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Mt Buller and Mt Stirling Alpine Resort Management Board

Water Supply Demand Strategy for Mt Buller, Mt Stirling and Mirimbah Water Supply Systems

May 2013

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

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1. Introduction

The Mt Buller and Mt Stirling Alpine Resort Management Board (RMB) is a statutory authority established in 2004 by an amendment to the Alpine Resorts (Management) Act 1997 (The Act), succeeding the separate Mount Buller Alpine Resort Management Board and the Mount Stirling Alpine Resort Management Board. The RMB is charged under the Act with managing the Mount Buller and Mount Stirling Alpine Resorts.

The RMB is responsible for a range of management and operational functions, one of which includes the provision of water supply services. The RMB operates three water supply systems as follows:

- Mt Buller – providing potable water for domestic use across the resort, as well as a raw water supply for snowmaking;
- Mirimbah – providing potable water for the picnic area and toilet block, resort entry gate and office and the Mirimbah Store; and
- Mt Stirling - providing potable water for the ski patrol base and a cafe.

The location of these systems is shown in Figure 1.

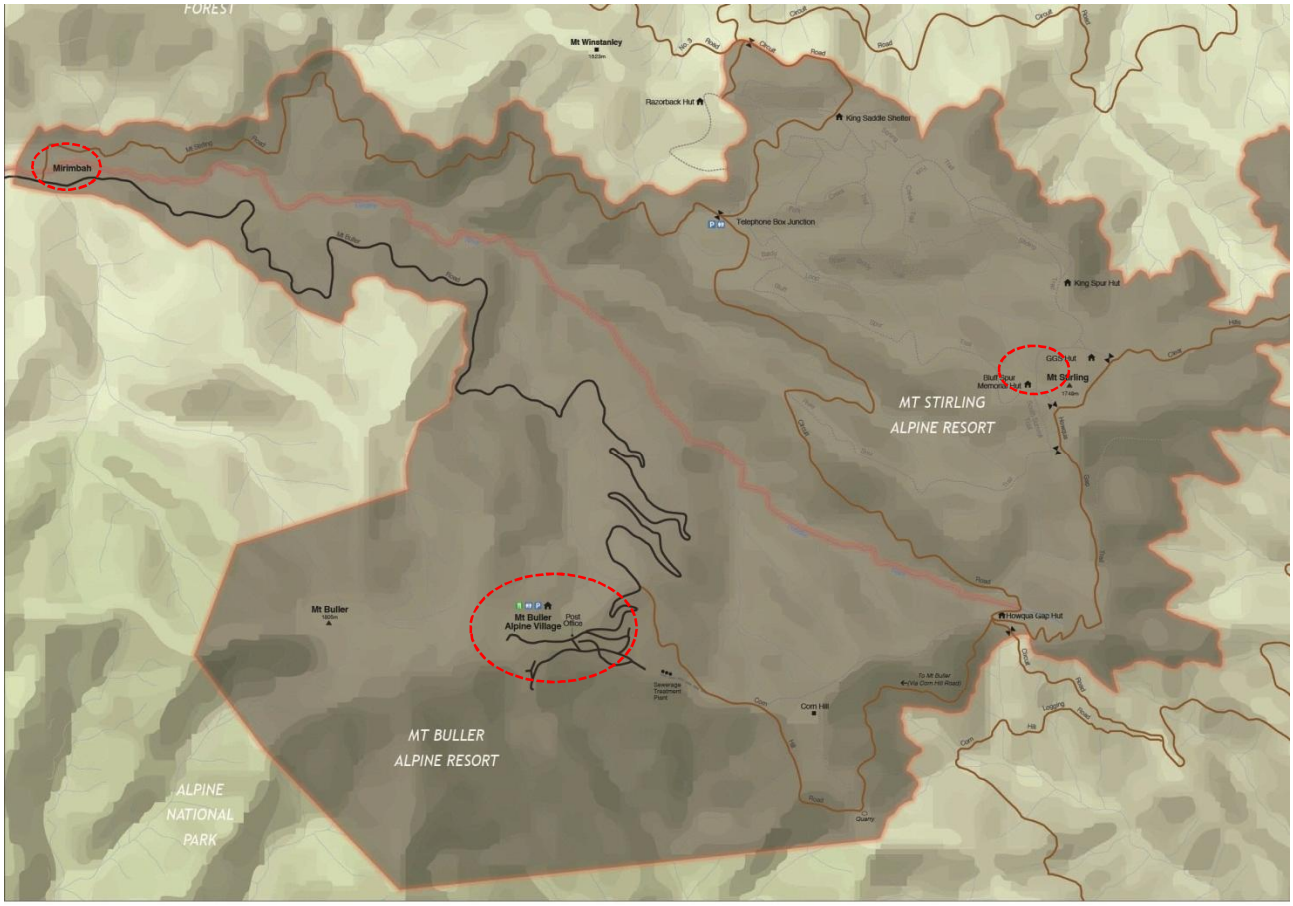

Figure 1 Water Systems Operated by the RMB

1.1 What is a Water Supply Demand Strategy?

The purpose of a Water Supply Demand Strategy is to identify the best mix of measures to maintain a balance between the demand for water and available supply, now and into the future (DSE, 2011). This balance between supply and demand is to be achieved taking into consideration; a longer term outlook; the total water cycle; social, environmental and economic costs and benefits; and risks and uncertainties such as that associated with growth in demand or climate change.

The Water Supply Demand Strategy is intended to be a key input into strategic planning for the Mt Buller and Mt Stirling Alpine Resorts. This (first) version of the Water Supply Demand Strategy specifically aims to:

- Describe the existing water supply system and identify gaps in knowledge or information that is required to inform future planning;
- Assesses the ability for the existing system to meet the current and estimated future supply-demand balance;
- Identify and appraise options to maintain the reliability of the system into the future; and
- Detail actions for work to address gaps in knowledge or information, as well as more detailed assessments to quantify the costs and benefits of future supply-demand options.

1.2 Context, Issues and Challenges

The Alpine Resorts 2020 Strategy (DSE, 2004) recognises the importance of the Alpine region of Victoria for tourism and the contribution these assets make to local and state economies. The Strategy also acknowledges that the alpine resorts in Victoria are located in environmentally sensitive areas where environmental protection is of paramount importance.

The Alpine Resorts 2020 Strategy establishes a vision of “four season, vibrant sustainable resorts” and identifies a range of issues which need to be addressed to realise this vision. The issues directly relevant to water supply include:

- Climate change – including the impact on snow cover and water availability;
- Resort use and visitation – increasing winter and non-winter visitation;
- Environmental management – attention to water management as snow making increases; and
- Future opportunities – being positioned to respond to future opportunities.

Understanding the demand for water and the availability of water at each of the three water systems is critical to supporting the realisation of the long term vision.

The major demands for water at Mt Buller are for snowmaking and residential use. There is large annual and seasonal variation in demand and supply. Demand is high in the winter ski season and particularly on weekends and in school holidays.

Supply is available as a winter diversion from Boggy Creek with water for snow making supplemented with water recycled from the Mt Buller waste water treatment plant. With the current water infrastructure and diversion licence, reliability of supply throughout the year is dependent on the ability to store water to manage the annual and seasonal variations in supply and demand.

The Mt Stirling and Mirimbah systems do not contain permanent residents, except for one family residing at the Mirimbah Store, however water is supplied to local amenities to support day visitors to the region. The demand for water is concentrated over the winter months, however the increase in visitation numbers in recent years in summer months has resulted in additional water being used over this period. Historically, water has been diverted from adjacent streams to meet the required demand throughout the year. Diversion licences have recently been formalised resulting in new restrictions on diversion during the months of November to June (inclusive).

1.3 Local Planning, State and Federal Water Policy

Climatic conditions over the last decade have resulted in significant developments with State Government water policy, state regulatory requirements and national water reform. In addition, further work has been undertaken locally to develop master plans for the Mt Buller Resort. It is important to appropriately align the Water Supply Demand Strategy such that it contributes towards meeting the requirements of these policies and plans. Table 1 provides an overview of specific areas of policy relevant to this Water Supply Demand Strategy.

Table 1 Alignment with Current Water Policy

Planning and Policy Directives	Areas of Alignment
National Water Initiative (NWC, 2003)	Provide healthy, safe and reliable water supplies. Increase water use efficiency in domestic and commercial settings. Encourage re-use and recycling of wastewater where cost effective. National metering standards.
Northern Region Sustainable Water Strategy (DSE, 2009)	Identify and understand threats to water availability and quality, including the implications of climate change and variability.
Mt Buller Resort Master Plan (Mt Buller Alpine Resort Management Board, 2010)	Develop the required activity infrastructure to support year round visitation and further development and investment.
Living Melbourne, Living Victoria Roadmap (Living Victoria Ministerial Advisory Council, 2011).	Integrated water cycle management. Protecting and enhancing public and environmental health. Transparent, adaptive and flexible decision making.
Guidelines for the Development of a Water Supply Demand Strategy (DSE, 2011)	Water systems designed to provide a minimum level of service in terms of quantity, quality and service provision. Planning should be based on the best available information about current and future water resources. Planning should be scenario based, incorporating uncertainty in supply and demand. Water should be managed on a whole-of-water cycle basis. All supply and demand options should be assessed on a robust and transparent basis.

Australian Drinking Water Guidelines (NRMMC, 2011)	Every effort needs to be taken to ensure that drinking water suppliers provide consumers with water that is safe to use.
Recycled Water Guidelines	Recycling can provide additional sources of water for various purposes including many that are currently supplied by freshwater resources.

1.4 Objectives for the Water Supply Demand Strategy

Five principles have been adopted to define the objectives for this Water Supply Demand Strategy. These have been selected based on the relevant principles contained in the policy documents detailed in the previous section. These principles are:

- The Victorian Government and the Mt Buller and Mt Stirling Alpine Resort Management Board is committed to tourism in the Alpine region and will provide a secure water supply system to meet current and future demands;
- Water planning will be based on the best available information on the current and future water resources;
- Water management will be integrated across all components of the water cycle;
- The Strategy will be adapted as necessary to reflect additional water information and knowledge as it comes to hand, as well as changing circumstances; and
- Options and actions should protect and enhance public and environmental health.

This (first) revision of the Water Supply Demand Strategy was compiled by GHD Pty Ltd. The Water Supply Demand Strategy was developed using readily available information which has been reviewed and documented in a manner to inform the current and future status of the water supply system. It is important to recognise that there are gaps in current knowledge and data which limits the extent of technical analysis used to support the Strategy. This Strategy identifies actions to reduce uncertainty and enable more detailed planning to be undertaken in the future.

GHD Pty Ltd has utilised a range of documents and reports in compiling this Strategy. The original authors of this work are recognised herewith and this work has been appropriately referenced throughout the Strategy.

2. The Mt Buller Water Supply System

2.1 Overview of the Supply System

The water requirements of Mt Buller are determined by the need to service the resident population, the visitors to the Resort and maintaining the amenity of the Resort during winter for skiing and snow-play. The population of the Resort varies throughout the year. Mt Buller's resident population during summer is 100 – 150 people, increasing to approximately 1,600 residents during the ski season (RMB, 2011a). The resident and visitor population require a supply of potable water for domestic and commercial purposes. Water is also used at Mt Buller for snowmaking purposes to improve snow cover in lower lying or highly used areas. The size of this demand is dependent on the climate conditions and varies substantially from year to year.

The Mt Buller water supply system receives water from two sources; diversions from Boggy Creek and its tributaries, and water recycled through the Mt Buller Wastewater Treatment Plant. The streamflow diverted from Boggy Creek is used to supply potable water demands within the Resort, and any water in excess of these needs can be used for snowmaking. The recycled water is used for snowmaking purposes only.

Water diverted from Boggy Creek is stored in Burnt Hut Reservoir prior to being distributed through the two main reticulation systems, the High Level System and the Low Level System. Disinfection occurs for the High Level System after leaving Baldy Tank, and for the Low Level System as it leaves Burnt Hut Reservoir. Water that is diverted in excess of the potable needs is transferred to Sun Valley Reservoir.

Mt Buller Wastewater Treatment Plant produces Class A recycled water that is transferred to Sun Valley Reservoir to supplement the snowmaking supply. For public health purposes the Class A recycled water cannot be used to supply potable demand and cannot be used on areas which fall within the potable water supply catchment area.

A schematic of the Mt Buller water supply system is shown in Figure 2.

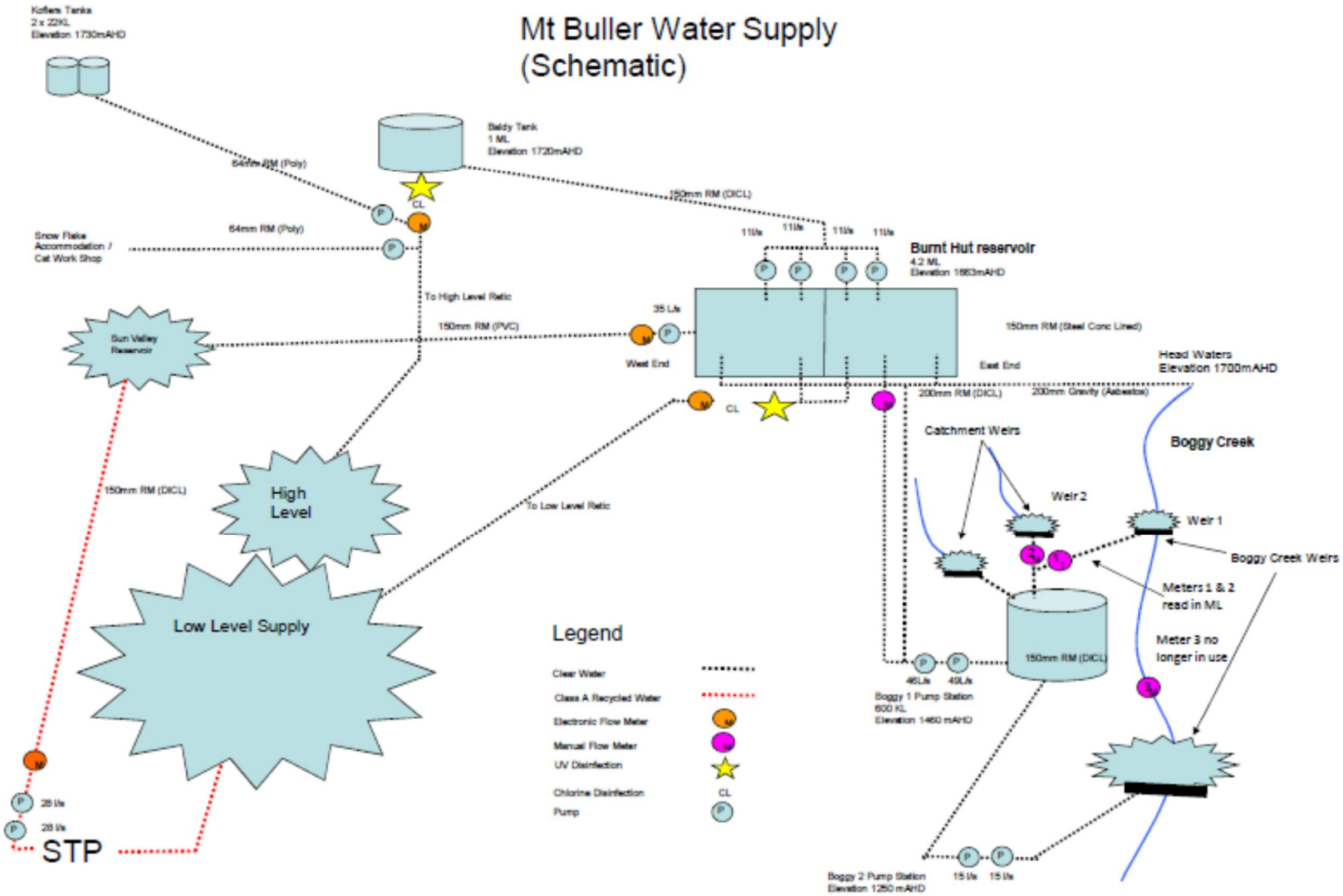

Figure 2 Mt Buller Water Supply System Schematic

2.2 Sources of Supply

2.2.1 Streamflow Diversion

Water for the Mt Buller supply system is drawn from Boggy Creek (and its tributaries) at three separate diversion locations. The diversions from Boggy Creek are governed by a Section 51 Annual Diversion Licence which allows up to 700 ML to be diverted each year between the months of May to October (inclusive) at a maximum diversion rate of 4 ML/d.

The Boggy Creek catchment is the northeast aspect of Mt Buller and is bounded by two spur lines running north. The catchment is above 1,250 m elevation and is mainly covered in snow during the winter period, mid-June to mid September. The topography of the catchment is steep and vegetated, and lies in montane, sub alpine and alpine areas. The catchment is relatively inaccessible and is an area where vehicle access is controlled. In winter, the water sourced from the catchment is either snowmelt or spring fed streamflow. In summer the majority of the flow in the river is spring fed streamflow (RMB, 2011a).

Diversions from Boggy Creek catchment occur at three locations. These are:

- The Headwaters of Boggy Creek– a side hill trench across the northeast aspect of Mt Buller that collects water that has originated from alpine bogs. This water can be gravity fed into the Mt Buller system;
- Catchment Weirs – two weirs that collect water from a number of small gullies within the Boggy Creek catchment. This water is gravity fed into the Mt Buller system; and
- Boggy Creek Weirs - two weirs that divert water from Boggy Creek. One weir gravity feeds the system and the other requires the water to be pumped into the system.

The three sources of supply are shown in Figure 2.

The Headwaters provide raw water at a higher elevation than Boggy Creek and can be used when appropriate to minimise pumping costs. If there is sufficient capacity and raw water quality, the Headwaters are used preferentially to Boggy Creek (RMB, 2011a).

2.2.2 Recycled Water

The Mt Buller Water Recycle and Conservation Project was completed in 2008 and provides recycled water as a supplementary supply for snow making.

The recycled water supply for Mt Buller is sourced from the Mt Buller Wastewater Treatment Plant. This plant receives wastewater from the Resort and treats it using a combination of secondary treatment processes and ultrafiltration to produce Class A recycled water. Class A recycled water is of sufficient quality to be used for snowmaking purposes, but cannot be used for drinking. Class A water is not used on snowmaking areas which are located within the Boggy Creek water supply catchment.

The Class A recycled water is produced during the winter months and stored in Sun Valley Reservoir. This storage is separate from the potable water supply system to ensure that the potable water supply is not contaminated by Class A recycled water.

Additional information about the Mt Buller Water Recycle and Conservation Project is provided in Appendix A.

2.3 System Demands and the Reticulation System

2.3.1 Potable Demand

The potable demand consists of all water that is used at the Resort except for the snowmaking water. This includes water for human consumption, food preparation, indoor water use, and any outdoor water use supplied from the reticulation system. Water supplied by this demand must meet the requirements of the Safe Drinking Water Act 2003. Demand for potable water occurs throughout the year, and fluctuates with the population of the Resort.

2.3.2 Potable Reticulation System

The key factor that has influenced the development of the Mt Buller potable reticulation system is the variation in elevation across the Resort. For this reason, the reticulation system is divided into two zones and fed from reservoirs located at different elevations in order to maintain the required water pressure (RMB, 2011a).

Raw water diverted at the most downstream weir on Boggy Creek requires pumping into the supply system via a 600 kL open tank. Water from the other Boggy Creek weir, and the Catchment weirs, flows via gravity into this tank. This water is then pumped to Burnt Hut Reservoir, which has a capacity of 4.2 ML (RMB, 2011a).

Burnt Hut Reservoir services the low level reticulation within the resort. Water is drawn from this reservoir, disinfected with ultra violet and chlorine disinfection before entering Mt Buller village (RMB, 2011a). The low level area represents about two-thirds of the total potable demand.

The high level reticulation system is supplied from Baldy Tank, a 1 ML underground storage that is supplied with water via Burnt Hut Reservoir. Water from this tank is also disinfected with ultra violet and chlorine disinfection before entering the distribution network. The high level reticulation system supplies the remaining third of the village, Buller Ski Lifts Ltd facilities, public toilets on the ski runs and a commercial outlet at Koffler's Hutte (RMB, 2011a).

2.3.3 Snowmaking Demand

The snowmaking demand consists of the water used to artificially increase the area and/or depth of snow coverage during the ski season (June to early October). This water is generally not suitable for human consumption but is of sufficient quality to minimise risks to the public and environment.

2.3.4 Snowmaking Reticulation System

Water for snowmaking has a dedicated reticulation system to avoid contamination of the potable supply. Water from the Mt Buller Wastewater Treatment Plant is transferred directly to Sun Valley Reservoir, a 70 ML storage located adjacent to the ski runs. This reservoir is connected to snowmaking infrastructure. Excess streamflow which has been harvested from Boggy Creek can also be transferred from Burnt Hut Reservoir into Sun Valley Reservoir to supplement the Class A recycled water supply. This reticulation system is shown in Figure 2.

2.4 Winter Period Operation (mid June to mid September)

Over the winter period Mt Buller obtains raw water from Boggy Creek and Class A recycled water from the Mt Buller Wastewater Treatment Plant.

Diversions from Boggy Creek are permitted between the months of May to October (inclusive). The divertible volume is limited by; the available streamflow; the permissible maximum diversion rate; and the availability of offstream storage.

Water to be used for potable purposes is stored in Burnt Hut Reservoir and several other smaller tanks prior to being treated and distributed.

Water in excess of the potable storage capacity is transferred to Sun Valley Reservoir and mixed with the Class A recycled water. The water stored in Sun Valley Reservoir is dedicated for snow making purposes only.

2.5 Summer Period Operation (October to end of May)

Historically, demand over the summer period has been relatively small and has been met using diversions from Boggy Creek. Whilst the current diversion licence does not permit water to be diverted from Boggy Creek during the months of November to April (inclusive), the lack of offstream storage for potable use has meant that diversions have continued over summer months in recent years. Alternative arrangements to meet summer demands are a priority area of focus for this Strategy.

Class A recycled water is not produced during summer months as there is currently no demand for this water over this period.

2.6 Gaps in Knowledge and Data

The development of this Water Supply Demand Strategy has highlighted a number of knowledge and data gaps. These gaps are detailed in Table 2.

Table 2 Knowledge and Information Gaps

Supply Side Gaps	Demand Side Gaps
Streamflow data for Boggy Creek: Streamflow records in Boggy Creek are incomplete and only cover a short time period. Additional streamflow data would allow a more accurate assessment of water availability including the impacts of climate change.	**Potable Demand:** Potable water use data is not available. These records would allow better characterisation of demand variability and system losses.
Historic diversion data: An incomplete diversion record exists for Boggy Creek weirs and the catchment weirs. No data exists for diversions from the Headwaters.	**Snowmaking Water Use and Areas:** Further information is required on the factors which influence snowmaking demand to better understand annual variability and future demand volumes.
Losses in the reticulation system: Losses within the reticulation system are not well understood, although they are known to be occurring.	**Future Visitor Forecasts:** Forecasts in the growth of visitors in both summer and winter are not currently available. These forecasts would allow better estimates of future potable water use to be made.
	Timing of future snowmaking infrastructure improvements: This information would assist decision making about the timing of future works.

3. The Mt Stirling and Mirimbah Supply Systems

3.1 Mt Stirling Supply System

The Mt Stirling Alpine Resort is a nature based resort and has no permanent population or accommodation. Development on Mt Stirling consists of a small office space for Resort Management staff and ski patrol base, a cross country ski outlet, a small food premises, a small industrial shed, several shelters / toilet blocks and three huts, two of which are privately owned but are accessible and used by the public.

Reticulated water is supplied to the toilet block, the ski hire outlet and café and the Resort Management ski patrol base. All water is sourced from Baldy Creek, a small tributary stream of the Delatite River. Water is pumped from Baldy Creek, disinfected with hypochlorite and filtered prior to being stored in a 5,000 L Header Tank. The water is then gravity fed through the small reticulation system.

A schematic of the Mt Stirling water supply system is shown in Figure 3.

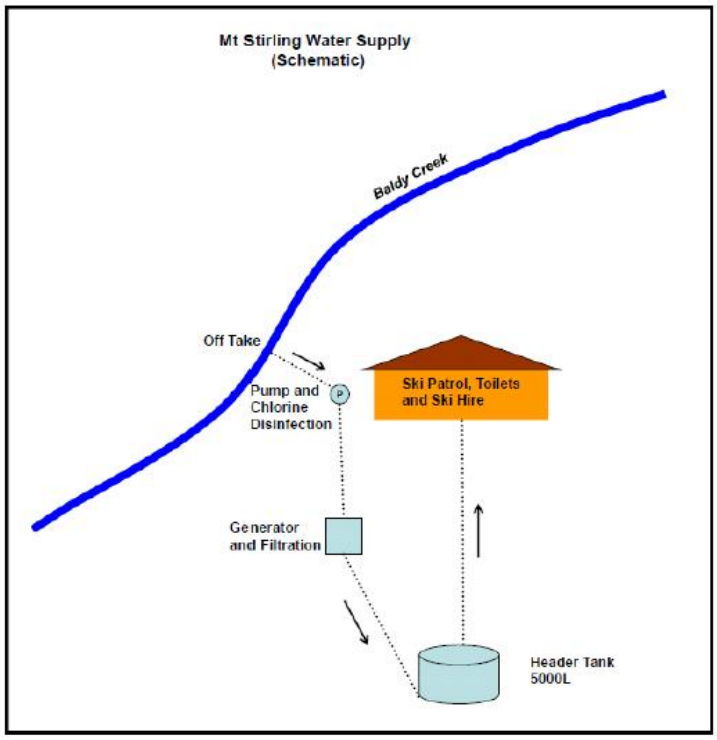

Figure 3 Mt Stirling Water Supply System Schematic

The diversions from Baldy Creek are governed by a Section 51 Annual Diversion Licence which allows water to be diverted each year between the months of July to October (inclusive) at a maximum diversion rate of 0.1 ML/d.

There is currently limited information on historic water use at Mt Stirling, however it is estimated that the annual demand is about 0.1 ML to 0.3 ML.

3.2 Mirimbah Supply System

Mirimbah is the common entrance point to Mt Buller and Mt Stirling. Reticulated water is supplied to a toilet block located within a small park, the Traffic Control (ticket office) building, a small chain hire/service station with residential premises and to an accommodation building used by Mount Stirling Ski Patrol staff.

The water supply for Mirimbah comes from Buller Creek approximately 300 m from the junction with the Delatite River, at an elevation approximately 620 m (below the snow line). Buller Creek is perennial and historically has been a reliable water source.

Water is collected from the river using a small diversion channel (at the take-off point the Creek is approximately 5 m wide and 1.2 m deep) and pumped into a shed for treatment. The collection point is adjacent to the parking area for staff vehicles and the picnic area.

After dosing, the water is pumped to a 22,750 L elevated holding tank (approximately 60 m higher than the Creek. Water is then gravity fed to the ski patrol accommodation (under the old bridge over the Delatite River), the RMB traffic control building, public toilet block and a second 10,000 L tank approximately 25 m lower.

A schematic of the Mirimbah water supply system is shown in Figure 4.

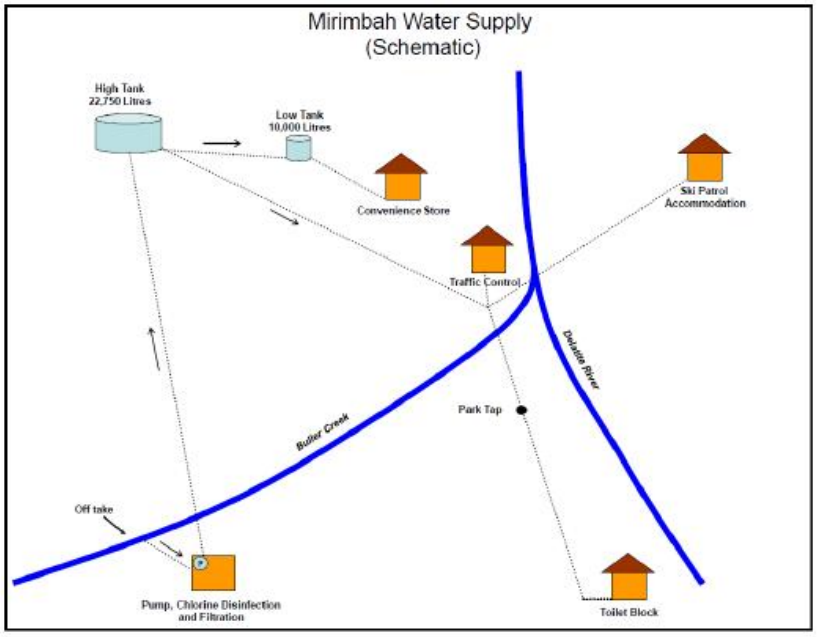

Figure 4 Mirimbah Water Supply System Schematic

The diversions from Baldy Creek are governed by a Section 51 Annual Diversion Licence which allows water to be diverted each year between the months of July to October (inclusive) at a maximum diversion rate of 0.1 ML/d.

A flow meter has been installed in the pipeline downstream of the pump which has provided diversion records since September 2011. Analysis of the diversion records indicates that winter use varies between 4,000 to 6,000 litres per day during winter months and 1,000 to 2,000 litres per day during summer months. This equates to an estimated annual demand of 0.7 ML to 1.4 ML.

4. Water Availability

4.1 Mt Buller Alpine Resort

4.1.1 Streamflow Diversions

The availability of water from Boggy Creek is influenced by two factors:

1. Variability of flow in Boggy Creek; and
2. The conditions of the annual diversion licence.

Variability of Flow in Boggy Creek

The flow in Boggy Creek is generated from a combination of rainfall runoff, snowmelt and groundwater. Each of these sources has quite distinctive characteristics which defines the variability of the flow regime over different seasons of the year. The existing diversion infrastructure aims to maximise the diversion of the available water which is generated from each of these streamflow sources.

There is limited streamflow data available on Boggy Creek upstream of the diversion points. A partial streamflow record exists for Boggy Creek upstream of the No 3 Weir, however previous hydrological analysis (AECOM, 2011) highlighted the difficulties associated with the application of this data due to the length and completeness of the record, as it relates to the operation of the existing system. Anecdotally, streamflow is known to vary around the 4 ML/d diversion limit during the permitted winterfill period, with extended periods below 4 ML/d occurring in dry years.

With the current flow data, it is difficult to assess to what extent streamflow may be constraining the supply system and it is also difficult to assess the impacts of climate change on the water resource. A review of the flow metering arrangements is required.

Annual Diversion Licence

The annual diversion licence sets the maximum annual and daily volumes that may be diverted from Boggy Creek. These conditions are shown in Table 3. The RMB is required to comply with these limits and may be requested to demonstrate compliance via metered records.

Table 3 Annual Diversion Licence conditions

Licence Condition	Volume
Annual Diversion Limit	700 ML/yr
Daily Diversion Limit	4 ML/d (May to October only)

Annual Water Availability

As guidance for planning purposes, the available raw water resource under a range of assumed diversion rates has been estimated, and summarised in Table 4.

Table 4 Potable Supply Volumes

Streamflow Scenario	Annual Diversion[1]	Comment
4 ML/d (Licence Limit)	700 ML/yr	Assumes sufficient streamflow exists to divert the full licence volume.
3 ML/d	552 ML/yr	Assumed average over the winter fill period.
2 ML/d	368 ML/yr	Conservative diversion estimate provided by Mt Buller

Note 1: To be diverted during May to October inclusive.

4.1.2 Recycled Water

The availability of recycled water is assumed to be 75% of the inflows to the wastewater treatment plant during the winter months of June to October (inclusive), resulting in an annual volume of about 87 ML/a. Historic inflow data is available and has been used for this assessment, however it is important to note that wastewater treatment plant inflows are dependent on potable water use (i.e. indoor water use). Therefore it varies annually and is dependent on visitor numbers. The annual variability of wastewater treatment plant inflows is shown in Figure 5.

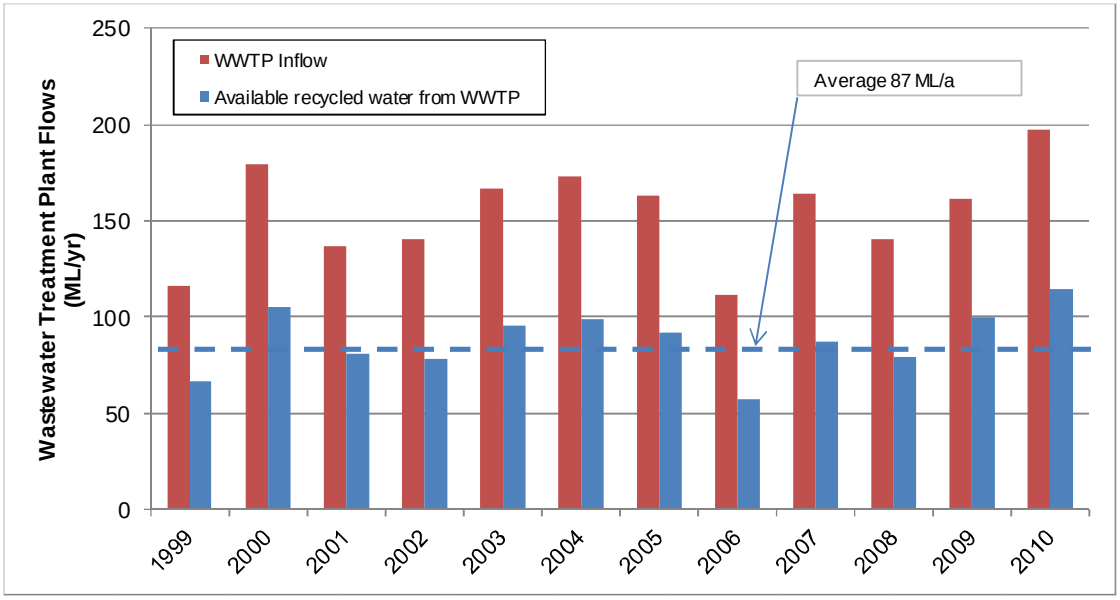

Figure 5 Wastewater Treatment Plant inflows

4.1.3 Uncertainties with Supply Estimates

Climate change may impact on streamflows in Boggy Creek and consequently the availability of potable supply. DSE modelling indicates that reduction of streamflow could be in the order of 3% to 21% for the Goulburn Basin by 2030 (DSE, 2011). Given the lack of streamflow data, it is not possible to assess the impact of this reduction on the water supply of Mt Buller. Addressing this uncertainty will require ongoing monitoring of the water supply situation and consideration of options to increase the volume of supply if necessary.

4.2 Mt Stirling Alpine Resort

Water for Mt Stirling is currently obtained from Baldy Creek. Historically flow regimes during winter and summer periods have far exceeded the diversion requirements for the Mt Stirling system and therefore this resource is considered to be highly reliable, now and into the immediate future.

Since June 2012, water availability is governed by the conditions of the RMB's diversion licence. This is a winterfill licence which enables up to 0.1 ML/d to be diverted between the months of July and October (inclusive). Tradeable water shares determine the annual volume of water available to the RMB.

Historically, small volumes have been diverted during summer periods to meet the water use needs of day visitors to the resort. Alternative arrangements to meet summer demands are a priority area of focus for this Strategy.

4.3 Mirimbah Water System

Water for Mirmibah is currently obtained from Buller Creek. Historically flow regimes during winter and summer periods have far exceeded the diversion requirements for the Mirimbah system and therefore this resource is considered to be highly reliable, now and into the immediate future.

Since June 2012, water availability is governed by the conditions of the RMB's diversion licence. This is a winterfill licence which enables up to 0.1 ML/d to be diverted between the months of July and October (inclusive). Tradeable water shares determine the annual volume of water available to the RMB.

Historically, small volumes have been diverted during summer periods to meet the water use needs of day visitors to the resort. Alternative arrangements to meet summer demands are a priority area of focus for this Strategy.

5. Current and Future Demands

5.1 Mt Buller System

5.1.1 Summary of Estimated Demands

The demand for water is characterised by significant seasonal (within year) and annual (across years) variability.

The highest demands occur during the winter period (assumed to be May to October inclusive) which is attributable to an increased live-in population, high visitation numbers and water requirements for snow making. In contrast, demand over the summer period (November to May inclusive) only represents about 8% of the annual demand.

Variability in water demand from year to year is related to climatic conditions, particularly over the winter period. However, operational decisions regarding the area of snowmaking and depth of coverage, significantly affect annual water consumption volumes, thus water use can also be high in wet years where snow making areas and/or depths are increased.

The current and future demands adopted for the purpose of this Water Supply Demand Strategy are summarised in Table 5. The basis for these estimates is provided in the following sections.

Table 5 Estimates of Seasonal and Annual Demands (in ML)

Type and Season	Current Development (2012)			Future Development (2025)		
	Min	**Ave**	Max	Min	**Ave**	Max
Potable Demand						
May-October	103	**134**	174	124	**161**	209
November-April	33	**33**	33	44	**44**	44
Total	136	**167**	207	167	**204**	254
Snow Making Demand						
May-October	250	**270**	280	630	**700**	770
Total Demand (Winter + Summer)	386	**437**	487	797	**904**	1,024

5.1.2 Basis for Potable Demand Estimates

Current Potable Water Demand

The current annual average potable raw water demand at Mt Buller is 167 ML/yr. This demand is assumed to include the total water volume extracted from the environment, inclusive of all consumptive use and non-consumptive uses such as losses.

The population of Mt Buller varies seasonally, with a large number of visitors to the resort during the ski season. Therefore the water demand for potable water use also varies seasonally, with high water demand during winter months and lower water demand during summer months, as shown by Figure 6.

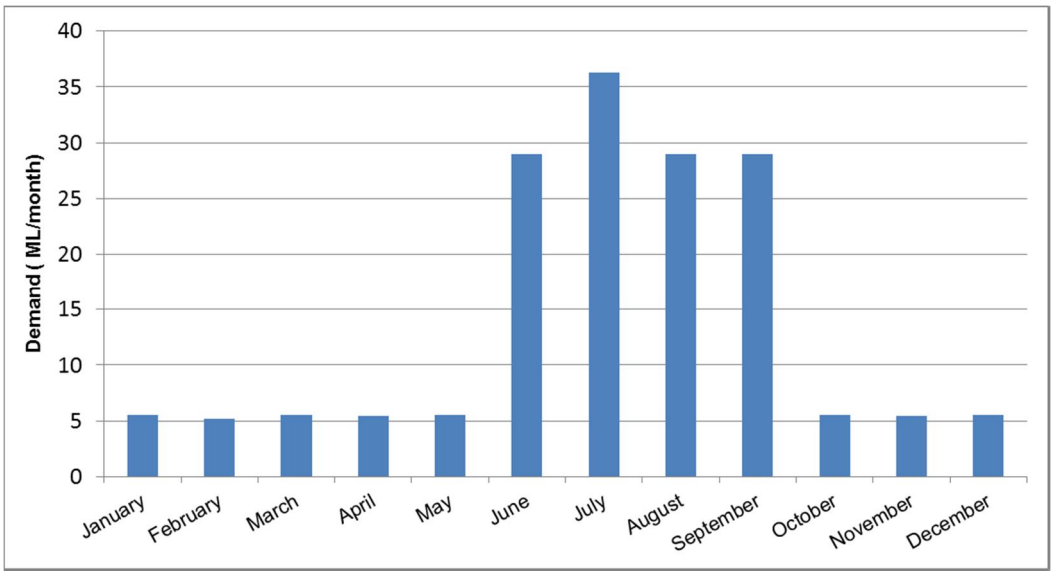

Figure 6 Current average monthly potable demand

There is currently limited information on the annual variability in potable demand. Annual demand is expected to be highly correlated to visitation numbers during the winter period, which is ultimately related to climatic conditions (ie snow coverage).

Future Potable Water Demand

A future potable demand has been estimated based on existing predictions of the growth in permanent population and visitors over the next 10 to 15 years. The details of this estimate are provided in Table 6.

Table 6 Future Potable Demand Forecast Details

Demand Factor	Assumption	Comment
Summer current water use	Approx 5.5 ML/month	Current summer water.
Growth in Summer demand	32% increase	The Victoria In Future 2008 (DPCD, 2008): Mansfield Shire Council population forecast population growth between 2011 and 2026 has been selected to represent growth in summer demands. Applying this population growth figure to existing summer demand is considered appropriate to encompass the expected increase in summer visitors as it is higher than the target increase in winter visitor growth detailed in the Mt Buller Master Plan (Mt Buller Alpine Resort Management Board, 2010).
Winter water use	Approx. 42 ML/month	Assumes potable water use not used by permanent (residential) population is used by visitor population.
Growth in Winter demand	20% increase	The Mt Buller Master Plan (Mt Buller Alpine Resort Management Board, 2010) target for increase in average maximum weekday ticket sales has been selected to represent the growth in winter demand. This figure is lower than the growth in permanent population, but is considered appropriate as the permanent population is less significant compared to the number of visitors during winter.

Based on the assumptions listed in Table 6 the future potable demand is estimated to be approximately 204 ML/yr. It is assumed that the future demand would be achieved by 2025.

Uncertainty Surrounding Potable Demand

Future potable water demand is uncertain as it is dependent on a number of factors that have significant uncertainty associated with them. These factors discussed in Table 7.

Table 7 Uncertainties with Potable Demand Estimates

Factor	Uncertainty
Permanent population growth	This will impact both summer and winter potable water demand.
Growth in visitor numbers	An increase in visitor numbers will increase the overall potable demand. In addition Mt Buller's campaign to increase summer visitation to the resort will require the resort to have larger volumes of water in storage at the start of the summer to cater for these visitors.
Quality of existing data	The existing potable demand data is believed to have been impacted by a suspected leak in the Sun Valley Reservoir. Therefore this data may be overestimating current demand estimates.
Timeframe for demand increase	The increase in visitor numbers to Mt Buller will be dependent on Mt Buller developing the infrastructure to support them. It is anticipated that once the infrastructure is in place demand will increase rapidly. Currently the timeframe for the infrastructure expansion is not known.

5.1.3 Basis for Snowmaking Demand Estimates

Current Snowmaking Demand

The historical water use for snowmaking is illustrated in Figure 7. There is limited information on the snowmaking areas and depths relating to these years, however generally snowmaking has increased from 43 ha to 72 ha over this period.

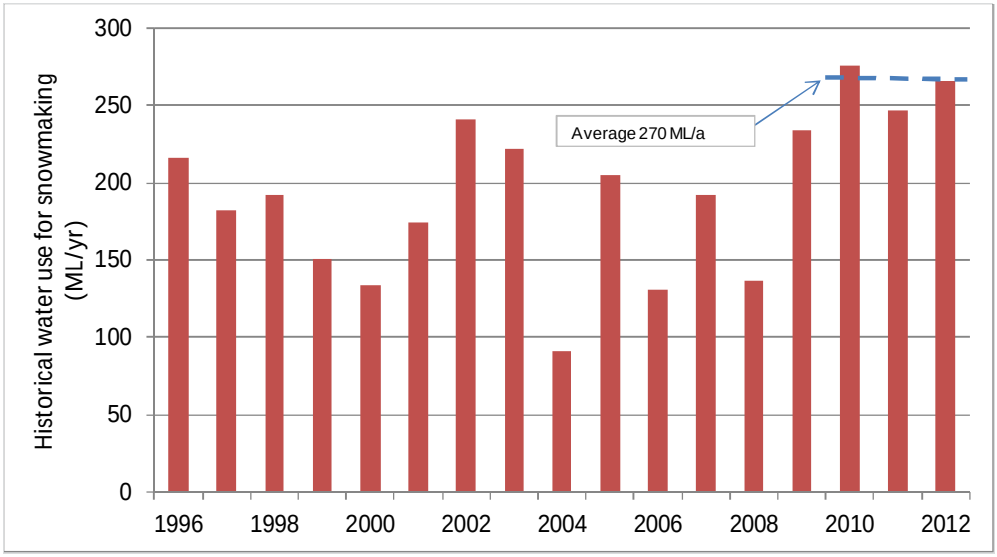

Figure 7 Historical Water Use for Snowmaking

The current average annual snowmaking demand at Mt Buller is estimated to be 270 ML/yr based on the average use over the last three years. Currently snowmaking occurs over 72 ha (Mt Buller, 2011) with a planned expansion to at least 108 ha.

Snow making is used to supplement natural snow cover on heavily used or lower elevation ski runs and lift access areas. The volumes of water used for snowmaking is largely dependent on climatic conditions, with wind speed, temperature and humidity influencing the efficiency of snowmaking. However, operational decisions regarding the area of snowmaking and depth of coverage, significantly affect annual water consumption. Whilst wetter years may provide adequate snow coverage, increased water availability also provides the opportunity to expand or improve upon the overall amenity for skiing and snowplay, thus water use may not necessarily be lower as could be expected. In recent years, the automation of snow making operations has resulted in the significant increase in snowmaking and resultant water use at Mt Buller.

Future Snowmaking Demand

A future snowmaking demand forecast has been generated based on existing predictions of the growth in snowmaking areas and expected water application rates. The details of this estimate are provided in .

Table 8 Future Snowmaking Demand Forecast Assumptions

Demand Factor	Assumption	Comment
Water use per hectare of snowmaking area	2.3 ML/ha to 8.0 ML/ha	Water use varies depending on manual or automated application methods.
Increase in snowmaking area	72 ha to 108 ha	As advised by RMB.
Automation of snowmaking	18 ha to 81 ha	An increase from 25% of current area to 75% of proposed area.

Based on the assumptions listed in the future snowmaking demand is estimated to be approximately 700 ML/yr. It is assumed that the future demand would be achieved by 2025.

Uncertainty Surrounding Snowmaking Demand

Future snowmaking water demand is uncertain as it is dependent on a number of factors that have significant uncertainty associated with them. These factors are discussed in Table 9.

Table 9 Uncertainties Related to Snowmaking Water Demands

Factor	Uncertainty
Impact of climate	Snowmaking is dependent on suitable climatic conditions. It is unknown how annual climate variability, or long term climate change, will impact upon the snowfall at Mt Buller, or on the frequency with which favourable snowmaking conditions occur.
Timeframe for snowmaking area increase	The timeframe for the increase in snowmaking area and expansion of automation methods is not currently known.

5.1.4 Emergency Supplies

During the summer months, diversion licence conditions prevent the harvesting of water from Boggy Creek. Therefore, the Mt Buller Resort is reliant on water that is held in storage. This water must meet the potable demand over the summer period, but also meet any unexpected water demands such as fire fighting requirements or water for other emergency situations. It is recommended that Mt Buller maintain a minimum volume of water within the supply system to allow for emergency events. This volume of water could be comprised of both recycled water and potable water. Class A recycled water can be used for fire fighting purposes if sufficient treatment and precautions are taken. Refer to the Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1) (NRMMC, EPHC and AHMC, 2006) for more information regarding the use of recycled water for fire fighting purposes.

It is assumed that a minimum of 10 ML of water (equivalent of 2 months of current summer demand) is maintained in storage at all times to allow for emergency purposes.

5.2 Mirimbah Water System

A water meter was installed in the Mirimbah system in September 2011. This meter is generally read on a weekly basis and provides a record of the volume of water diverted from Buller Creek over the last 13 months.

The diversion data has been examined and used to establish an annual water use estimate, as detailed in the table below.

Table 10 Mirimbah System Demand Estimates

Period	Lower Bound		Upper Bound	
	Usage Rate (L/d)	Volume (ML)	Usage Rate (L/d)	Volume (ML)
Summer	1,000	0.24	2,000	0.67
Winter	4,000	0.49	6,000	0.73
Total		**0.73**		**1.4**

The RMB expects summer demand to increase by 100% and winter demand to increase by 10% over the next 5 to 10 years.

5.3 Mt Stirling Alpine Resort

There are currently no records of historical water use at Mt Stirling. Demands for the Water Supply Demand Strategy have been derived by adjusting the Mirimbah demand estimates in relation to the frequency in which the generator (used to run the diversion pump) is operated.

The following demand estimates have been developed.

Table 11 Mt Stirling System Demand Estimates

Period	Lower Bound		Upper Bound	
	Usage Rate (L/d)	Volume (ML)	Usage Rate (L/d)	Volume (ML)
Summer	150	0.04	300	0.11
Winter	600	0.07	1200	0.14
Total		**0.11**		**0.25**

The RMB expects summer demand to increase by 100% and winter demand to increase by 10% over the next 5 to 10 years.

6. Supply and Demand Balance

6.1 Mt Buller Alpine Resort

The supply demand balance has been examined for:

Streamflow scenarios covering

- 2 ML/d maximum diversion rate for winterfill period;
- 3 ML/d maximum diversion rate for winterfill period; and
- 4 ML/d maximum diversion rate for winterfill period.

Demand scenarios covering

- Current level of winter and summer period demand;
- Maximum snow making demand; and
- Expected future levels of winter and summer period demand.

Details of the supply demand balance under the following streamflow and demand scenarios are provided in Table 13.

6.1.1 Summer Period Supply-Demand Balance

Analysis of the potable supply and demand balance indicates that, irrespective of the streamflow scenario used, the existing potable storage of 5 ML is not sufficient to store enough water to supply potable demand through the summer period when diversions are not permitted from Boggy Creek.

Therefore the reliability of the existing system over the Summer period is currently low, and immediate action is required.

Options to be considered to improve the Summer period reliability include:

- Additional raw water storage capacity - minimum storage size of 45 ML plus an allowance for losses and buffer for other uses results in minimum storage size of 50 to 60 ML;
- Seek summer diversion licence (ie allowance to maintain historical use over summer periods).
- Additional summer period supply sources such as groundwater, stormwater/rainwater harvesting;
- Consider partitioning the current recycled water storage with partial use for recycled water only (and provide minimum 33 ML for Summer potable demand);

6.1.2 Winter Period Supply-Demand Balance

Analysis of the supply and demand balance over the winter period has revealed:

Under current demands – the winter period demands can be met with the existing storage and diversion arrangements under wet conditions, average conditions and are just met under dry conditions;

Maximum demand conditions – on an annual basis, the maximum snow making demand that can be supported by the system is approximately 450 to 550 ML/a, depending on water availability and snow making conditions in any year.

Under future Demands – the winter period demands cannot be met by the existing system under the range of inflow conditions.

Options to be considered to improve Winter period reliability include:

Short term:

- No immediate action required although additional storage capacity provides greater operational flexibility and assisting to manage peak daily snow making demand and to mitigate the risk from other uncertainties associated with streamflow and demand variability.

Medium term:

- Additional raw water storage capacity – additional volume between 100 and 150 ML is ultimately required depending on need to meet future peak demands in low inflow years ; and
- Additional supply sources such groundwater, stormwater/rainwater harvesting.

Longer term:

- Alternative winterfill licence conditions – increasing the diversion rate and annual volume; and
- Additional supply source such as groundwater.

Table 12 Mt Buller Supply Demand Balance

Option	Current			Maximum Snow Making Demand			Future Demands		
	Summer	Winter	Total	Summer	Winter	Total	Summer	Winter	Total
Water Availability									
2 ML/d	0	368	368	0	368	368	0	368	368
3 ML/d	0	552	552	0	552	552	0	552	552
4 ML/d (max. 700 ML)	0	700	700	0	700	700	0	700	700
Recycled Water	0	87	87	0	100	100	0	110	110
Demands									
Potable	33	134	167	44	161	205	44	161	205
Snow Making		270	270		550	550		700	700
Supply-Demand Balance									
2 ML/d	-33	51	18	-44	-243	-287	-44	-383	-427
3 ML/d	-33	235	202	-44	-59	-103	-44	-199	-243
4 ML/d (max. 700 ML)	-33	383	350	-44	89	45	-44	-51	-95

6.2 Mt Stirling and Mirimbah

The supply demand balance has been examined for:

Streamflow – historical climate conditions

- Buller Creek and Baldy Creek have been highly reliable streams in the past with flow rates which far exceed the current diversion rates.

Demand scenarios covering

- Current demand (including low and high range estimates);
- Future demands (including low and high range estimates) incorporating a 100% increase in summer period water used and 10% increase in winter period water use.

Details of the supply demand balance under the following streamflow and demand scenarios are provided in Table 13.

6.2.1 Summer Period Supply-Demand Balance

There is currently insufficient off-stream storage capacity to enable summer period water use to be met without diversions occurring over summer months. Full compliance with the current stream diversion licence conditions will therefore result in a shortfall in supply of:

- 0.7 to 1.3 ML in the Mirimbah system; and
- 0.1 to 0.3 ML in the Mt Stirling system.

Options to be considered to improve Summer period reliability include:

- Seek summer diversion licence (ie allowance to maintain historical use over summer periods).
- Additional offstream storage; and
- Additional supply source such as groundwater.

6.2.2 Winter Period Supply-Demand Balance

The existing supply is expected to meet the current and expected future demand in these systems. Therefore, no action is required.

Table 13 Mt Striling and Mirimbah Supply Demand Balance

Option	Current (2012)			Future (2025)		
MIRIMBAH						
	Summer	**Winter**	**Total**	**Summer**	**Winter**	**Total**
Water Availability						
Winterfill diversions 0.1 ML/d	0	18.4	18.4	0	18.4	18.4
Demands						
Low Demand	0.24	0.49	0.73	0.48	0.54	1.02
High Demand	0.67	0.73	1.40	1.33	0.81	2.14
Supply-Demand Balance						
Low Demand	-0.24	17.9	17.7	-0.48	17.9	17.7
High Demand	-0.67	16.7	17.0	-1.33	16.7	17.0
MT STIRLING						
	Summer	**Winter**	**Total**	**Summer**	**Winter**	**Total**
Water Availability						
Winterfill diversions 0.1 ML/d	0	18.4	18.4	0	18.4	18.4
Demands						
Low Demand	0.24	0.49	0.73	0.48	0.54	1.02
High Demand	0.67	0.73	1.40	1.33	0.81	2.14
Supply-Demand Balance						
Low Demand	-0.24	17.9	17.7	-0.48	17.9	17.7
High Demand	-0.67	16.7	17.0	-1.33	16.7	17.0

7. Options for Securing the Supply-Demand Balance

7.1 Qualitative Assessment of Options

A number of options exist for securing the water supply and demand balance. These options include:

Mt Buller System

- Additional raw water storage to increase the total off stream storage capacity;
- Permit to continue summer diversions (ie allowance to maintain historical use over summer periods);
- Alternative winterfill licence conditions – increasing the diversion rate and annual volume;
- Stormwater and rainwater harvesting;
- A supplementary groundwater supply source; and
- Demand management to reduce demand for potable.

Mirimbah and Mt Stirling Systems

- Permit to continue summer diversions (ie allowance to maintain historical use over summer periods).
- Additional raw water storage to meet summer period demand; and
- Groundwater supply.

It is expected that a range of options would be implemented progressively over time.

A high level analysis of each option is presented here for the purposes of allowing a comparison of the advantages and disadvantages. This analysis is intended to identify where future resources and funding should be directed. The qualitative assessment is shown in Table 14 and Table 15.

Table 14 Mt Buller System - Qualitative Analysis of Supply-Demand-Options

Option	Ability to balance potable supply and demand	Ability to balance snowmaking supply and demand	Infrastructure requirements (ie cost)	Operational Flexibility	Ranking	Comments
Additional Raw Water Storage	✓✓	✓	××	✓✓	1	Additional storage enables more effective use of the existing diversion licence from Boggy Creek. It provides greater flexibility to balance peak day/week winter demands, and provides a balancing storage for summer periods.
Seek Summer diversion licence	✓✓	NA	NA	✓	2	Continuation of historical practices to divert small volumes over the Summer period may provide contingency in years where winter flows are low.
Alternative winterfill licence conditions – net volume licence	✓✓	✓✓	×	✓	3	Mt Buller's net water use is relatively small as a large proportion of the water diverted from Boggy Creek is returned to the stream within the same season via snow melt. The impact of higher diversion rates and volumes should be assessed in the context of net water use within the Boggy Creek catchment.
Supplementary Groundwater supply	✓✓	✓	××	✓	4	Groundwater could provide sufficient water to supply the summer potable demand, however its ability to assist in snowmaking is unknown and the ability to obtain a licence for this purpose is uncertain. A groundwater supply will require the development of bores, possibly require additional water treatment and may need to utilise existing or additional offstream storages.
Demand Management	✓	×	-	-	5	The impact of demand management would be relatively small and would only reduce the potable water demand. A reduction in potable water may affect the operability of the recycled water plant.
Stormwater Harvesting	-	✓	×	-	6	Stormwater harvesting could provide additional snowmaking water supply. This option would require additional collection and treatment infrastructure.
Rainwater Harvesting	-	✓	××	-	7	Rainwater harvesting would require buildings to be fitted with gutters. This is not practical because of the damage they would receive from snow falling off the roofs of building.

✓✓ Strong positive impact
✓ Some positive impact
- Neutral
×× Strong negative impact
× Some negative impact
NA Not applicable

Table 15 Mirimbah and Mt Stirling Systems - Qualitative Analysis of Supply-Demand-Options

Option	Ability to balance potable supply and demand.	Infrastructure requirements (ie cost)	Operational Flexibility	Ranking	Comments
Permit to continue summer diversions	✓✓	-	✓✓	1	This option may be considered where the overall impacts on the waterway and existing users are deemed to be low and where the stream groundwater systems are highly connected.
Groundwater	✓✓	×	✓	2	Groundwater could provide sufficient water to supply the summer potable demand, however its ability to assist in snowmaking is unknown and the ability to obtain a licence for this purpose is uncertain. A groundwater supply will require the development of a production bore, possible additional water treatment and may require additional offstream storage, depending on flow rates.
Rainwater Harvesting	✓	×	-	3	Rainwater harvesting would require buildings to be fitted with gutters. This is not practical because of the damage they would receive from snow falling off the roofs of houses.
Additional Raw Water Storage	✓✓	××	✓✓	4	Additional storage would allow greater harvesting of water from the waterways during winter to supply summer demands. The storage of water in a dam may introduce additional water treatment requirements.

✓✓ Strong positive impact
✓ Some positive impact
- Neutral
×× Strong negative impact
× Some negative impact
NA Not applicable

7.2 Concept for Additional Offstream Storage at Mt Buller

7.2.1 Description

The highest ranking solution for achieving the short and longer term objectives of this Strategy is the construction of additional off stream storage at Mt Buller. Construction of additional storage will:

- Allow streamflow to be diverted in winter and stored to provide potable supplies during the summer period when diversions cannot occur;
- Can be used to provide potable water for both potable and snowmaking demands increasing the flexibility of the existing water supply system;
- Will provide greater flexibility to manage peak day and/or week winter demands; and
- Can be integrated into the existing supply system without the need for additional water treatment infrastructure as the existing source water is being used.

The proposed concept is to construct new raw water storage at a suitable site at Mt Buller to store potable water harvested from Boggy Creek throughout winter. This storage will be sized to ensure sufficient water can be held at the end of the winter diversion period (30 October) to provide for the summer potable demand and any potable emergency storage considered necessary.

This storage could be used to supply both the potable demand and snowmaking demand, and will be connected to the distribution infrastructure for both of these systems. This flexibility will achieve two important aims:

- Maximise the availability of water for both potable and snowmaking use; and
- Allow potable water to be used for snowmaking within the Boggy Creek catchment to reduce the risk to public health and the environment.

7.2.2 Operation

The water supply system with additional potable water storage would operate along the principles detailed in Table 16.

Table 16 Upgraded supply system operating principles

Winter Operation	Summer Operation
Water is harvested from Boggy Creek into the new raw water storage.	The new raw water storage will be used to supply potable demand through the summer period.
The new raw water storage will be operated to achieve a storage target on 30 October to provide sufficient water for the summer period.	Class A recycled water will continue to be sent to Sun Valley Reservoir for snowmaking use over winter.
Class A recycled water will continue to be sent to Sun Valley Reservoir for snowmaking use.	A reserve volume shall be maintained in the raw water storage for emergency purposes.
Excess potable water in the new storage can be used for snowmaking directly or via transfer to Sun Valley Reservoir.	A reserve volume shall be maintained in Sun Valley Reservoir for emergency purposes.
Water cannot be sent from Sun Valley Reservoir back into the new raw water storage.	

7.2.3 Ability to meet peak demands

The ability of the Mt Buller system to meet peak demands following the construction of new raw water storage will dependent on three variables:

1. The size of the new raw water storage;
2. The streamflow that is available to be diverted; and
3. The volume of the peak demand.

Both the availability of streamflow and the volume of the peak demand have significant uncertainties associated with them. Therefore optimizing the size of the storage is difficult.

High level analysis of different storage sizes was undertaken using a water balance model. The inflow and demand scenario modelled is detailed in Table 17.

Table 17 Inflow and demand scenarios used for storage size assessment

Model Component	Volume	Comment
Inflow Scenario	368 ML/yr	A conservative inflow scenario
Demand Scenario	Snowmaking: 402 ML/yr Potable:207 ML/yr (Peak future demand)	The highest demand scenario

Using the scenarios detailed in Table 17 various storage sizes were assessed to determine their ability to meet various goals. The results of this assessment are contained in Table 18.

Table 18 Storage Size Assessment

Goal	Additional Storage Size	Comment
No deficit in potable water	50 ML	This will provide sufficient storage to supply summer demands with a 10 ML buffer for emergency purposes.
Maximise availability of potable and snowmaking water	175 ML	A storage of this size will meet the full peak demand under the dry inflow

8. Action Plan and Implementation

8.1 Actions to Secure the Water System

This section outlines a range of actions which are required to reduce uncertainty in current assessments which will assist to enable more informed decisions to be made to secure the water supply system, now and into the future.

The measures outlined in the Action Plan below will provide the following outcomes in relation to the objectives of the Water Supply Demand Strategy:

Providing a secure water supply system to meet current and future demands

- The Draft Strategy assessed the ability for the existing system to meet the current and estimated future supply-demand balance by assessing the reliability of supply over summer and winter periods and quantifying the magnitude of any surplus or shortfall;

Planning to be based on the best available information on the current and future water resources

- The Draft Strategy describes the existing water supply system and identified gaps in knowledge or information that is required to inform future planning;

Water management will be integrated across all components of the water cycle

- The Draft Strategy identifies and appraises options to maintain the reliability of the system into the future which draw upon the range of alternative supply sources;

Adaptive management

- The Draft Strategy details a range of actions for work to address gaps in knowledge or information, as well as more detailed assessments to quantify the costs and benefits of future supply-demand options;

Options and actions should protect and enhance public and environmental health

- The Draft Strategy recognises the Management Boards responsibility to comply with regulatory requirements and other licence conditions.

In order to achieve the objectives of the Strategy, a range of actions have been identified as follows.

Table 19 Water Supply Demand Strategy Action Plan

Actions	Comments	Priority
Obtain permit to continue summer diversions	Consult with licensing agencies to confirm interim arrangements with continued summer diversions until alternative options identified within this Strategy are examined.	High
Commence the planning for additional raw water storage at Mt Buller.	Additional potable water storage is they preferred solution to meeting Mt Buller's future water demands	High
Undertake a groundwater resource appraisal at Mt Buller, Mt Stirling and Mirimbah	Assess the feasibility of groundwater to meet short and long term objectives for all three systems.	High
Meter Boggy Creek streamflows (Mt Buller)	Monitoring streamflow in Boggy Creek will reduce the uncertainty regarding the supply forecasts used in this Strategy.	High
Meter streamflow diversions from Boggy Creek (Mt Buller) and Baldy Creek (Mt Striling)	Monitoring diversions will assist in future water planning and allow RMB to demonstrate compliance with diversion licences.	High
Monitoring snowmaking demands	Establishment of a monitoring program to improve the current understanding of the snowmaking water use and develop improved estimates of future water requirements (variability and volume).	High
Work with Buller Ski Lift Ltd to determine the timing of future snow making area expansion.	Understanding the timeframes for snowmaking area expansion will assist in developing future demand forecasts.	Medium
Community Consultation	Work with Mt Buller community and stakeholders to determine an appropriate volume of emergency supply reserve to be maintain in the storages through summer	Medium
Meter potable water demand.	Metering potable water demand will reduce the uncertainty surrounding the current demand and its variability. Metering this demand will also assist in the development of a demand management option to manage the supply and demand balance in the future.	Medium
Net volume licencing	Commence discussions with licencing agencies to further develop the concepts around net volume usage as it applies to the water use arrangements at Mt Buller.	Low

8.2 Monitoring and Reporting

The Mt Buller and Mt Stirling Alpine Resorts Management Board will actively monitor the supply-demand balance as part of the implementation of this Strategy. This monitoring will focus on comparing elements of supply and demand that may indicate if action is required to maintain the supply-demand balance.

Table 20 Measures for monitoring the supply and demand balance

Measure	What this may indicate
Actual demand compared to the forecast demand	If demand is exceeding forecast and action is required to secure supply reliability, then unplanned supply augmentation will incur additional costs. Alternatively, actions may need to be deferred where monitoring reveals that growth in demand is slower than forecast in this Strategy.
System inflow and storage levels	If actual water availability is less than those used in this Strategy, available supply may be less than required, therefore necessitating greater use of Melbourne System water than forecast.
Consumptive demand compared to diversions from the environment	Monitor losses within the system to maximise use of the available resource and prevent unnecessary pumping and use of energy.
Snow making areas and depth	Higher or lower water use requirements than currently forecast

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Appendix A

Mt Buller Water Conservation Project

Mt Buller Water Recycle & Conservation Project

Providing a sustainable mountain

Mt.Buller MT.STIRLING RESORT MANAGEMENT

The Water Recycle Project is a key feature of the Government's "Our Water Our Future" action plan. The project aims to provide Mt Buller with Class A recycled water, which can be used in commercial, recreational and domestic applications including irrigating parklands and sporting fields, in gardens, laundries and toilets, and most importantly for snow making at Mt Buller! Class A recycled water is safe and provides customers with a year-round supply of high quality water.

Key

- Reservoir or Tank
- Pumping Stations
- UV Disinfection Plant
- Village Sewered Zone
- Village Water Supply
- Sewerage Gravity Feed
- Proposed Recyled Water Connections
- Recycled Water
- Snowmaking Area

Sun Valley Reservoir and Pump Station (Snowmaking)

Baldy Water Storage and Pump Station

Burnt Hut (Water Storage)

Boggy 1 Pump Station

Boggy 2 Pump Station

5 4 3 2 1

Info/Stats

- Project Budget – $3.5 Million
- Estimated Completion – 2008 Ski Season
- Reuse Capacity – 2.0ML/d
- Average Snowmaking / Year – 205 ML
- Average Daily Water Use (Winter) – 1.2 ML
- Average Daily Water Use (Summer) 400 KL
- Altitude:
  - Sun Valley Reservoir – 1710 mAHD
  - Sewerage Treatment Plant – 1570 mAHD
  - Burnt Hut Reservoir – 1680 mAHD
  - Baldy Water Storage – 1720 mAHD

ML (Mega Litre) = 1,000,000 Litre
KL (Kilo Litre) = 1,000 Litre

1 & 2 • Boggy Pump Stations – Fresh Water is pumped from natural streams and springs for the use as potable water and for snow making

3 • Burnt Hut Reservoir – Water is stored here and treated with Ultra Violet (and Chlorine when required). This is the source of water for the lower section of the village.

4 • Baldy Tank – Water is stored here and treated with Ultra Violet (and Chlorine when required). This is the source of water for the higher section of the village.

5 • Sun Valley Reservoir – This is the reservoir where water is kept for snow making. This has a capacity of 70ML.

6 • Class A sewerage treatment plant – This is where waste water is turned into highly usable Class A water.

For further information please contact the Mt Buller and Mt Stirling Alpine Resort Management Board on (03) 5777 6077

Wastewater Treatment Plant Class A

Treated Effluent to Howqua River

6

Holding Tank → UV Disinfection → Ultra Filtration

UV Disinfection ← Secondary Biological Wastewater Treatment

Our Water Our Future

A Victorian Government initiative

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