order only and give a guide to project cost ranking rather than absolute dollars.

In addition, they are solely project costs and do not include life cycle operating costs. Qualitative issues, such as ecology, have been mentioned for some projects but not evaluated in depth.

There may also be some recreational possibilities on a lake behind a dam at Pakuratahi or Whakatikei. The Skull Gully site is within the Wainuiomata water supply catchment. Access to this is managed so any recreational possibilities are more limited compared to the other two sites.

8. Outcomes

	Maximum population supplied	Capital Cost $M/ML
• Te Marua intake or taking additional water at the Kaitoke weir and development of the Wellington CBD reservoir*	390,000	0.5 to 1.2
• Upper Hutt aquifer, approximate range	400,000 – 415,000	1.4 to 2.1
• Long-term options (with our without the Upper Hutt aquifer)	450,000+	1.1 to 1.8

*cost of CBD reservoir not included.

9. Wholesale water supply levy

Provision has been made in the current capital works expenditure programme for a river intake and pump station at Te Marua and for a contribution to the Wellington CBD reservoir. Storage developments are all relatively expensive and will impact on the wholesale water levy in due course. A number of options are available as to how the levy may change. These will be modelled as part of the next Long Term Council Community Plan (LTCCP) process.

10. Financing the investigations

A budget of $520,000 (operating expenses) has been allocated for the current year for the preliminary investigations. A sum of $1M will be included in the estimates for next year.

11. Consultation

Water supply managers of the cities and Capacity (the management company for Wellington and Hutt City water distribution) have had the projects explained to them and have sighted a draft of this report. They are comfortable with the investigations being progressed.

12. Next steps

12.1 Te Marua/Kaitoke source option (immediate)

Further investigations are required prior to a resource consent application to take more water at the Kaitoke weir, or water at the site of the Te Marua pump station intake. If the latter proceeds, then a river intake and pump station have to be designed and constructed by about 2007 to avoid any increase in the risk of shortfalls.

In conjunction with this, GWRC will assist Wellington City Council as appropriate with a development of Wellington CBD reservoir.

12.2 Medium/Long-term source options

Upper Hutt aquifer and/or off-river storage

A series of investigations and studies of geological, environmental, engineering and social issues will run in parallel to help determine the best option for a new source. A report will be submitted to the Committee in about February 2007 with a recommended scheme for public consultation. Updates though will be provided from time to time before then. Sufficient work will have to be done on the aquifer option prior to applying for a resource consent for Te Marua or Kaitoke in order for its suitability as an alternative source to be assessed.

13. Communications

Previous studies have shown that a new major water source development would be needed about 2020. Updated population projections now suggest the need for a major new water source about 2011. However, a reduction in the population growth rate or a positive response to the Wellington Water Management Plan could delay the development. It is appropriate to convey these changes to the stakeholders through a media release.

14. Recommendations

That the Committee recommends to Council to:

(1) ***Receive*** *the report.*

(2) ***Note*** *its contents.*

(3) ***Issue*** *a media release.*

Report prepared by:	Report approved by:
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