Southern Alpine Resort Management Board

Water supply
2016-17 Annual Report

For year ending 30 June 2017

Lake Mountain Alpine Resort and Mount Baw Baw Alpine Resort

Contents

INTRODUCTION .................................................................................................................. 4
  1. Legislative framework .............................................................................................. 4
  2. Board governance ................................................................................................... 4
  3. Vision for the resorts .............................................................................................. 4
  4. Mission for management of the resorts ................................................................. 4
  5. Water supply for the resorts .................................................................................. 4
  6. Reporting requirements ......................................................................................... 4

SECTION A - LAKE MOUNTAIN ALPINE RESORT .......................................................... 5
  1. The location and scope of activities ...................................................................... 5
  2. Notice of declaration .............................................................................................. 5
  3. Characterisation of the system ............................................................................. 5
  3.1. Snowy Hill .......................................................................................................... 6
  3.2. Arnold Gap ......................................................................................................... 6
  3.3. Cascades ............................................................................................................ 6
  4. Schematic Drawing ............................................................................................... 8
  5. Water (Regulated) Supply .................................................................................... 8
  6. Quality Management Systems ............................................................................. 9
  7. Regulated Water Risk Management Activities .................................................... 9
  8. Review of the Risk Management Plan .................................................................. 10
  9. Complaints ........................................................................................................... 10
  10. Emergency / Incident Management .................................................................. 10

SECTION B - MOUNT BAW BAW ALPINE RESORT ....................................................... 11
  1. The location and scope of activities .................................................................... 11
  1.1. Characterisation of the system ......................................................................... 11
  1.2. Source of Water ............................................................................................... 16
  2. Water Treatment and Quality Management Systems ........................................... 17
  2.1. Water Treatment ............................................................................................... 17
2.2. Issues .......................................................................................................................... 21
3. Emergency / Incident Management .............................................................................. 21
4. Drinking Water Quality Standards for 2016/2017 ......................................................... 21
   4.1.1. Escherichia coli (E. coli) ...................................................................................... 21
   4.1.2. Trihalomethanes ................................................................................................. 22
   4.1.3. Turbidity ............................................................................................................. 22
4.2. Other algae, pathogen, chemical or substance that may pose a risk to human health ... 23
4.3. Aesthetic Characteristics ............................................................................................. 27
   4.3.1. Results for pH Units ............................................................................................ 27
   4.3.2. Results for True Colour ...................................................................................... 27
   4.3.3. Results for Iron .................................................................................................. 28
   4.3.4. Results for Copper and Manganese ................................................................. 28
4.4. Analysis of Results ..................................................................................................... 29
   4.4.1. Trends over time .................................................................................................. 29
   4.4.2. Analysis Issues ................................................................................................... 31
5. Complaints ...................................................................................................................... 31
6. Findings of the most recent risk management plan audit ............................................... 31
   6.1. Opportunities for improvement identified .......................................................... 31

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Website: www.southernalpine.vic.gov.au
1. **Legislative framework**
   The Southern Alpine Resort Management Board (‘the Board’) was established on 1 January 2017 as a result of an amendment to the *Alpine Resorts (Management) Act 1997*. It is the successor to the Lake Mountain Alpine Resort Management Board and the Mount Baw Baw Alpine Resort Management Board.

2. **Board governance**
   The Board is established by the *Alpine Resorts (Management) Act 1997* s34 (2) as amended by the *Alpine Resorts Legislation Amendment Act 2016*. The Board is deemed to be the committee of management of all the Crown land within the Lake Mountain Alpine Resort and Mount Baw Baw Alpine Resort that is permanently reserved under the *Crown Land Reserves Act 1978*.

   The Board has vested in it, all the rights, property and assets that as at 31 December 2016 that were vested in the Mount Baw Baw and Lake Mountain Alpine Resort Management Boards. Similarly, all debts, liabilities and obligations of the previous Boards became the debts, liabilities and obligations of the new Board. The assets and liabilities were transferred at fair value.

3. **Vision for the resorts**
   Recognised as providing memorable, accessible, all seasons alpine adventures.

4. **Mission for management of the resorts**
   Building a dynamic, passionate, customer focused culture and pursuing relationships to adapt to climate change and deliver exciting all-seasons adventures.

5. **Water supply for the resorts**
   At Mount Baw Baw Alpine Resort, its water supplies are for drinking water and at Lake Mountain Alpine Resort it is a regulated water supply.

6. **Reporting requirements**
   This report has been prepared for the Secretary, to the Department of Health and Human Services as outlined in Section 26 of the *Safe Water Drinking Act 2003* and Section 16 of the Safe Drinking Water Regulations 2015. The report is provided each year on the issues relating to the quality of drinking water and regulated water supplied by that water supplier.
SECTION A - LAKE MOUNTAIN ALPINE RESORT

1. The location and scope of activities
Lake Mountain Alpine Resort is located approximately 120km northeast of Melbourne, is the closest alpine resort to Melbourne and the premier family snow play destination in the State. Located adjacent to the Yarra Ranges National Park and with 37km of groomed trails, and access to over 2,400 hectares of skiable terrain in the National Park the Resort is also one of Victoria’s premier cross-country ski resorts. The resort covers an area of 465 hectares. The hub of the resort, i.e. toboggan slopes, cross country trail head, and visitor centre and administration buildings are situated at an elevation of approximately 1,400.

During the green season Lake Mountain acts as an event venue, hosts guided walking tours, mountain biking, road cycling and provides several natures based adventure activities within the resort.

Lake Mountain is strategically located in the Yarra Valley, one of Victoria’s key gourmet produce and wine regions. One of the key strengths of the resort has been its proximity and relationship to the town of Marysville, 22 kilometres away (a half hour drive) via State Highway C512 (or from Woods Point 70kms to the east via C513). Once a prospering tourism and conference hub, with a strong day visit market, Marysville and the surrounding region are now rebuilding the tourism offer after the devastating ‘Black Saturday’ bushfires of early February 2009.

2. Notice of declaration
The storage and supply of water to Lake Mountain Alpine Resort is untreated and has been declared and gazetted as a Regulated Water Supply by the Minister for Health on the 23rd of October 2005.

3. Characterisation of the system
Lake Mountain Alpine Resort is a Regulated Water System as defined under the Safe Drinking Water Act 2003.

Regulated Water
The Safe Drinking Water Act 2003 (‘the Act’) defines two types of water – ‘drinking water’ and ‘regulated water’.

Declaration concerning regulated water:

- The Minister may, by notice publish in the Government Gazette, declare any water that is not drinking water to be regulated water for the purposes of this Act.

- The Minister may only make a declaration in relation to particular water if the Minister is satisfied that the water may be supplied to the public in circumstances in which it may be mistaken as being drinking water.

- In making a declaration, the Minister may identify the water that is the subject to the declaration by reference to its source, it’s method of supply, its composition or in any other way the Minister considers to be appropriate.
'Regulated Water' is defined in Sec 6 of the Act as, water that is not intended as drinking water, but which may be supplied to the public in circumstances in which it may be mistaken as drinking water. Where water supplier supplies water that is not intended for drinking, but which may be supplied to the public in circumstances such that it may be mistaken as drinking water, the Minister for Health may declare such water as regulated water.

The water supplier is responsible, under the Act to:

- Prepare a risk management plan for the regulated water.
- Ensure that the risk management plan contains the matters detailed in Regulation 6 of the Safe Drinking Water Regulations (except those that specifically relate to drinking water only).
- Have the Risk Management Plan audited, when required, by the Secretary to the Department of Health and Human Services by an approved auditor.
- Take all reasonable steps to ensure that the intended recipients of the water are made aware of the nature of the water and of the health risks that may arise from the use of the water.
- Include a summary of their management activities for regulated water in their annual report.

**Source Water, Gerratys**
Water is sourced from the Taggerty River. This small stream is fed by natural springs from Echo Flat.

**Storage and distribution**
The main water supply system for Gerratys, the resorts village centre, consists of a small concrete weir directing water, via a series of 50mm poly pipes under a gravity/syphons process from the Taggerty River to 3 enclosed concrete tanks. The combined storage capacity of these tanks is 800kl. The storage tanks supply water to resorts facilities via a 100mm Ductile Iron pipe.

**3.1. Snowy Hill**
Water is sourced from the storage and distribution system from Gerratys. The delivery line works on gravity/syphons process via 50mm polythene line that supplies the Snowy Hill amenities.

**3.2. Arnold Gap**
Water is sourced from a small tributary and stored in 1000 litre polythene tanks. The supply and delivery lines for systems work on gravity/syphons process via 50mm polythene lines which in turn supplies water to the amenities building located at Arnold Gap.

**3.3. Cascades**
Water is sourced from a small tributary and stored in 500 litre polythene tanks. The supply and delivery lines for systems work on gravity/syphons process via 50mm polythene lines which in turn supplies water to the amenities building located at Cascades.
Resort Water Supply, Storage and Reticulation System Gerratys

Source Water

Water collection point

Water Storage

Amenities Building

Commercial Centre

Machinery Workshop
5. Water (Regulated) Supply
Lake Mountain Alpine Resort is the sole water (regulated) supplier to the following facilities on Lake Mountain.

- **Day Visitor Centre** which includes;
  - Public space
  - Public amenities
  - Food outlet
  - Snow sports centre
  - Ski patrol/ first aid
  - Resort ticketing outlet
- **Resort Commercial Centre** which includes;
  - Retail outlet
  - Rentals department
  - Public space
  - Administrative & management offices
- **Workshop/ Machinery Shed**
- **Snowy Hill Amenities Building**
- **Resort Snow Making System.**
6. Quality Management Systems

There is no treatment applied to the water supply at Lake Mountain. With this in mind, resort management is taking steps to minimise the possibility of potential health risks by raising public awareness through the signing of all the resort water outlets, advising resort visitors that the water is not treated, nor is it suitable for consumption.

As part of the management of the water supply system, water quality monitoring is undertaken, catchment and associated water delivery and storage infrastructure inspections are conducted to minimise any potential for supply failure and contaminants which may affect water quality and impact the water supply system. The management of the storage and water diversion infrastructure includes the purging of the reticulation system coupled with the cleaning of the storage tanks which is undertaken on a quarterly basis.

7. Regulated Water Risk Management Activities

The management activities that have been implemented in relation to regulated water supply, in particular those that pertain to Section 25 of the Safe Drinking Water Act 2003, warning to be given if regulated water supplied are described as follows:

- A blanket signage program for all water outlets on the resort has been completed and maintenance schedule that is monitored through the resort Water Supply Risk Management Plan. All water outlets have been signed warning visitors to Lake Mountain that water is untreated and of the health risks that may arise from its use.

- User groups of the mountain through public forums and stakeholder meetings are advised of the issues pertaining to the non-treatment of the resorts water supply and of the health risks that may arise from its use.

- All managers and staff working within the commercial operations on the resort are briefed on issues pertaining to the non-treatment of the resorts water supply and the health risks that may arise from its use.

- As a part of the resort staff induction information sessions, the non-treatment and health risks that may arise from the use of water on the resort are covered both verbally and as inclusion in the resort employee handbook, which all employees receive prior to commencement of employment.

- To minimise risk to employees the resort management have installed water coolers and supply potable water for consumption.
8. Review of the Risk Management Plan

The Lake Mountain Safe Drinking Water Risk Management plan is reviewed on an annual basis coupled with a scheduled six-monthly meeting that assists in assessing and minimising risk to visitors to the resort. The scheduled meetings incorporate the monitoring of water quality results, signage of water outlets within the resort, equipment inspection and maintenance schedules.

An audit of the Lake Mountain Alpine Resort Risk Management Plan was completed in April 2016 and the Board was found to be compliant with its obligations under section 7(1) of the Safe Drinking Water Act 2003. The opportunities for improvement support the ongoing implementation of good risk management, and reinforce a culture of effective risk management in the Victorian water industry.

9. Complaints

Lake Mountain Alpine Resort Management Board, nor the Southern Alpine Resort Management Board have received any water related complaints for this reporting period at Lake Mountain Alpine Resort.

10. Emergency / Incident Management

There has been no water supply incidents or emergencies to report for this period at Lake Mountain Alpine Resort.
SECTION B - MOUNT BAW BAW ALPINE RESORT

1. The location and scope of activities
   The resort is located on the south west face of the Baw Baw Plateau, two and a half hours’ drive east of the Melbourne CBD. Mount Baw Baw has a summit elevation of 1,565 metres and gently sloping terrain with gradients of 15% to 25%. It consists of and is surrounded by a rich variety of diverse alpine and sub-alpine native vegetation.

   The resort’s northern and eastern boundaries are adjacent to Baw Baw National Park, managed by Parks Victoria.

   The resort’s western and southern boundaries are adjacent to Tanjil State Forest, managed by the Department of Environment, Land, Water and Planning.

   Whilst the resort covers 355 hectares, just 37 hectares have been developed. Developed land includes groomed ski runs, six ski lifts, several terrain parks, two toboggan runs and ten kilometres of groomed cross-country ski trails. The resort village has 43 surveyed allotments, 34 of which are developed. Land occupied by site holders is under leasehold or a licence.

   The resort at peak operation during the snow season has seven surface lifts, with a mix of terrain of 25% for beginners, 65% for intermediate and 10% for advanced skiing. Parking is available for up to 700 cars (2,600 guests) and at least 20 buses at any time.

   The resort offers mountain biking, acts as an event venue, and is the launch point for walks into the neighbouring state forests and national parks during the non-snow season.

   The village and surrounding region offers almost 700 accommodation beds, with a variety of styles covering most budgets. Occupancy is highest in the snow season, particularly on weekends.

1.1. Characterisation of the system

   Mount Baw Baw Alpine Resort is a Drinking Water Supplier as defined under the Safe Drinking Water Act 2003.

   Water Supplier
   The Board must:
   • Prepare, implement, review and revise a risk management plan in relation to its supply of drinking water and regulated water.
   • Prepare for the Secretary to DHHS an Annual Report on drinking water quality.
   • Monitor drinking water supply from catchment to tap (water sampling points).
   • Ensure all drinking water supplied meets water quality standards.
   • Notify the Secretary if non-complying water is supplied or is likely to be supplied.
Catchment

The water catchment for the Mount Baw Baw Alpine Resort, Dam Valley, is located in a protected valley slightly elevated above the village. The village is supplied by surface water from within the catchment by means of rain runoff and snowmelt. Runoff in the catchment flows through sphagnum moss, which is thought to act as a filter for suspended particulate matter, and is collected in a small mountain stream being a minor tributary of the headwaters of the Tanjil River - Eastern Branch.

A weir has been constructed on the stream below Dam Valley to capture water and direct it to a draw off pipe which then transports water into two (2) 400,000 litre concrete storage tanks which service the village.

Despite the close proximity of the catchment to the village, there is minimal public access. Only one trail 6 metres in width passes through the north western side of the catchment, which is accessible only by foot. The catchment is heavily vegetated with trees, moss and shrubs and apart from the abovementioned trail is in pristine condition.

The primary access to the catchment occurs with cross country skiers in winter and bush walkers and mountain bikers in summer. Because the trail is relatively close to the resort, it is thought that guests will pass through this area quickly, and are unlikely to stop and eat or go to the toilet. Signage has been erected to advise guests of the status of the area and how to prevent catchment contamination occurring.

Regular monthly sampling of raw water in the catchment area is undertaken to monitor the raw water quality and includes monitoring for parameters such as turbidity and organic chemicals.

Distribution System – Tanks

Two (2) covered circular concrete tanks are located close to the weir at the bottom (south-western end) of the catchment. These tanks are filled by gravity from the weir. The two tanks are connected by a 150mm ductile iron, concrete lined pipe to the village distribution and reticulation network. Overflow from the tanks discharges back into the headwaters of the Tanjil River - Eastern Branch. This overflow runs most of the time, indicating that the flow through the weir pipe currently exceeds the village demand.

Regular weekly monitoring of raw water quality in the supply tanks is undertaken to ensure that pathogens and organic chemicals within raw water storages are within the regulated guidelines. Results obtained from raw water quality sampling are utilised to assist with identification of potential issues prior to final treatment of water and supply to the village reticulation network.

Distribution System - Pipelines

A pressurised buried main pipeline carries drinking water from the two storage tanks to the village reticulation system. Flow is under gravity, with head supplied by the natural height of the catchment and storage tanks in comparison to the village. The pressurised main is 150mm Ductile Iron Concrete Lined (DICL) from the supply tanks to the end of Currawong Road, adjacent
to Site 38. The remainder of the distribution and reticulation pipeline throughout the village is 100mm DICL.

There are four scour points within the system and these are run usually at monthly intervals to ensure that there is no accumulation of sediments within the system. The reticulation system is of a ring main configuration hence creating minimal dead ends, which in turn will not allow stagnation to occur.
Diagram 1: Plan and aerial view of the Mount Baw Baw Village – Water Supply System
Diagram 2: Schematic of the Mount Baw Baw Alpine Resort Water Supply System
1.2. **Source of Water**

The source of water for the Mount Baw Baw Village is a minor tributary of the Tanjil River - Eastern Branch and is located within the Mount Baw Baw Alpine Resort. The collection location is known as Dam Valley and is situated approximately 500 metres north east of the village at an altitude of 1514 metres Above Sea Level (ASL). Mount Baw Baw Alpine Resort is located within the Parish of Telbit West, County of Tanjil.
2. Water Treatment and Quality Management Systems

2.1. Water Treatment

Prior to final distribution to consumers all water is treated by UV (Ultra Violet) Treatment Plant located at the Mountain Sports Centre at the base of the ski area (see diagram). A sketch image and photograph of the UV treatment plant is shown below.

![UV Treatment Plant](image1)

In addition to the abovementioned UV Treatment Plant, (see diagram 1), after the UV Treatment Plant, a Residual Trim Unit provides automated chlorine dosing. The residual trim unit acts as a secondary disinfection barrier in Mount Baw Baw’s multiple barrier approach to water treatment. The residual trim unit provides the ability to control the level of chlorine and provide a disinfection residual within the water supply distribution system.

Since the installation of the automated dosing system the chlorine residual within the distribution system have stabilised with measurements logged in the range of 0.10 mg/L – 1.13 mg/L for Free Chlorine and 0.21 mg/L – 1.27 mg/L for Total Chlorine.
An Uninterrupted Power Supply (UPS) is installed and connected to both the Ultraviolet Treatment Plant and Residual Trim Unit. The installation of this backup power supply has alleviated issues related to the potential supply of untreated water in the event of an interruption to mains power. This unit is able to provide a backup power supply in the event of a power outage within the village reticulated electricity system.

Prior to installation of the chlorine Residual Trim Unit, the Board conducted a manual chlorination program. The program was introduced as a second barrier of protection in managing potential issues of microbial risk during the warmer months and through periods of low water flow/use. Water quality profiling has been undertaken throughout the reporting periods with regular testing for chlorine residuals in the village water supply. Methodology for manual chlorine dosing consisted of simple pool floats and calcium hypochlorite tablets, which are inserted into the floats at periods determined by system demand and residual
measurements in the village system. This process was discontinued in March 2016, however, as a result of a recommendation for improvement during water supply risk management plan audit conducted 13th June 2016 and consultation with C-Tech Services it was decided that this process should be reinstated as a further barrier of protection should the chlorine dosing plant be offline for scheduled maintenance or during periods of low system loading.

Regular sluicing is undertaken at four sluice points within the reticulation system. Catchment inspections are also a scheduled maintenance item and are undertaken to ensure that the catchment is clear of dead animals, faeces and any other foreign matter, which may compromise/contaminate water quality. Catchment inspections are also undertaken in the event of reported irregularities, i.e. dead animal smells etc.

*Please Note: Sluicing is undertaken in line with catchment yield, water availability and is generally not undertaken during extreme dry periods in summer.*

Table 2.1: Treatment and Management Processes – Chemical and Ultra Violet

<table>
<thead>
<tr>
<th>Locality</th>
<th>Treatment Process</th>
<th>Added Substances</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mount Baw Baw Alpine Resort</td>
<td>Chlorination</td>
<td>Aquaward 700g/kg Calcium Hypochlorite tablets.</td>
<td>Implemented to ensure multiple treatment barriers in place. Please Note: Procedure discontinued March 2016.</td>
</tr>
<tr>
<td></td>
<td>Chlorination</td>
<td>Sodium Hypochlorite Solution @ 9%</td>
<td>Implemented to ensure multiple treatment barriers in place.</td>
</tr>
<tr>
<td></td>
<td>Ultra Violet</td>
<td>Nil</td>
<td>Implemented to ensure multiple treatment barriers in place.</td>
</tr>
</tbody>
</table>

Table 2.1.1: Treatment and Management Processes – Inspections, Sluicing and Systems Management

<table>
<thead>
<tr>
<th>Period</th>
<th>Location</th>
<th>Treatment/Inspection Process</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2016</td>
<td>Dam Valley</td>
<td>Inspected catchment for possible contaminants on 11/07/2016</td>
<td>All Clear</td>
</tr>
<tr>
<td>August 2016</td>
<td>Dam Valley</td>
<td>Inspected catchment for possible contaminants on 01/08/2016</td>
<td>All Clear</td>
</tr>
<tr>
<td>September 2016</td>
<td>Dam Valley</td>
<td>Inspected catchment for possible contaminants on 09/09/2016</td>
<td>All Clear</td>
</tr>
<tr>
<td>October 2016</td>
<td>Dam Valley</td>
<td>Inspected catchment for possible contaminants on 03/10/2016</td>
<td>All Clear</td>
</tr>
<tr>
<td>October 2016</td>
<td>Village Main</td>
<td>Full sluice of system at Points 1 &amp; 4 on 28/10/2016.</td>
<td>Ran sluice valves until all clear</td>
</tr>
<tr>
<td>Period</td>
<td>Location</td>
<td>Treatment/Inspection Process</td>
<td>Comments</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------</td>
<td>------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>November 2016</td>
<td>Dam Valley Catchment</td>
<td>Inspected catchment for possible contaminants on 02/11/2016</td>
<td>All Clear</td>
</tr>
<tr>
<td>November 2016</td>
<td>Village Main</td>
<td>Full sluice of system at all points on 08/11/2016. Sluicing undertaken in conjunction with sequential delivery valve isolation to ensure all sections of main were fully cleared</td>
<td>Ran sluice valves until all clear</td>
</tr>
<tr>
<td>December 2016</td>
<td>Dam Valley Catchment</td>
<td>Inspected catchment for possible contaminants on 01/12/2016</td>
<td>All Clear</td>
</tr>
<tr>
<td>December 2016</td>
<td>Village Main</td>
<td>Full sluice of system at all points on 21/12/2016. Sluicing undertaken in conjunction with sequential delivery valve isolation to ensure all sections of main were fully cleared</td>
<td>Ran sluice valves until all clear</td>
</tr>
<tr>
<td>January 2017</td>
<td>Dam Valley Catchment</td>
<td>Inspected catchment for possible contaminants on 16/01/2017</td>
<td>All Clear</td>
</tr>
<tr>
<td>January 2017</td>
<td>Village Main</td>
<td>No full sluice conducted this month due to low catchment inflows.</td>
<td>Low catchment inflows this month.</td>
</tr>
<tr>
<td>February 2017</td>
<td>Dam Valley Catchment</td>
<td>Inspected catchment for possible contaminants on 01/02/2017</td>
<td>All Clear</td>
</tr>
<tr>
<td>February 2017</td>
<td>Village Main</td>
<td>Full sluice of system at Points 1 &amp; 4 on 17/02/2017.</td>
<td>Ran sluice valves until all clear</td>
</tr>
<tr>
<td>March 2017</td>
<td>Dam Valley Catchment</td>
<td>Inspected catchment for possible contaminants on 03/03/2017</td>
<td>All Clear</td>
</tr>
<tr>
<td>March 2017</td>
<td>Village Main</td>
<td>No full sluice conducted this month due to low catchment inflows.</td>
<td>Low catchment inflows this month.</td>
</tr>
<tr>
<td>April 2017</td>
<td>Dam Valley Catchment</td>
<td>Inspected catchment for possible contaminants on 03/04/2017</td>
<td>All Clear</td>
</tr>
<tr>
<td>April 2017</td>
<td>Village Main</td>
<td>No sluice conducted this month due to low catchment inflows.</td>
<td>Low catchment inflows this month.</td>
</tr>
<tr>
<td>May 2017</td>
<td>Dam Valley Catchment</td>
<td>Inspected catchment for possible contaminants on 02/05/2017</td>
<td>All Clear</td>
</tr>
<tr>
<td>May 2017</td>
<td>Village Main</td>
<td>Full sluice of system at all points on 05/05/2017. Sluicing undertaken in conjunction with sequential delivery valve isolation to ensure all sections of main were fully cleared.</td>
<td>Ran sluice valves until all clear</td>
</tr>
<tr>
<td>June 2017</td>
<td>Dam Valley Catchment</td>
<td>Inspected catchment for possible contaminants on 05/06/2017</td>
<td>All Clear</td>
</tr>
</tbody>
</table>
2.2. Issues
This reporting period, after an identified water supply risk management plan opportunity for improvement and consultation with supplier of the chlorine residual trim unit, Mount Baw Baw Alpine Resort reinstated its manual chlorine dosing program.

The reinstatement of manual dosing and monitoring processes was recommended to counteract issues currently being experienced with the operation of the automated chlorine dosing plant in times of low flow/demand. In these times dosing may be reduced to amounts outside of resort requirements due to the low volumes of water flow through the system. The occurrence of this issue will continue to be monitored by resort personnel and the contractor C-tech services to ensure suitable residual levels are maintained within the reticulation system at all times.

3. Emergency / Incident Management
There were no incidents of known or suspected contamination reportable under section 22 of the Safe Drinking Water Act 2003 at Mount Baw Baw Alpine Resort during the reporting period. Further to this, there were no situations or events that occurred during the reporting period that were not reportable under section 22 of the Act which impacted or had the potential to impact the water quality of the drinking water being supplied.

4. Drinking Water Quality Standards for 2016/2017
4.1.1. Escherichia coli (E. coli)
Results

Table 4.1.1: E.coli Water Quality Standard

<table>
<thead>
<tr>
<th>Locality</th>
<th>Frequency of sampling</th>
<th>No. of samples collected</th>
<th>No. of samples containing E.coli</th>
<th>No. of investigations conducted</th>
<th>No. of confirmed false positives</th>
<th>No. of investigations where standard not met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mount Baw Baw</td>
<td>Weekly</td>
<td>52</td>
<td>0</td>
<td>0</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

4.1.1.1 Actions Taken in relation to non-compliance
Mount Baw Baw complied with the E.coli water quality standard for the reporting period 1 July 2016 to 30 June 2017.
4.1.2. Trihalomethanes

Results

Table 4.1.2.1: Trihalomethanes

Water quality standard: less than or equal to 0.25 milligrams per litre

<table>
<thead>
<tr>
<th>Locality</th>
<th>Frequency of sampling</th>
<th>No of samples</th>
<th>No of Non-complying samples</th>
<th>Max mg/L</th>
<th>Complying (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mount Baw Baw</td>
<td>Monthly</td>
<td>12</td>
<td>0</td>
<td>0.064</td>
<td>Yes</td>
</tr>
</tbody>
</table>

4.1.2.1 Actions taken in relation to non-compliance

Mount Baw Baw Alpine Resort potable water supply complied with the Trihalomethane water quality standard for the reporting period.

4.1.3. Turbidity

Results

Table 4.1.3.1: Turbidity

Water quality standard: 95th percentile of results for samples in any twelve month period must be less than or equal to 5.0 Nephelometric Turbidity Units (NTU)

<table>
<thead>
<tr>
<th>Locality</th>
<th>Frequency of sampling</th>
<th>No of samples</th>
<th>Maximum NTU</th>
<th>95th percentile</th>
<th>Complying (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mount Baw Baw</td>
<td>Weekly</td>
<td>52</td>
<td>0.5</td>
<td>0.2</td>
<td>Yes</td>
</tr>
</tbody>
</table>

4.1.3.1 Actions taken in relation to non-compliance

Mount Baw Baw Alpine Resort’s drinking water complied with the turbidity water quality standard for the reporting period.
4.2. Other algae, pathogen, chemical or substance that may pose a risk to human health

As previously discussed in section 2.1, Mount Baw Baw Alpine Resort utilises UV and chlorine based disinfection treatment processes to manage potential issues of microbial risk including Escherichia coli (E. coli) detections. To ensure the provision of drinking water of the highest quality, testing is conducted regularly for the following chlorine based disinfection by products, Chloroacetic Acid, Dichloroacetic Acid and Trichloroacetic Acid.

A summary of results obtained for Chloroacetic Acid, Dichloroacetic Acid and Trichloroacetic Acid chlorine based disinfection by product parameters as listed in the Australian Drinking Water Guidelines 2011 (ADWG) during the 2016/2017 reporting period is contained in Tables 4.2.1 to 4.2.3.

Mount Baw Baw Alpine Resort commenced sampling and monitoring of its raw water supply in January 2011. The raw water monitoring was implemented as a result of the auditor’s recommendation for improvement identified during the regulatory audit conducted 15th December 2009.

Further raw water supply sampling and monitoring was implemented in January 2013 as a result of a regulatory audit conducted 10th March 2012. The auditor recommended the implementation of monitoring for metals such as copper, iron and manganese.

Samples were collected from the raw water supply at Dam Valley Catchment. Raw water was analysed for the following parameters: pH, Turbidity, Nitrogen, Phosphorus, Organic Carbon, Suspended Solids, Electrical Conductivity, Nitrate, Copper, Iron, Manganese and Radiation. It is anticipated that this water sample data will, over time assist with the risk assessment process and identification of potential issues prior to final treatment of water and supply to the village reticulation network of the Mount Baw Baw Alpine Resort.

A summary of results obtained for radiation, nitrate, copper, iron, manganese, pH and true colour parameters and measured against the Australian Drinking Water Guidelines 2011 (ADWG) health guideline values during the 2016/2017 reporting period is contained in Tables 4.2.4 to 4.2.8 and 4.3.1 to 4.3.3.

Results

As can be seen by the monthly results shown in Tables 4.2.1 to 4.2.3, the Mount Baw Baw Alpine Resort potable water supply complied with the standard for water quality in relation to the Chlorine Based Disinfection By-products - Chloroacetic Acid, Dichloroacetic Acid and Trichloroacetic Acid.
Table 4.2.1: Chloroacetic Acid

Water quality standard (ADWG): must not exceed 0.15 mg/L

<table>
<thead>
<tr>
<th>Locality</th>
<th>Frequency of sampling</th>
<th>No of samples</th>
<th>No of Non - Complying Samples</th>
<th>Max mg/L</th>
<th>Complying (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mount Baw</td>
<td>Monthly</td>
<td>12</td>
<td>0</td>
<td>&lt;0.005</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 4.2.2: Dichloroacetic Acid

Water quality standard (ADWG): must not exceed 0.1 mg/L

<table>
<thead>
<tr>
<th>Locality</th>
<th>Frequency of sampling</th>
<th>No of samples</th>
<th>No of Non - Complying samples</th>
<th>Max mg/L</th>
<th>Complying (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mount Baw</td>
<td>Monthly</td>
<td>12</td>
<td>0</td>
<td>0.018</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 4.2.3: Trichloroacetic Acid

Water quality standard (ADWG): must not exceed 0.1 mg/L

<table>
<thead>
<tr>
<th>Locality</th>
<th>Frequency of sampling</th>
<th>No of samples</th>
<th>No of Non - Complying samples</th>
<th>Max mg/L</th>
<th>Complying (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mount Baw</td>
<td>Monthly</td>
<td>12</td>
<td>0</td>
<td>0.023</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 4.2.4: Results for Alpha Radiation

Water quality standard (ADWG): Gross Bq/L – less than 0.5

<table>
<thead>
<tr>
<th>Locality</th>
<th>Frequency of sampling</th>
<th>No of samples</th>
<th>No. of non-complying samples</th>
<th>Maximum Bq/L</th>
<th>Complying (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mount Baw</td>
<td>Annually</td>
<td>1</td>
<td>0</td>
<td>&lt;0.21</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Table 4.2.5: Results for Beta Radiation

Water quality standard (ADWG): Gross Bq/L – less than 0.5

<table>
<thead>
<tr>
<th>Locality</th>
<th>Frequency of sampling</th>
<th>No of samples</th>
<th>No. of non-complying samples</th>
<th>Maximum Bq/L</th>
<th>Complying (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mount Baw Baw</td>
<td>Annually</td>
<td>1</td>
<td>0</td>
<td>&lt;0.42</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Mount Baw Baw Alpine Resort potable water supply met the water quality standards in relation to both Alpha Radiation and Beta Radiation. Radionuclides should be identified and investigated if Gross Alpha or Beta activities exceed 0.5 Bq/L for drinking water samples. For both gross Alpha and Beta activities, levels were below 0.5 Bq/L.

Table 4.2.6: Results for Nitrate

Water quality standard (ADWG): must not exceed 50mg/L

<table>
<thead>
<tr>
<th>Locality</th>
<th>Frequency of sampling</th>
<th>No of samples</th>
<th>No. of non-complying samples</th>
<th>Maximum mg/L</th>
<th>Complying (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mount Baw Baw</td>
<td>Monthly</td>
<td>12</td>
<td>0</td>
<td>0.006</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Mount Baw Baw Alpine Resort potable water supply met the water quality standards in relation to Nitrate.

Table 4.2.7: Results for Copper

Water quality standard (ADWG): must not exceed 2mg/L.

Aesthetic guideline value (ADWG): should not exceed 1mg/L.

<table>
<thead>
<tr>
<th>Locality</th>
<th>Frequency of sampling</th>
<th>No of samples</th>
<th>No. of non-complying samples</th>
<th>Maximum mg/L</th>
<th>Complying (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mount Baw Baw</td>
<td>Monthly</td>
<td>12</td>
<td>0</td>
<td>0.001</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Table 4.2.8: Results for Manganese

Water quality standard (ADWG) – not exceed 0.5mg/L.

Aesthetic guideline value (ADWG): should not exceed 0.1mg/L.

<table>
<thead>
<tr>
<th>Locality</th>
<th>Frequency of sampling</th>
<th>No of samples</th>
<th>No. of non-complying samples</th>
<th>Maximum mg/L</th>
<th>Complying (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mount Baw</td>
<td>Monthly</td>
<td>12</td>
<td>0</td>
<td>0.001</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Mount Baw Baw Alpine Resort potable water supply met both the water quality standard and the aesthetic guideline value for Manganese.

4.2.1 Actions taken in relation to non-compliance

Mount Baw Baw Resort met the water quality standards for all of the parameters monitored during the reporting period.
4.3. Aesthetic Characteristics

4.3.1. Results for pH Units

The mean result for pH was within the range as outlined in the ADWG of pH 6.5 to 8.5.

Mount Baw Baw Alpine Resort utilises Ductile Iron Concrete Lined (DICL) piping and these pipes have the ability to significantly increase the pH level of water. A pH result of up to 9.2 may be tolerated provided there is no indication of deterioration in the microbiological quality of the water supply.

As in previous years, spikes in pH levels appear to be related to catchment flow levels and system load due to reduced water usage due to lower levels of visitation during the warmer summer months. Lower visitation levels result in lower flows through the reticulation system, causing water to sit. This water subsequently comes into contact with the concrete lined pipes for longer periods, which is thought to elevate pH levels within the system. Summer visitation is expected to increase as a result of a greater focus on activities such as mountain biking and it is envisaged that spikes in the pH levels will reduce as a more constant loading on the system is achieved.

Table 4.3.1: Results for pH

<table>
<thead>
<tr>
<th>Locality</th>
<th>Frequency of sampling</th>
<th>No of samples</th>
<th>Minimum pH</th>
<th>Maximum pH</th>
<th>Mean pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mount Baw Baw</td>
<td>Weekly</td>
<td>52</td>
<td>6.0</td>
<td>10.2</td>
<td>7.4</td>
</tr>
</tbody>
</table>

4.3.2. Results for True Colour

The mean result for True Colour is outside the range outlined in the ADWG aesthetic guideline value of mean 15 Hazen Units (HU). Mount Baw Baw Alpine Resort utilises UV disinfection as part of its drinking water treatment process, high colour and organic matter, have the potential to reduce the effectiveness of UV disinfection. This reduction can increase the microbial risk of the water.

Due to its location, it is thought that the Mount Baw Baw water supply catchment contains naturally occurring organic matter which may contribute to the high results. During the last 6 reporting periods, Mount Baw Baw Alpine Resort has trialled closing the supply tank inlet valve prior to major rain events in addition to its regular sluicing program. This action appears to have had some effect on true colour results, particularly during times of high catchment inflows and low system loading.

Closure of the Supply Tank Inlet Valve prior to major rain events and regular sluicing of the main when conditions permit can minimise the occurrence of readings above ADWG guideline values, however these actions currently rely heavily on manual monitoring and sluicing times are
limited by other operational issues such as catchment flow and system loading. This can be seen in Table 2.1.1.

Table 4.3.2: Results for True Colour

Aesthetic guideline value (ADWG): mean 15 Hazen Units (HU)

<table>
<thead>
<tr>
<th>Locality</th>
<th>Frequency of sampling</th>
<th>No of samples</th>
<th>Minimum - HU</th>
<th>Maximum - HU</th>
<th>Mean – HU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mount Baw Baw</td>
<td>Weekly</td>
<td>52</td>
<td>20</td>
<td>50</td>
<td>34.5</td>
</tr>
</tbody>
</table>

4.3.3. Results for Iron

As previously discussed in section 4.3.2 on page 25, Mount Baw Baw Alpine Resort utilises UV Disinfection, elevated levels of metals such as copper, iron and manganese have the potential to discolor water. High colour is a contributing factor in the reduction of the effectiveness of UV disinfection. This reduction can increase the microbial risk of the water.

Mount Baw Baw Alpine Resort drinking water met the aesthetic guideline values for Iron.

It is anticipated that the collection of this water sample data will, over time assist with the risk assessment process and the supply of an improved quality of potable drinking water to the Mount Baw Baw Alpine Resort.

Table 4.3.3: Results for Iron

Aesthetic guideline value (ADWG): exceed 0.3mg/L

<table>
<thead>
<tr>
<th>Locality</th>
<th>Frequency of sampling</th>
<th>No of samples</th>
<th>No. of non complying samples</th>
<th>Maximum mg/L</th>
<th>Complying (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mount Baw Baw</td>
<td>Monthly</td>
<td>12</td>
<td>0</td>
<td>0.10</td>
<td>Yes</td>
</tr>
</tbody>
</table>

4.3.4. Results for Copper and Manganese

Drinking water met the aesthetic guideline values for copper and manganese.
4.4. Analysis of Results

4.4.1. Trends over time

There has been a reduction in E.coli detections overall, since the 2006/2007 reporting period with 100% compliance achieved in all periods with the exception of 2009/2010.

One E.coli detection occurred during 2009/2010, however the overall result of 98% still complied with the water quality standard for E.coli at that time.

This reduction of E.coli detections post 2005/2006 reporting period and increase in compliance with the E.coli water quality standard was as a direct result of the installation and operation of the UV treatment plant.

The introduction of improved systems management, the effect of the UV treatment plant, manual disinfection using chlorine, the installation of an automated chlorine dosing plant and thorough staff training in relation to sampling procedures and techniques have assisted with the improvement in compliance across the last ten reporting periods.

The trend for E.coli compliance is shown below in Graph 1.

Graph 1 – Results for E.coli compliance

As shown below in Graph 2 there has been a decrease in the level of Trihalomethanes during the period 1 July 2016 to 30 June 2017 when comparing to 2015/2016.

The most notable issue in the past 2 reporting periods being the level of Trihalomethanes recorded during the 2015/2016 reporting period. The highest recorded result of 0.15 was recorded during the month of May 2016 when it was difficult to undertake sluicing operations due to low catchment inflows. These low inflows restricted the amount of water available for
use in the village reticulation system. The 2016/2017 results are still below the water quality standard of 0.25 mg/L (Shown as WQS in Graph 2 below) for Trihalomethanes and results have reduced to lower levels as a result of regular snowfalls and increased system loading.

Graph 2 - Results for Trihalomethanes showing the yearly trend.

![Graph 2](image_url)


Turbidity levels for the period 1 July 2016 to 30 June 2017 remained stable with no increase compared to the 2015/2016 result. Full compliance was met for the turbidity water quality standard for the reporting period with 95\textsuperscript{th} percentile of twelve month period being 0.24 for 2016/2017, this compares with the result for 2014/2015 and 2015/2016. These results are lower when compared with previous periods where the result was as high as 0.68, recorded in the 2010/2011 reporting period.

Mount Baw Baw Alpine Resort continues to undertake a regular reduction of intake flows, particularly with regard to major rain events. Major rain events have the potential to increase turbidity levels within the raw water catchment. The reduction in intake flows can reduce the incidence of turbid water entering the village potable water supply, resulting in the supply of a higher quality of drinking water.
4.4.2. Analysis Issues
No major issues arose from analysis procedures during the period 1 July 2016 to 30 June 2017. All water samples collected as part of the monitoring programs conducted at Mount Baw Baw Alpine Resort have been independently analysed by a National Association of Testing Authorities, Australia (NATA) certified laboratory.

5. Complaints
Mount Baw Baw Alpine Resort Management Board, nor the Southern Alpine Resort Management Board have received any water related complaints for this reporting period at Mount Baw Baw Alpine Resort.

6. Findings of the most recent risk management plan audit
A regulatory Audit of the Mount Baw Baw Water Supply Risk Management Plan was not undertaken during the period 1 July 2016 to 30 June 2017.

The next regulatory audit will be scheduled to take place before 31st May 2018.

6.1. Opportunities for improvement identified
Please refer to table 6.1 below for progress against continuous improvement opportunities identified as part of the most recent risk management plan audit.
Table 6.1: Progress on identified improvements

<table>
<thead>
<tr>
<th>Auditors Continuous Improvement Opportunities</th>
<th>Auditors Continuous Improvement Opportunities</th>
<th>Expected Completion Date</th>
</tr>
</thead>
</table>
| **1. Discuss with sampling laboratory, upgrading sampling procedures, for example, sealed sterilised sampling components.** | a) Review existing sampling procedures document to ensure sterilisation procedures currently utilised are in line with best practice guidelines.  
   b) Discuss with Paul Whiffen from ALS Laboratory Traralgon, the availability and potential supply of single use, sealed, sterilised sampling equipment. | Completed October 2016.  
Completed November 2016. |
| **2. Consider promoting the option of flushing drinking water taps in ski lodges prior to use, for example, at the start of ski season. It may also be helpful to offer to drain down drinking water in lodges when they are vacated and possibly maintenance and servicing of backflow prevention valves could also be considered.** | a) Continue with existing lodge start up and shut down procedures for those lodges which are a part of the centralised booking service as this procedure is already followed.  
   b) Consult with remaining stakeholders to develop standard operating procedures for lodge start up and shut down which reflect the suggested procedures. | Relevant procedures are currently in place.  
Ongoing – expected completion June 2018. |
| **3. The chlorination unit that has just been installed, during periods of very low use, for example, outside of the ski season, may warrant the discussion of a storage tank, post chlorination.** | a) Continue weekly monitoring and recording of chlorine residual levels at the Village Supply Tanks, Village Supply Taps and Chlorine Dosing Plant to ensure suitable residual levels are maintained throughout the supply system.  
   b) Discuss with Dean Braden from C-Tech Services, the potential benefits, if any, of installation of a treated water storage tank, post treatment for use during periods of low visitation. | Relevant procedures are currently in place.  
Ongoing throughout 2016 – 2017 reporting period after consultation and collation of relevant data. |
<p>| <strong>4. Discuss with relevant parties, possibly continued chlorination of raw water tanks during the summer</strong> | a) Review existing sampling procedures document to ensure sterilisation procedures | Completed October 2016. |</p>
<table>
<thead>
<tr>
<th>Auditors Continuous Improvement Opportunities</th>
<th>Auditors Continuous Improvement Opportunities</th>
<th>Expected Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>period where there may be the possibility of the water being retained in the raw water tanks for considerable periods of time</td>
<td>currently utilised are in line with best practice guidelines.</td>
<td>Completed November 2016.</td>
</tr>
<tr>
<td>b) Discuss with Paul Whiffen from ALS Laboratory Traralgon, the availability and potential supply of single use, sealed, sterilised sampling equipment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. In view of the upgrade of plant suggest consider increasing training.</td>
<td>a) Key staff are aware of policies and procedures in relation to all facets of water supply operation. Further training of key staff to be conducted to ensure full awareness of processes and procedures relating to the automated chlorine dosing plant.</td>
<td>Ongoing training.</td>
</tr>
<tr>
<td></td>
<td>b) Review of existing staff training matrix document to be conducted to ensure that automated chlorine dosing plant processes and procedures are included.</td>
<td>December 2017.</td>
</tr>
</tbody>
</table>