Hydrosphere Consulting

Rous County Council

Regional Water Supply Drought Management Plan

Adopted
17 August 2016

ballina shire council

Byron Shire Council

lismore city council

Richmond Valley Council

ROUS COUNTY COUNCIL

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Executive Summary

There are five local water utilities providing potable water to approximately 43,000 residential properties and 5,500 non-residential customers within the Ballina, Byron, Lismore and Richmond Valley local government areas (LGAs). Rous County Council is the regional water supply providing bulk water to the majority of the region as well as retail water supply services to rural and urban connections direct from the bulk supply system. The principal component of the Rous County Council bulk supply is Rocky Creek Dam, situated 25 km north of Lismore near the village of Dunoon. Ballina, Byron, Lismore and Richmond Valley local councils also supply potable water to other towns and villages within their LGAs from their local supplies (refer Table 1).

Table 1: Urban Water Supplies in the Region

Local Water Utility	Service Areas	Water Sources	Residential Customers (properties)	Non-Residential Customers
Rous County Council bulk water supply	• Ballina Shire Council, excluding Wardell; • Byron Shire Council, excluding Mullumbimby; • Lismore City Council, excluding Nimbin; and • Richmond Valley Council, excluding Casino and all land west of Coraki.	• Surface water - Rocky Creek Dam, Emigrant Creek Dam, Wilsons River Source • Groundwater - Woodburn bores, Alstonville Plateau bores	Bulk supply to the four constituent councils	
Rous County Council retail supply	Rural and urban connections within the Constituent Council areas served directly from the bulk supply system		2,000	-
Ballina Shire Council	Wardell, Meerschaum Vale, Cabbage Tree Island and some rural customers	• Surface water - Marom Creek Weir • Groundwater - Alstonville Plateau bores	280	28
	Ballina Heights, North Ballina, West Ballina, Ballina Island, East Ballina, Lennox Head, Wollongbar, Russellton Industrial Estate, Alstonville and some rural customers	Rous County Council bulk supply	13,800	1,700
Byron Shire Council	Mullumbimby	• Surface water - Laverty's Gap Weir • Rous County Council bulk supply (emergency supply)	1,500	200
	Bangalow, Brunswick Heads, Byron Bay, Suffolk Park, Ocean Shores	Rous County Council bulk supply	8,200	1,200
Lismore City Council	Nimbin	• Surface water - Mulgum Creek Weir and DE Williams dam	240	70
	Lismore City, Dunoon, Modanville, The Channon, Dunoon Road, Clunes, North Woodburn	Rous County Council bulk supply	11,600	1,500

Local Water Utility	Service Areas	Water Sources	Residential Customers (properties)	Non-Residential Customers
Richmond Valley Council	Casino	• Surface water - Jabour Weir	4,200	500
	Evans Head, Woodburn, Broadwater, Rileys Hill and Coraki	Rous County Council bulk supply	2,400	300
Total Region			42,920	5,500

This Drought Management Plan documents a regional restriction regime that applies to all customers served by the Rous County Council regional water supply. This regional approach aims to ensure consistency and community acceptance and therefore improve the success of drought management in the region. The water restrictions triggers contained within this Plan are based on the Rous County Council system (i.e. Rocky Creek Dam storage level). The local water supplies managed by councils in the region (for Mullumbimby, Wardell, Nimbin and Casino) may adopt triggers for the introduction of water restrictions developed for their specific water sources/storages. Councils may apply this regional restriction regime to their local supplies and this is the preferred approach to ensure a consistent drought management process across the region.

Water restrictions will be applied as storage levels in Rocky Creek Dam fall, to reduce both residential and business demand and prolong the supply. Restrictions are a quick, effective and relatively low cost tool for responding to drought. In the past they have been effective in slowing the rate at which water storage levels drop, allowing more time to implement alternative supply options as required. Leading up to the introduction of restrictions and during their implementation, restrictions will be actively supported by an operational readiness plan and a communication plan. Alternative supply options will be activated when storage levels reach trigger points defined in the operational readiness plan.

The drought restriction regime consists of four colour-coded restriction levels with an “Emergency” situation implemented beyond Level 4 (Table 2). Each restriction level has an associated target demand and required water saving measures for residential and non-residential potable water use. Compliance with water restrictions will be monitored and enforced. If storage levels drop further or target demands are not met, higher level restrictions requiring greater reductions in water usage will be implemented.

Table 2: Regional Water Restriction Levels and Target Reduction in Demand

Restrictions	Everyday water saving measures	Level 1: Moderate	Level 2: High	Level 3: Very High	Level 4: Severe	Emergency
Target reduction in demand	0%	5%	15%	25%	35%	45%

The Operational Readiness Plan lists actions to be taken to ensure that Rous County Council and the constituent councils are prepared to implement a robust, timely, efficient and affordable response to drought. The Communication Plan describes actions to be taken at each restriction level and resources required to effectively engage and communicate drought messages to the community and other stakeholders. The Plan includes the use of a range of media and communication tools to convey drought messages.

Monitoring and evaluation are essential tools for the implementation and ongoing improvement of this plan. The Drought Management Plan will be reviewed following implementation of drought restrictions and may need to be revised to address any identified issues and improve management of future droughts.

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1.1 Plan Structure

This Drought Management Plan aims to provide a consistent restriction regime for all water supplies across the Rous County Council supply region incorporating Byron, Ballina, Lismore and Richmond Valley Local Government Areas (LGAs). Key components of this plan are shown in Figure 1.

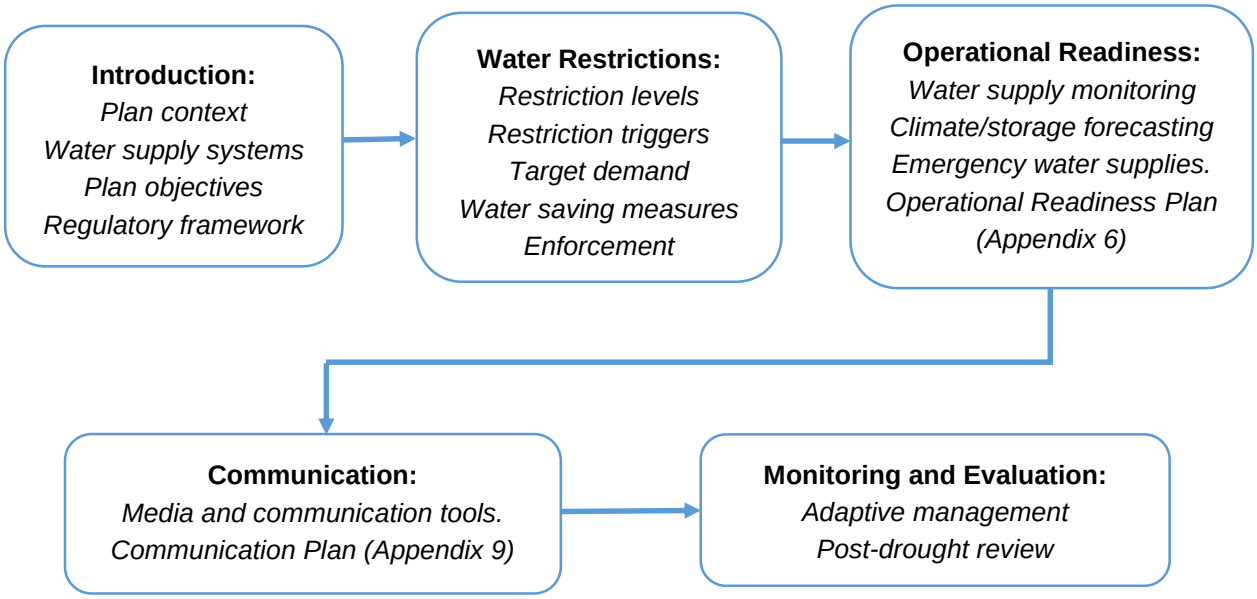

Figure 1: Rous County Council Drought Management Plan Structure

1.2 Water Supply Systems

There are five local water utilities (LWUs) providing potable water to customers within the Ballina, Byron, Lismore and Richmond Valley local government areas (LGAs). Rous County Council is a special purpose council under the *Local Government Act (1993)*. Rous County Council provides bulk water to the other four LWUs (constituent councils) with a supply network extending from Ocean Shores in the north and Byron Bay in the east, west to Lismore and south to Evans Head. Rous County Council also provides water supply services to rural and urban connections (retail customers) direct from the bulk supply system. Ballina, Byron, Lismore and Richmond Valley local councils also supply potable water to other towns and villages within their LGAs from their local supplies (refer Figure 2).

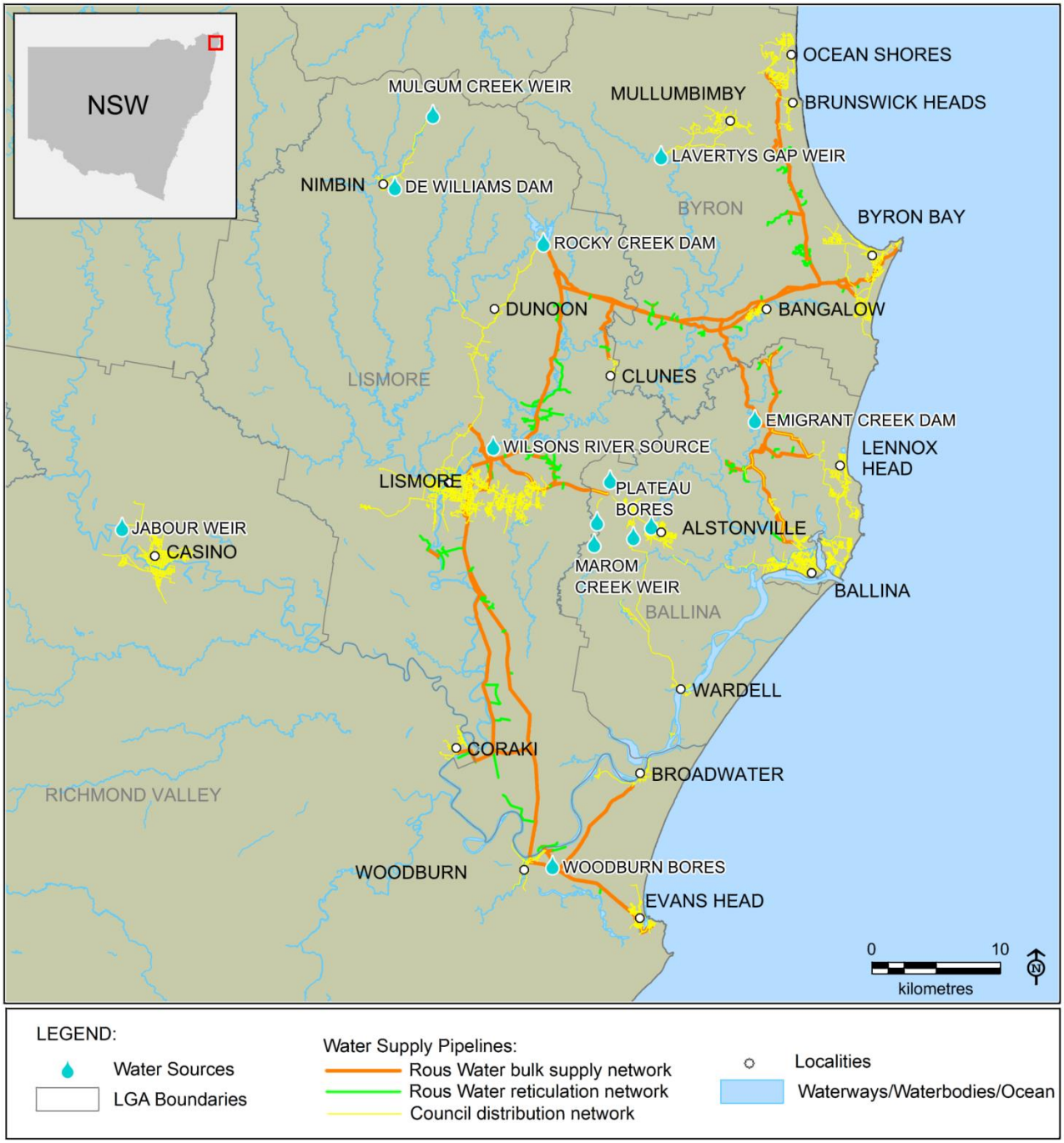

Figure 2: Regional Water Supply Systems

Surface waters are the primary water resource utilised by Rous County Council although there are also some groundwater sources available for use during dry periods (Table 3). The principal component of the Rous County Council bulk supply is Rocky Creek Dam, situated 25 km north of Lismore near the village of Dunoon. Water from Rocky Creek Dam is treated at the Nightcap Water Treatment Plant (WTP) and is distributed through three trunk mains owned and operated by Rous County Council. One trunk main delivers water to Lismore and to the Richmond Valley area. The other two mains supply Byron Bay and Ballina Shires. Water from the Wilsons River Source upstream of Lismore is pumped directly from the Wilsons River to the Nightcap WTP for filtration and distribution to consumers. Water from Emigrant Creek Dam is treated at the Emigrant Creek WTP and is distributed to supplement supplies to Ballina and Lennox Head.

Table 3: Rous County Council Bulk Water Sources

Details	Rocky Creek Dam	Emigrant Creek Dam	Wilsons River Source	Converys Lane bore	Lumley Park bore	Woodburn bores	Prospect bores
Water Source [1]	Terania Creek	Alstonville Area	Wyrallah Area (Wilsons River)	Bangalow Groundwater	Alstonville Groundwater	Richmond Coastal Sands	Richmond Coastal Sands
Source Type	Large in-stream storage	Large in-stream storage	Run-of-river abstraction	Groundwater extraction	Groundwater extraction	Groundwater extraction	Groundwater extraction
Storage capacity	14,000 ML	820 ML	-	-	-	-	-
Area served	Lismore City, Richmond Valley, Ballina and Byron Shires	Ballina and Lennox Head	Lismore City, Richmond Valley, Ballina and Byron Shires	Alstonville, Wollongbar	Alstonville, Wollongbar (dry periods)	Woodburn, Evans Head, Broadwater (dry periods)	Not used
Water Treatment	Nightcap WTP (70 ML/d)	Emigrant Creek WTP (7.5 ML/d)	Nightcap WTP	Chlorination	Chlorination	Chlorination	Chlorination
Licence entitlement	12,358 ML/a[3]	2,620 ML/a[3]	5,400 ML/a[3]	150 ML/a[4]	530 ML/a[4]	726 ML/a [2,3]	230 ML/a [2,3]
Secure Yield [5]	13,800 ML/a						

Source: Hydrosphere Consulting, (2012a)

1. As specified in the relevant Water Sharing Plan.
2. Will be subject to Richmond River Coastal Sands Water Sharing Plan (under preparation).
3. Water Sharing Plan for the Richmond River Area Unregulated, Regulated and Alluvial Water Sources (2010).
4. Water Sharing Plan for the Alstonville Plateau Groundwater Sources (2003).
5. Assessed in accordance with current security of supply methodology 5/10/10 rule (NSW Urban Water Services, 2013).

Table 4 summarises the current operating rules for the Rous County Council regional supply based on Rocky Creek Dam storage levels.

Table 4: Rous County Council Bulk Water Supply Operating Rules

RCD Supply Level (% of full supply volume)	Status	Source Usage
100%	Normal Operation	Rocky Creek Dam only
95%		Start Wilsons River Source and Emigrant Creek Dam
60%	Dry Period Operation	Start Woodburn bores, Converys Lane bore
30%		Start Ballina Shire Council's plateau bores
20%	Emergency Operation	Start emergency supply source[1]
15%		
10%		

1. Refer Section 3.3.

The regional water supplies and customers are given in the following table.

Table 5: Urban Water Supplies in the Region

Local Water Utility	Service Areas	Water Sources	Residential Customers (properties)	Non-Residential Customers
Rous County Council bulk water supply	• Ballina Shire Council, excluding Wardell; • Byron Shire Council, excluding Mullumbimby; • Lismore City Council, excluding Nimbin; and • Richmond Valley Council, excluding Casino and all land west of Coraki.	• Surface water - Rocky Creek Dam, Emigrant Creek Dam, Wilsons River Source • Groundwater - Woodburn bores, Alstonville Plateau bores	Bulk supply to the four constituent councils	
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Total Region			42,920	5,500

Appendix 2 provides additional background information on non-potable supplies in the region, non-reticulated supplies, the region's highest water users, water demand, regional climatic conditions, the history of past droughts and the effectiveness of water restrictions implemented in the past.

1.3 Drought Management Plan Objectives

The primary objective of this Drought Management Plan is to ensure continued water supply during drought conditions in order to meet water user, public health and fire-fighting needs.

This Plan aims to:

- Ensure a robust, timely, efficient and affordable response to drought;
- Facilitate the application of restrictions at a regional level and also at a local level for council-operated water supplies;
- Provide a clear water restriction regime for all water users; and
- Reduce the impact of water extraction on the available resource and other water users while minimising disruption to customers.

Operational objectives relate to maintaining water supplies in preparation for drought as well as the actual implementation of drought response measures during a drought. The operational objectives are:

- Provide an action plan that will ensure operational readiness;
- Ensure regular monitoring of water resource information, climatic conditions and seasonal forecasts;
- Ensure the introduction of water restrictions is well-considered and planned;
- Implement drought management actions at defined trigger points;
- Ensure clear communication to the public and visitors regarding water restrictions and access to information;
- Ensure that operating and managerial staff have a clear understanding of the operating procedures outlined in this plan;
- Ensure customers and other stakeholders are aware of the requirements of this plan; and
- Continually review the effectiveness of the drought management procedures within this plan, while considering alternative measures that may be more effective.

1.4 Application

This Drought Management Plan documents a regional restriction regime that applies to all customers served by the Rous County Council regional water supply. This regional approach aims to ensure consistency and community acceptance and improve the success of drought management in the region. The water restrictions triggers contained within this Plan are based on the Rous County Council system (i.e. Rocky Creek Dam storage level). The local water supplies managed by councils in the region (for Mullumbimby, Wardell, Nimbin and Casino) may adopt triggers for the introduction of water restrictions developed for their specific water sources/storages. Councils may apply this regional restriction regime to their local supplies and this is the preferred approach to ensure a consistent drought management process across the region.

1.5 Demand Management and Everyday Water Saving Measures

Rous County Council's demand management program is an ongoing initiative to encourage efficient water use and ensure a secure water supply. Everyday water saving measures are a key part of the current demand management program that will apply at all times outside of water restriction periods. These measures are currently voluntary. The components are summarised as follows:

- Outdoor watering – permitted between 6 am and 10 am and between 3 pm and 10 pm;
- Hand-held hoses – to be fitted with an on/off nozzle (trigger nozzles preferred;

- Cleaning vehicles and boats – where possible to be washed on the lawn using hoses fitted with an on/off nozzle; and
- Driveways, paths and paved areas – water is not be used to clean driveways, paths or paved areas unless necessary as a result of an accident, fire, hazard to health or the environment, or other emergency. High pressure water cleaners using 10 L/min or less are recommended.

1.6 Regulatory Requirements

Legislative requirements relating to management of water supplies during drought include:

- *Local Government Act, 1993* - provides the legal framework for the system of local government in NSW. The Act confers service functions on Councils including the provision, management and operation of water supply facilities;
- *Local Government (General) Regulation 2005* – Reg. 137 regulates water supply restrictions;
- *Water Management Act 2000* - the key NSW water legislation for the sustainable management of water. The Act promotes the sharing of responsibility for the sustainable and efficient use of water between water users;
- *Public Health Act 2010 and Regulations* - The main objectives are to promote, protect and improve public health, to control the risks to public health, to promote the control of infectious diseases and to prevent the spread of infectious diseases; and
- *Work Health and Safety Act, 2011 and Regulation*.

Other related guidelines and standards include:

- *Water Supply and Sewerage Strategic Business Planning and Financial Planning Checklist* (NSW Office of Water, 2014);
- *Drought Management Guidelines* (Water Directorate, 2003);
- *AS NZS ISO 31000-2009 Risk management* - Principles and guidelines;
- *Australian Drinking Water Guidelines* (NHMRC/NRMMC, 2004);
- *NSW Health Guidelines for Water Carters* (NSW Health, 2005);
- *Backflow and Cross Connection Prevention Guidelines* (NSW Water Directorate, 2010); and
- *Penalty Notices – Fixed Penalty Handbook for Local Councils* (Infringements Processing Bureau, NSW Police Service).

2. Water Restrictions

Water restrictions are an effective and relatively low cost tool for responding to drought. The drought restriction regime (Table 6) consists of four colour-coded restriction levels with an "Emergency" situation implemented beyond Level 4. Everyday water saving measures discussed in Section 1.5 are outside the water restrictions regime as an ongoing demand management measure.

The triggers to introduce restrictions are based on the storage volume (as a percentage of full supply capacity) in Rocky Creek Dam (RCD). If water saving measures are successful, the demand from both the residential and non-residential sector should reduce although the greatest reduction in the initial restriction levels would be experienced with outdoor residential use where many of the restrictions are focussed. The target demand reduction and average daily target demand at each restriction level is provided in Table 6. The monthly target demand multipliers are provided in Table 7 (based on recent consumption records and the monthly demand pattern given in Appendix 3). The target demand on any given day is the average daily target demand of the water restriction level in force multiplied by the monthly target demand multipliers.

Table 6: Water Restriction Levels, Triggers and Target Demand

Restrictions	Everyday water saving measures	Level 1: Moderate	Level 2: High	Level 3: Very High	Level 4: Severe	Emergency
Trigger to introduce restrictions	-	RCD = 60%	RCD = 45%	RCD = 30%	RCD = 20%	RCD = 10%
Target reduction in demand	0%	5%	15%	25%	35%	45%
Average daily target demand (ML/d)	33.5	31.8	28.5	25.1	21.8	18.4

Table 7: Monthly Target Demand Multipliers

Month	Target Demand Multiplier
January	1.012
February	0.987
March	0.935
April	0.913
May	0.884
June	0.872
July	0.974
August	1.023
September	1.088
October	1.094
November	1.097
December	1.120

Failure to achieve the target demand at a particular level of restriction within a reasonable timeframe (e.g. 3 weeks following introduction of that level) may require adoption of the next more stringent restriction level even if the trigger storage level in RCD has not been reached. The decision to introduce higher level restrictions will be made considering all available information at the time (e.g. severity of existing restrictions, success of communication activities, predicted storage levels, demand patterns and remaining storage, etc.). There may be underlying causes for not reaching target demand and addressing these issues (i.e. ineffective communication strategies) may have greater success than imposing the next level of restrictions.

Restrictions will be lifted to the level above once the trigger for the above restriction level has been reached. The trigger level will generally be maintained for at least 7 days (as long as there is no downward trend) before the restriction level is lifted. In addition, Rous County Council will consider short-term climate forecasts (refer section 3.2) and the level of demand reduction achieved before lifting the restrictions.

Modelling of secure yield against the target demand and trigger levels has confirmed that the 5/10/10 rule can be met by this restriction regime (refer to Appendix 3).

2.1 Water Saving Measures

The water saving measures are presented in the Water Restrictions Guide (Appendix 4) for each water user group and the expected range of water use activities. The restrictions will apply to use of potable water only and include rainwater tanks that are topped-up with potable town water. The use of standalone rainwater/ bore water and/or recycled water is not restricted but must be identified by signage at the location of water use.

The rationale for application of water saving measures is that:

- There is a range of restrictions for all sectors connected to the regional water supply which aims to minimise the impacts on the community while reducing unnecessary water use as the restriction level increases;
- The focus is on reducing outdoor residential water use first as:
    - Public health risks are not increased by reducing outdoor water use;
    - It is not feasible to enforce restrictions on indoor water use and leakage; and
    - Internal water use is likely to also reduce when outdoor drought water restrictions are in place due to greater public awareness.
- Early reductions to residential water use are more severe than for business and commercial premises because:
    - The residential sector accounts for the majority of usage in the region; and
    - There is minimal direct financial impact to the residential sector whereas many business and commercial premises rely on the water supply to continue operation.
- As water restriction levels increase, further opportunities for reduction in residential use will become limited and businesses and commercial premises will be required to reduce water usage; and
- The restrictions are consistent with the current demand management strategy and everyday water saving measures for the region.

Non-residential users will be required to develop a Drought Water Management Plan (Drought WMP) with water savings measures to be approved by the applicable constituent council and Rous County Council (refer Section 2.3).

2.2 Enforcement

The *Local Government Act (1993)* and *Local Government Regulations (2005)* confer on councils the authority to prevent waste or misuse of water generally and specifically to prevent water use "*contrary to a council notice restricting the use of water*" (Section 637 of the Act and Sections 159-160 of the Regulation). A water authority has a number of legal avenues available, including formal warnings, fines and the installation of flow restriction devices to premises for the misuse of water. Rous County Council and the constituent councils will develop an agreed methodology for consistent enforcement of restrictions and tools to be used across the region as part of the Operational Readiness Plan (Appendix 6).

2.3 Drought Water Management Plans for Non-Residential Users

Reducing non-residential water use is an important part of drought management planning particularly when the ability to further reduce residential use is limited. Engaging high water users in the non-residential sector will be especially important in reducing demand and experience in other parts of Australia has shown that targeting the highest water users yields the greatest reductions in demand for the least cost/resources expended.

The target demand reductions for each restriction level (provided in Table 6) are required to be achieved by all water users. Preparing a Drought WMP will assist non-residential water users in taking the appropriate measures to achieve the target demand and comply with water restrictions. Drought WMPs would aim to assist water users to understand:

- How much water they use;
- Where they use water in their business;
- How their water use compares to industry benchmarks (if available);
- Any deficiencies in their system including leaks and waste; and
- Measures to reduce potable water use to comply with restrictions.

The Water Restrictions Guide (Appendix 4) covers a variety of outdoor water use in the non-residential sector and provides a guideline for water saving measures that can be incorporated into Drought WMPs. Other measures may also be required to achieve the target reductions. Drought WMPs will be implemented in accordance with the following principles (refer also Appendix 5):

- Drought WMPs will be mandatory for non-residential customers, commencing at Level 3 Water Restrictions (RCD at 30%);
- An approved Drought WMP and the associated restriction requirements will be enforceable under the *Local Government Act (1993)* via warnings and fines if necessary;
- A percentage reduction target reflecting the target reduction for that water restriction level will apply to the Drought WMPs (Level 3 - 25% reduction, Level 4 – 35% reduction, Emergency – 45% reduction) relative to the pre-drought average consumption (measured either annually or quarterly based on what data is available);
- Drought WMPs will need to set out the actions businesses will take to achieve the target reductions at each restriction level including details of resources, responsibilities, training, budgets, timeframes and self-monitoring and reporting elements;
- Administration of the Drought WMP Program will be conducted by constituent councils within their respective LGAs with support from Rous County Council in terms of developing templates, guidelines and materials;

- All Drought WMPs submitted will be reviewed and audited by council staff to ensure the plans are comprehensive and comply with restriction requirements;
- Monitoring actions may include meter readings and Drought WMP audits; and
- Drought WMPs will be reviewed after periods of water restrictions to assess effectiveness and identify areas for improvement.

Developing consistent, clear guidelines and flexible, user friendly tools will be necessary to ensure effective implementation of Drought WMPs. These materials will be developed as part of the Operational Readiness actions (refer Appendix 6).

3. Operational Readiness

Extreme drought conditions are rare but history has shown that circumstances can change quickly and rainfall can vary substantially. The Operational Readiness Plan lists actions to be taken to ensure that Rous County Council and the constituent councils are prepared at all times to implement a robust, timely, efficient and affordable response to drought conditions.

While the Communication Plan (Section 4) is primarily focused on stakeholder communication, the Operational Readiness Plan contains actions for Rous County Council and constituent council staff to undertake as part of plan implementation. The Communication Plan and Operational Readiness Plan will operate concurrently and there are several linkages between them.

The Operational Readiness Plan (Appendix 6) includes:

- Routine Actions – undertaken on a regular basis and monitored using the quarterly meetings of the Water Supply Liaison Committee. Actions include:
    - Assessing the risk of future water restrictions;
    - Ensuring preparation and approval of communication tools; and
    - Considering any required changes to water supply management; and
- Drought Actions – undertaken when water restrictions are introduced.

The Operational Readiness Plan will be updated on a regular basis to ensure it remains relevant and appropriate.

3.1 Water Supply Monitoring

Rous County Council regularly monitors the water available for supply in the main water sources:

- Water storage levels in Rocky Creek Dam and Emigrant Creek Dam; and
- Daily stream flow in the Wilsons River.

Daily treated water production data for each source is monitored and recorded. Water quality is regularly monitored at each water source, water treatment plant and throughout the distribution network as part of Drinking Water Quality Risk Assessment processes and operational requirements.

During drought, Rous County Council continues this routine monitoring and data are used to balance the supply from the available water sources and determine the need for restrictions. Regular monitoring of dam levels, stream flows, water extraction, treated water production and monitoring of actual water consumption compared to target demands are critical during drought periods. The data obtained from this monitoring provides important feedback on the effectiveness of the various drought response levels and will generally provide the basis for moving between water restriction levels.

The following monitoring actions will also be implemented during drought:

- Draw-down and water quality of any groundwater bores being used;
- Daily water production for all sources will be compared to the respective target water production of the current restriction level;
- Daily supply of water to each of the constituent councils reservoirs will be monitored and reported to each of the constituent councils for advice and action as appropriate;
- The movement of the salt/freshwater interface in the Wilsons River in relation to the intake point; and

- Additional water quality sampling and testing will be carried out depending on the source of water and the identified risks.

The monitoring data collected will be used for:

- Reporting to Rous County Council, constituent councils and regulatory agencies;
- Media releases and public awareness programs;
- Liaising with (and informing) staff, regulators and water users; and
- Determining the timing of water restrictions.

3.2 Seasonal Climate Forecasting

Predicting future climate will assist with operational readiness by evaluating the short-medium term likelihood of a water restriction event (risk assessment). This information can assist in decision making and preparations for restrictions and/or implementing demand reduction practices. Figure 3 provides the steps required for ongoing assessment of climate forecasts and interaction with drought management actions. Tools for climate forecasting are discussed in the following sections. Results of climate forecasts and implications for drought management actions will need to be assessed on a case by case basis.

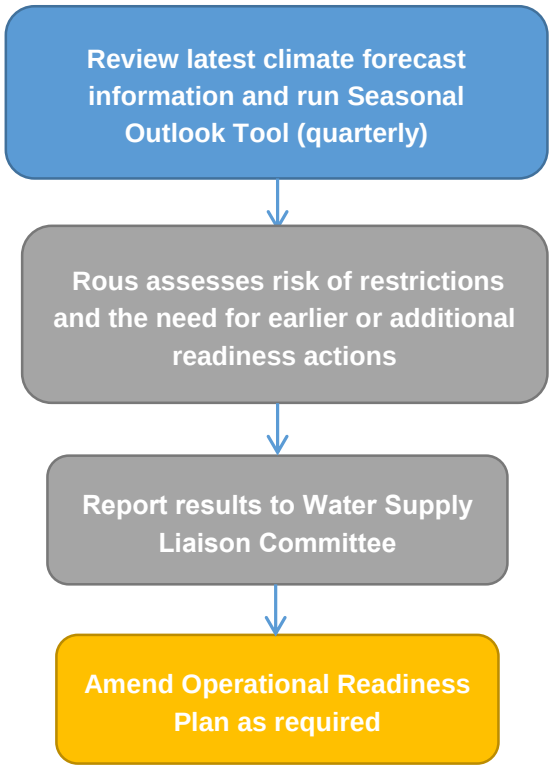

Figure 3: Risk Assessment Process

3.2.1 *Bureau of Meteorology Climate Forecasts*

The Bureau of Meteorology provides a range of climate forecasting tools on their website with outputs available as summary reports, maps, charts, models and videos. Climate forecasts are regularly updated and provide an overview of short-term and long-term forecasts for Australia and in some cases specific locations. Key forecasts are discussed below.

Rainfall and Temperature

The rainfall and temperature climate outlook maps show the likelihood of experiencing wetter/drier (and warmer/cooler) than median weather for the upcoming three months. Outlooks for separate months are also provided. The maps can be used to provide detailed information on the likelihood of certain rainfall scenarios in a specific location. Several locations in the Rous County Council supply region are available including sites close to Rocky Creek Dam. For rainfall, additional information on the likelihood of rainfall exceeding particular totals, as well as the rainfall totals that have a specific chance of occurring are also provided. The probabilities (or chances) are generated from the Predictive Ocean Atmosphere Model for Australia (POAMA) - the Bureau's dynamic climate model. Probability based outlooks should not be used in isolation in risk management and decision making.

El Niño / La Niña Status

The term El Niño refers to the extensive warming of the central and eastern tropical Pacific Ocean which leads to a major shift in weather patterns across the Pacific. This occurs every three to eight years and is associated with drier conditions in eastern Australia. La Niña is the positive phase of the El Niño Southern Oscillation. It is associated with cooler than average sea surface temperatures in the central and eastern tropical Pacific Ocean and generally results in above average rainfall over much of Australia.

The 'ENSO Wrap-Up' (available at http://www.bom.gov.au/climate/enso/) provides a summary of the current status and predicted forecast of the oscillation between El Niño and La Niña conditions. The ENSO Wrap-Up is updated fortnightly and includes a visual graphic of the ENSO Tracker which indicates the current phase and discusses the likely changes in the coming year.

3.2.2 *Short-Term Seasonal Outlook Tool*

A Short-Term Seasonal Outlook Tool has been developed for the Rous County Council supply area to estimate probable storage levels in Rocky Creek Dam over a forecast period of three months. The model uses various data inputs including historical storage level, consumption data and seasonal climate forecasts issued by the Bureau of Meteorology (BOM). This tool has significant limitations largely due to the variable accuracy of BOM weather predictions (refer Appendix 7) and should not be used in isolation. However, when considered alongside other available information, the outlook tool can assist water managers to make predictions about the need for water restrictions and drought management practices in the coming months, thereby increasing operational readiness for drought conditions. For example, if Rocky Creek Dam levels start receding and/or a dry period is forecast, Rous County Council would run the Seasonal Outlook Tool to give an indication of the likelihood and timeframe of the dam reaching a certain level. Using this information in conjunction with other decision making tools, the risk of a water restriction event can be assessed and decisions can be made regarding preparations for restrictions and/or implementing demand reduction practices. From a drought management perspective the tool will be incorporated into the Operational Readiness Plan, with the tool forming a part of the risk assessment process.

Essentially, the tool is based on a rainfall, evaporation and water production balance model. Currently the tool is in the form of a simple Microsoft Excel Spreadsheet that contains the historical data required for analysis including:

- Historic climate data since 1889;
- Historic Rocky Creek Dam storage levels since 1998; and
- Historic Rocky Creek Dam daily production.

In order to run the model and gain a three month projection of storage levels, current input data is required including:

- BOM climate outlook projections; and

- The latest RCD storage level data.

The key visual output of the tool is a graph, illustrating the various forecast scenarios as a range of storage levels, according to the probability of occurrence. The observed recent storage level is shown as well as the storage 'trigger' levels at which water restrictions are imposed. In addition, long-term average monthly storage levels are plotted to display the predicted scenarios in context with historical statistics.

The model was run for the period January to April 2016. Results are shown in and summarised as follows:

- Even for the worst-case rainfall scenario (0-150mm in next 3 months of which the model predicts a 0% chance of occurrence), the model predicts that storage levels in Rocky Creek Dam will not reach 60% (the trigger for Level 1 water restrictions) in this period; and
- Using the most likely rainfall scenario of 500-700mm falling in the next three months, the model predicts that dam storage levels will remain over 80% and this is in line with the long-term average historical storage levels for this time of year.

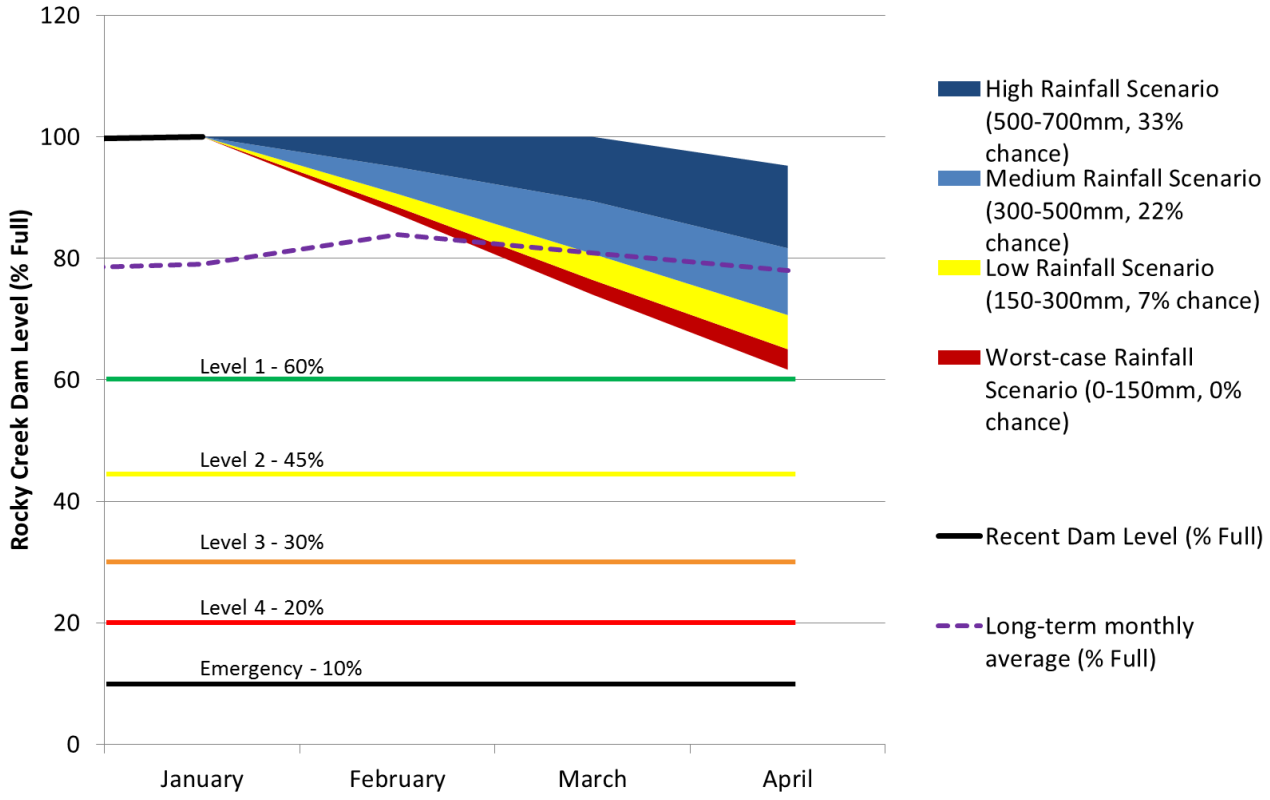

Figure 4: Rous County Council Short-term Outlook Tool Output Graph

For full details of the Outlook Tool including discussion of data requirements, methods and limitations refer to Appendix 7.

3.3 Emergency Water Supplies

During drought conditions, existing water sources will diminish according to the net demand at a particular restriction level. As a drought progresses, it may be necessary to consider potential alternative supplies to supplement existing sources. When drought conditions occur, Rous County Council has a number of water source options that can be implemented with relatively short lead times to slow the rate at which RCD levels drop, and allow more time to implement alternative supply options if required (refer Operating Rules in Table 4).

Once RCD levels reach 20%, emergency supply options may also be required if drought conditions continue. Potential emergency supply options include:

- Increased extraction from the Wilsons River Source outside of the current licence;
- Accessing dead storage in Rocky Creek Dam;
- Groundwater extraction;
- Water cartage from neighbouring supply systems;
- Alternative water sources; and
- Temporary desalination plants.

Each option requires individual lead-in times and activation tasks. Appendix 8 contains information on potential emergency supply options available to supplement the existing Rous County Council sources during drought and the opportunities and limitations of each option.

4. Communication

Effective communication of information between Rous County Council, constituent councils, relevant public authorities, businesses and the community is essential to ensure the successful implementation of water saving measures and in achieving the objectives of this Drought Management Plan.

A community awareness campaign is vital for ensuring the community is made aware of actions that directly impact them, such as water restrictions and any enforcement measures. The community also needs to be given advice on how to minimise the impact of various water restrictions and general advice on saving water around the home. The community will be regularly updated with the status of water restrictions and water supply sources and will be informed of the consequences of not achieving target reductions in water consumption.

Key government agencies include Department of Primary Industries – Water (DPI-Water), Office of Environment and Heritage (OEH), Environmental Protection Agency (EPA) and NSW Health. The relevant agencies will be informed when significant impacts on the community, the environment or other stakeholders are expected as a result of actions arising from implementation of the plan.

There are several components of a successful communication plan including:

- Pre-drought messaging – demand management requirements, everyday water saving measures and the forecast level of risk that water restrictions may need to be introduced in the near future. This prepares the community for the possible introduction of restrictions and encourages reduction in water use where possible to reduce the need for restrictions;
- Regular communication of the level in Rocky Creek Dam and associated restriction levels to be imposed;
- Once restrictions are introduced, provide regular feedback on the effectiveness of restrictions in reducing demand; and
- A range of media and communication tools to convey drought messages to the whole community. Section 4.2 summarises the media and communication tools.

The Communication Plan (Appendix 9) provides actions to be implemented prior to and at each restriction level to ensure successful communication of drought management requirements.

The Communication Plan will be updated on a regular basis to ensure it remains relevant and appropriate and uses up to date communication tools and media.

4.1 Water Supply Liaison Committee

The Water Supply Liaison Committee was established under the *Water Supply Agreement* between Rous County Council and the constituent councils and consists of Rous County Council and constituent Council staff. The group will meet on a quarterly basis (pre-drought conditions) and as required by the Communication Plan once Rocky Creek Dam drops below 70%.

Objectives of the pre-drought meetings are to:

- Discuss the seasonal forecast, current storage levels and implications for drought management over the next three months and longer time frames as forecasting permits;
- Update the communication plan as needed with any new contact details/changes to media, etc.;
- Review the status of the Operational Readiness Plan actions;
- Develop and approve communication tools;

- Discuss any changes to water supply management and implications for drought management (e.g. new water sources, monitoring, yield assessments, etc.); and
- Update and adapt the Drought Management Plan to incorporate the latest knowledge, communication tools, experience and technology in a process of continuous improvement.

Once Rocky Creek Dam drops below 70%, the committee (or a sub-committee) will also arrange and discuss:

- Media and communication tools required by the Communication Plan;
- Status of the Communication Plan actions; and
- Status of the Operational Readiness Plan actions.

4.2 Media and Communication Tools

4.2.1 *Media Releases*

A media release is a brief written summary or update, alerting the local media about a matter for editorial comment and free publication. Media releases will be submitted electronically in an editable format. Timing for publishing of media releases will aim to give the community at least 2 weeks' notice of the introduction of water restrictions and at least 1 week notice for a change in restriction level. Potential media outlets are listed in Appendix 9.

A standard template for drought media releases will be produced as part of the Operational Readiness Plan to ensure efficiency, consistency and expedite approval. The template will contain an outline of the required content including:

- RCD storage level;
- Water restriction level in place;
- Dates when water restrictions come into effect;
- A summary list of water saving measures required for that level and detail of how to access the full list of water saving measures (e.g. link to webpage, contact number/email);
- Target demand reduction for that level;
- Update on current trends in demand including acknowledgement of any reductions achieved so far;
- Enforcement details; and
- Details of the seasonal climate forecast.

4.2.2 *Town Signs*

The town signs referred to in the communication plan are Roads and Maritime Services and Council approved road signs, informing the community and visitors to the region that water restrictions are in place. They are to be installed at pre-approved locations on main roads at major town/village entry roads and other key locations in the region. Rous County Council will design and produce roads signs in consultation with constituent councils as part of the Operational Readiness Plan. Individual councils will be responsible for approving, installing, maintaining and adjusting signs in their LGA.

4.2.3 *Webpages*

Existing Rous County Council and Council webpages provide a tool for information to be communicated in real-time and also provides links to further information, contact details and tips on water saving measures.

Rous County Council and the constituent councils will be responsible for maintaining individual webpages and links to further information. For ease of administration, Rous County Council will maintain a central Water Restrictions page that is regularly updated and councils can provide a link to this page.

The Water Restrictions webpage will contain information about everyday water saving measures, a summary of forecasted weather conditions, potential water restrictions and contact details for further information. As the RCD storage levels drop to below 70% capacity, the webpage will be updated with key drought information as listed for media releases.

The webpage will also contain links to:

- Water restrictions guidance for residential use;
- Water restrictions guidance for business and commercial use;
- Summary of seasonal outlook;
- Storage level information; and
- This Drought Management Plan.

4.2.4 *Social Media*

Social media such as Facebook and Twitter present opportunities to quickly and easily expand the reach of drought management messaging in the community. Social media is used by a large cross-section of the community, but is particularly useful in targeting those members of the community that may not necessarily be reached by traditional newspaper and radio media. Cross-promotion across the different media types will increase the use of social media (e.g. newspaper/radio advertisements would refer members of the public to the social media sites).

Rous County Council will utilise social media to provide a means for information to be communicated in real-time and disseminate updates about water storage levels and water restriction levels, as well as providing relevant links to further information, contact details and tips on water saving measures.

4.2.5 *Printed Leaflets*

Printed leaflets provide another layer in the community awareness campaign to further emphasise the drought message and have been a standard tool in past droughts. Leaflets can provide a brief message alerting water users about the need for water restrictions including:

- Water restriction level in place;
- Summary of water restrictions;
- Water saving tips and how to access detailed water restrictions information;
- Target demand reduction for the restriction level; and
- Details of enforcement and applicable fines.

Due to the economic and environmental cost of printed materials and the prevalence and popularity of online messaging, the distribution of printed leaflets will only be considered at higher restriction levels. Printed leaflets would be distributed to households and businesses via Australia Post or a private contractor. Leaflets can also be included with water bills if billing cycles coincide with water restriction periods. In addition, leaflets can be left at council offices, tourism offices, holiday premises and shopping centres.

5. Monitoring and Evaluation

5.1 Drought Management Plan Monitoring and Adaptive Management

Monitoring and evaluation are essential tools for the implementation and ongoing improvement of this plan. The Water Supply Liaison Committee will oversee the plan implementation and ensure the pre-drought and on-going actions defined in the Operational Readiness Plan are completed. The Committee will also be responsible for assessing if the plan is meeting its objectives and how best to adapt the plan to incorporate the latest knowledge, experience and technology in a process of continuous improvement.

5.2 Post-Drought Review

A post-drought review will be undertaken within 3 months of the end of a drought to examine the effectiveness of actions taken. The review will be undertaken when water restrictions have been lifted and storage levels have returned to above 60% for over a month and will include:

- A review of drought monitoring data;
- An evaluation of both supply side and demand side actions, including their effectiveness and timing for each system;
- An assessment of the impact of drought management actions (including water restrictions) on various stakeholders incorporating feedback from the community, business and government agencies; and
- An assessment of the impact of drought management actions on Rous County Council and constituent councils in terms of costs, resourcing and operations.

Based on the results of the post-drought review the Drought Management Plan may need to be revised to address any identified issues and improve management of future droughts.

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Appendix 1: Development of the Drought Management Plan

Development of the Drought Management Plan

A review and update of the 2009 *Regional Water Management Strategy* was undertaken during 2015/16. As part of this review a working group consisting of Rous County Council and constituent council staff was formed to oversee the development of a new integrated Drought Management Plan for the region. This Plan aims to provide a consistent restriction regime for all water supplies with a more streamlined approach to implementation across the region.

There were a number of stages in developing this plan. The major stages of the plan development are shown in Figure 5.

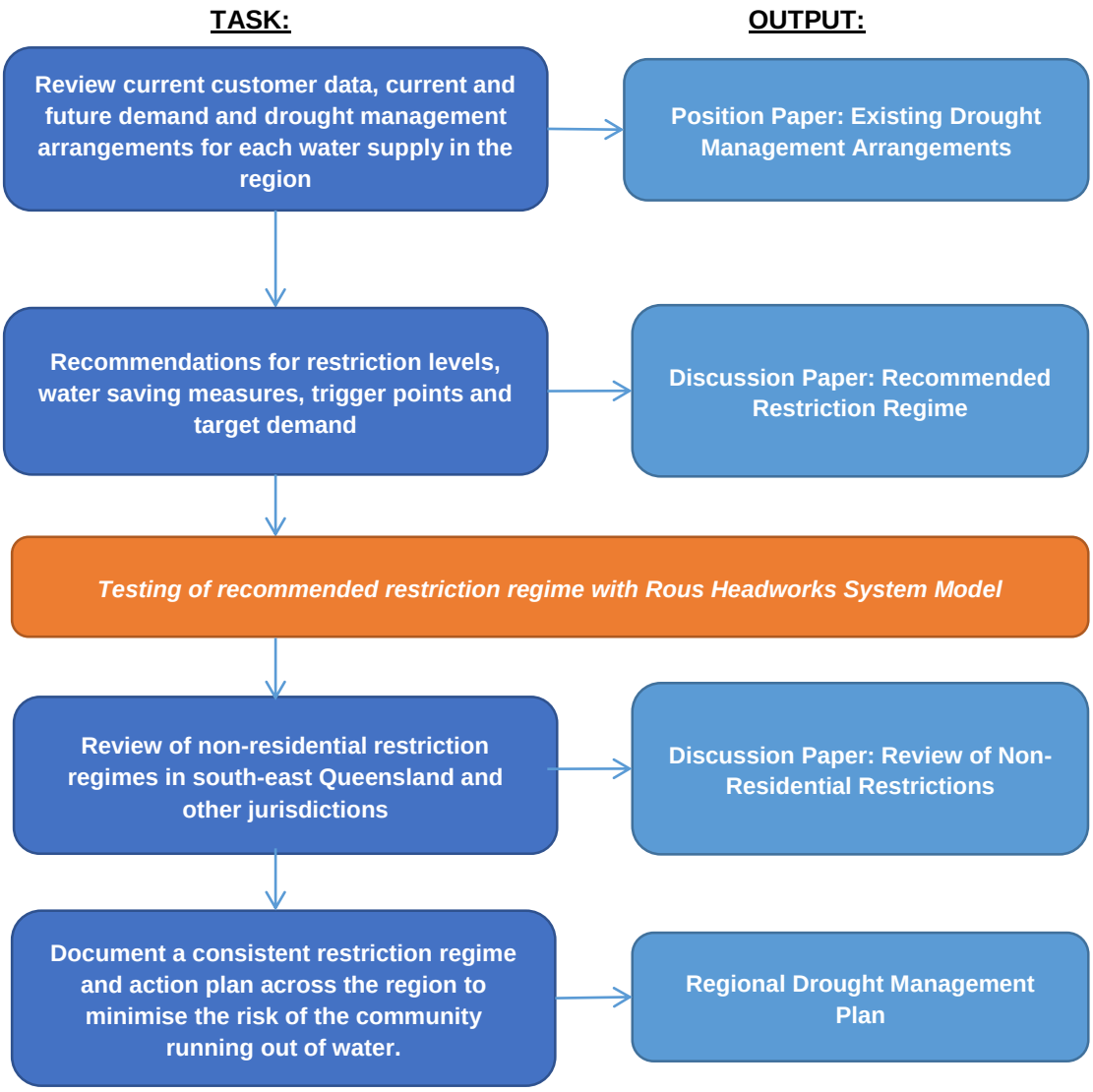

Figure 5: Regional Drought Management Plan Development Process

Appendix 2: Additional Background Information

Recycled Water and Stormwater Resources

Provision of recycled water for non-potable supply to households and for irrigation of public open space and agricultural uses is underway in the region to varying degrees and is likely to contribute to reduction in overall water demand across the region in the future, including during drought periods. During prolonged drought water restrictions will mean that inflows to sewage treatment plants will be reduced and this may reduce water available for non-potable supply.

All houses in new developments in the Ballina and Lennox Head area since 2003 have a dual water supply system or dual reticulation in place. At present the water in the second water supply (lilac piping and taps) has potable water supplied to it. Recycled water is expected to be supplied through the system, to homes with dual water supplies in Lennox Head in 2016 and the Ballina Precinct in 2017, hence reducing the demand on the potable water supply.

Treated effluent is also currently used for agricultural uses and irrigation of playing fields and public open space within the study area. Table 8 presents reported rates of effluent reuse by each local council for the 2014/15 financial year. Stormwater from urban areas is not captured to supplement reticulated water supply except for private rainwater tanks.

Table 8: Reuse Statistics for each LGA

LGA	Treated effluent reuse in 2014/15 (ML/yr)	Treated effluent reuse in 2014/15 (%)
Ballina	273	9%
Byron	478	16%
Lismore	34	1%
Richmond Valley	425	22%

Source: NSW Office of Water (2015)

Private reticulated services and non-reticulated services

Within the study area, properties not connected to town water supplies rely on household rainwater tanks, bore water or direct river extraction. The current number of residential properties and population not connected to a town water supply within the region has been estimated from the number of dwellings reported in the 2011 Census (ABS, 2016). Unconnected properties account for approximately 27% of dwellings in the study area.

Table 9: Population Not Connected to a Town Water Supply

Area	Dwellings (2011) [1]	Occupancy Ratio [1]	Connected Properties (2011)	Estimate of Unconnected Properties (2011)	Estimate of Unconnected Persons (2011)
Ballina	18,024	2.4	12,999	5,025	12,060
Byron	14,455	2.4	10,091	4,364	10,474
Lismore	18,467	2.4	12,896	5,571	13,370
Richmond Valley	10,019	2.4	6,355	3,664	8,794
Rous Retail	included above	2.4	2,205	-	-
Region	60,965	2.4	44,546	16,419	39,406

1. Source: ABS Census (2011)

In times of prolonged drought, rainwater tanks may be depleted or groundwater/surface water extraction may be restricted and these private water supplies may purchase potable water from town water supplies via water carters.

Water carters can access filling stations within the study area as follows:

- Rous County Council - The potable water carters using the Rous filling station network are licensed by Rous County Council and registered as a food industry by NSW Health. There are 13 tankers who deliver potable water with average tanker size of 12,000 L. There are also nine other non-potable users (e.g. under-boring, vacuum excavation, Council maintenance) with average tanker size between 1,000 - 2,000 L. There are 11 filling stations connected to the Rous County Council network and one in Casino, Wardell and Nimbin, all operated by Rous County Council. Rous County Council has provided data on water carter usage indicating the average filling station demand (since 2006 when the system commenced) is 33 ML/a with a maximum of 60 ML in 2009/10;
- RVC has provided data on usage by the water carter operating in Casino indicating the average demand was 13 ML/a with a maximum of 18 ML in 2009/10. This carter has a private standpipe and three 20,000 L tankers;
- Ballina Shire Council has recently revised its Backflow Prevention Policy to require all users purchasing water from Council's water supply to provide their own metered standpipe with appropriate backflow prevention suitable to the risk/usage. No approvals have been issued to date. All water carters source water from Rous County Council filling stations; and
- All water carters in the Byron Shire use the Rous County Council filling stations. Council has developed a draft policy to prevent bulk water supply from Council's network (including Mullumbimby and Billinudgel).

The average total external bulk sales in the study area is estimated to be less than 50 ML/a. The maximum demand (experienced in 2009/10) is expected to be less than 80 ML/a (Hydrosphere Consulting, 2012a).

Highest Water Users

The majority of potable town water consumption in the Rous County Council supply area is from residential use (approximately 76% residential to 24% non-residential based on 2014/15 demand). There is limited information on non-residential customer types, however a breakdown of the of the region's top non-residential water use categories (consuming > 5ML/a, 52 businesses) is provided in Figure 6 (note this excludes Richmond Valley regional water supply customers as data was not available). Tourism businesses account for almost half of the top users' water consumption (47%). Aged care and education account for 15% and 13% consumption respectively. Hospitals and hospitality businesses (clubs, pubs and food and beverage) comprise 8% of top water user consumption each. Mixed commercial business (4%), shopping centres (2%), public pools (2%) and car washes (1%) make up the remaining water consumption of these top 52 water users.

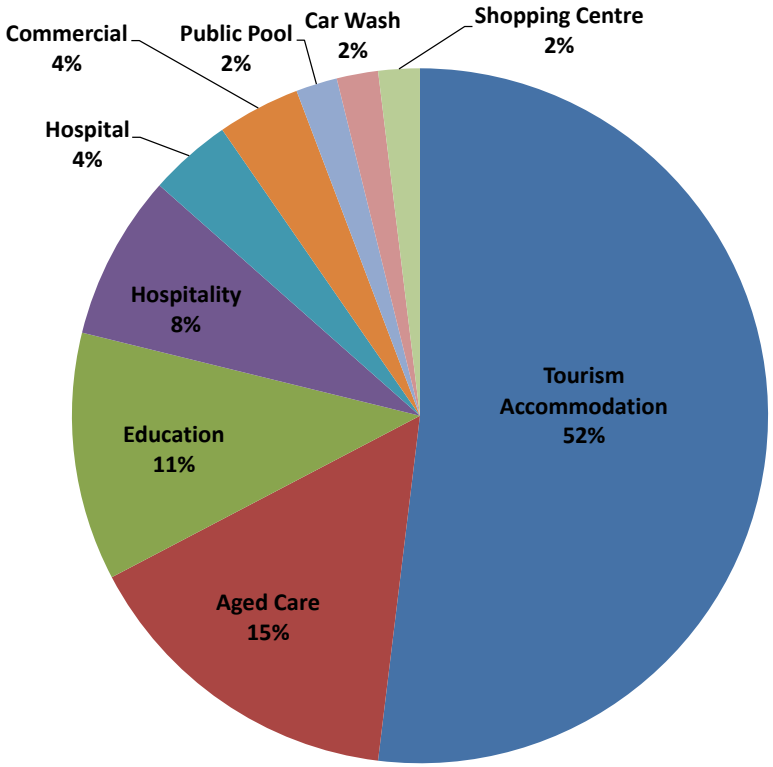

Figure 6: Relative Consumption of the Top water users in Ballina, Lismore and Byron LGAs (>5 ML/a)

Average and Minimum Potable Water Requirements

A breakdown of the total amount of water supplied by the Rous County Council bulk supply system over the last seven years is provided in Table 10 including retail sales and unmetered water. There were no periods of water restriction during this timeframe and the data is indicative of average, unrestricted demand.

Table 10: Total Demand – Rous County Council Bulk and Retail Sales and Unmetered Water

ML/a	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	Average
Raw Water Extraction	10,525	11,782	11,142	11,127	11,077	11,521	11,182	11,194
Bulk Sales	9,663	10,789	9,677	9,293	9,708	10,045	9,869	9,863
Retail Sales	721	759	676	752	738	757	768	739
Filling Stations[2]	-	-	-	-	26	42	39	36
Unmetered Water	141	234	789	1,082	605	676	506	576
Unmetered water as % of Bulk Water	1.3%	2.0%	7.1%	9.7%	5.5%	5.9%	4.5%	5%

1. Rous County Council identified major leaks in 2010 and 2011

2. Data available from 2012/13 onwards

Source: Hydrosphere Consulting (2012a) and updated with recent data from Rous County Council.

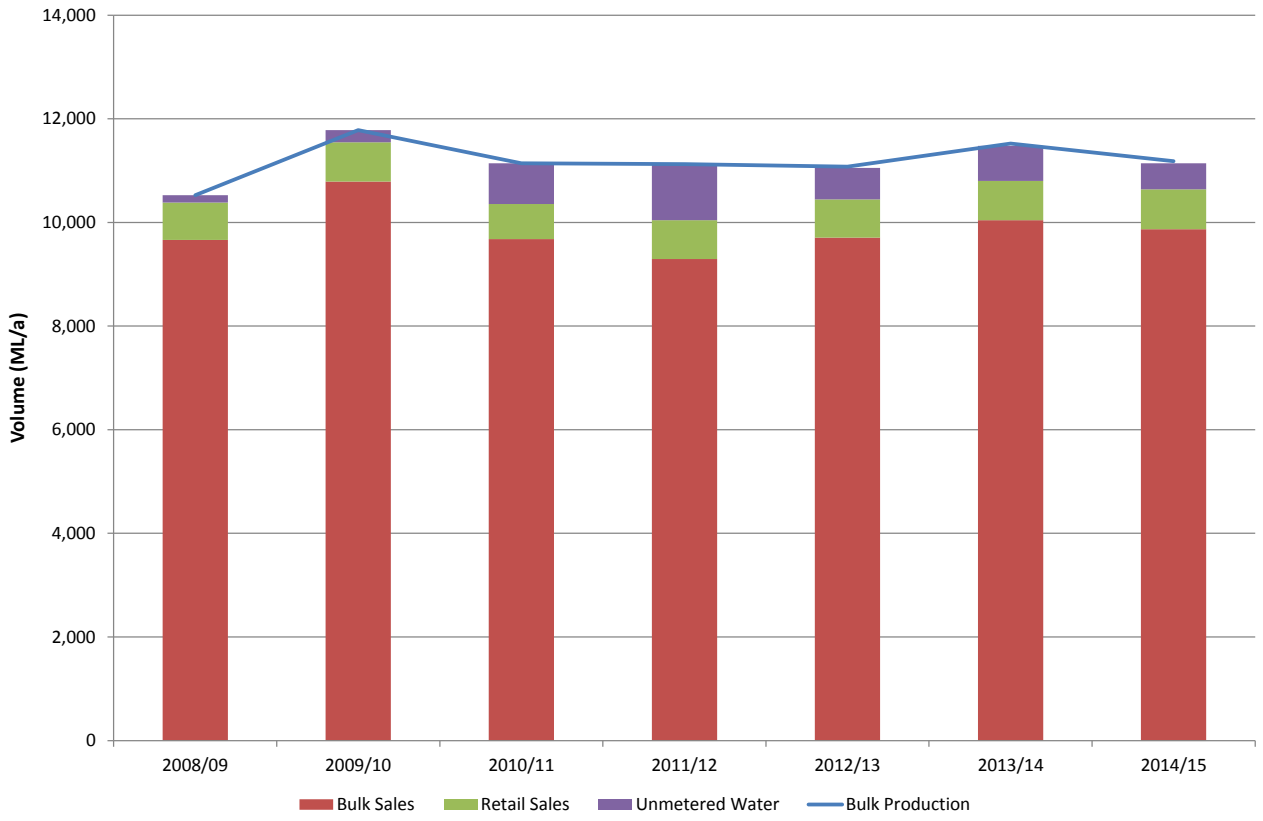

Figure 7: Rous County Council Total Demand

It is necessary to understand the minimum water supply (health and sanitation) requirements when planning for drought. The minimum residential water requirements are based on the minimum water quantity required for domestic use set by the World Health Organisation (WHO, 2005):

- Drinking: 4 L/person/day;
- Cooking: 3 L/person/day;
- Laundry: 7 L/person/day;
- Showers: 35 L/person/day; and
- Toilets: 21 L/person/day.

Water for laundry and toilets may not necessarily be of a potable standard but would need to meet secondary contact requirements as a minimum. The total minimum water requirement (potable and non-potable) is 70 L/person/day. This is assumed to apply to both urban and rural customers. Rainwater tanks are expected to fail in times of drought and rural customers may source water from Council's reticulated supplies or water carters.

The minimum non-residential water requirement is unknown, due to the diversity of non-residential properties. For the purposes of calculating minimum water requirements:

- Residential water usage is assumed to reduce to 70 L/person/day during a drought;
- Public parks and playing fields are assumed to have a 50% reduction in average daily usage;
- All other non-residential customers (including Rous County Council retail customers) are assumed to have a 50% reduction in average daily usage; and
- No allowance has been made for fire-fighting requirements.

The assumed minimum water requirements for each system during drought are shown in Table 11. These figures include an allowance for water losses (based on historical data). The total minimum water requirements for the Rous County Council supply area has been estimated to be just under 12 ML/day or 36% of normal demand. The target demand at Emergency Level restrictions is 55% of normal demand.

Table 11: Minimum Water Requirements

Category (kL/day)	Byron	Ballina	Lismore	RVC	Rous Retail	Total Rous Supply Area
Residential	1,582	2,595	2,199	462	-	6,839
Non-Residential	1,011	628	1,151	249	1,011	4,051
Unmetered water allowance (10%)	259	322	335	71	101	1,089
Total Minimum Water Requirements	2,852	3,546	3,685	783	1,112	11,978
Normal demand						33,500
Minimum water requirements as a percentage of the average volume of water supplied						36%

As part of its drought management planning, Byron Shire Council has installed an emergency supply pipeline to Rous County Council's bulk supply at St Helena which can supply up to 0.5 ML/d to Mullumbimby apart from the high level areas. If the Laverty's Gap water source is exhausted, it would be necessary to truck water into these areas. Currently, there is no formal agreement between Rous and BSC regarding emergency supply provision although this level of additional demand on the regional supply is expected to be feasible at emergency level restrictions.

Climate

The region experiences a mild subtropical climate with high intensity rainfall. The majority of rain falls in the summer and autumn months. Mean annual rainfall is reported to be 1,163 mm with an average number of 98 rain days per year from 2002 - 2015 (BOM, 2015). On average, January is the wettest month and July and September are the driest. Average maximum daily temperatures range from 30°C in summer to 20°C in winter (BOM, 2015).

Seasonal variability in rainfall and evaporation at Lismore is shown in Figure 8. Late summer-early autumn typically has the highest rainfall totals and late winter-early spring has the lowest. Evaporation rates generally exceed rainfall from July to January.

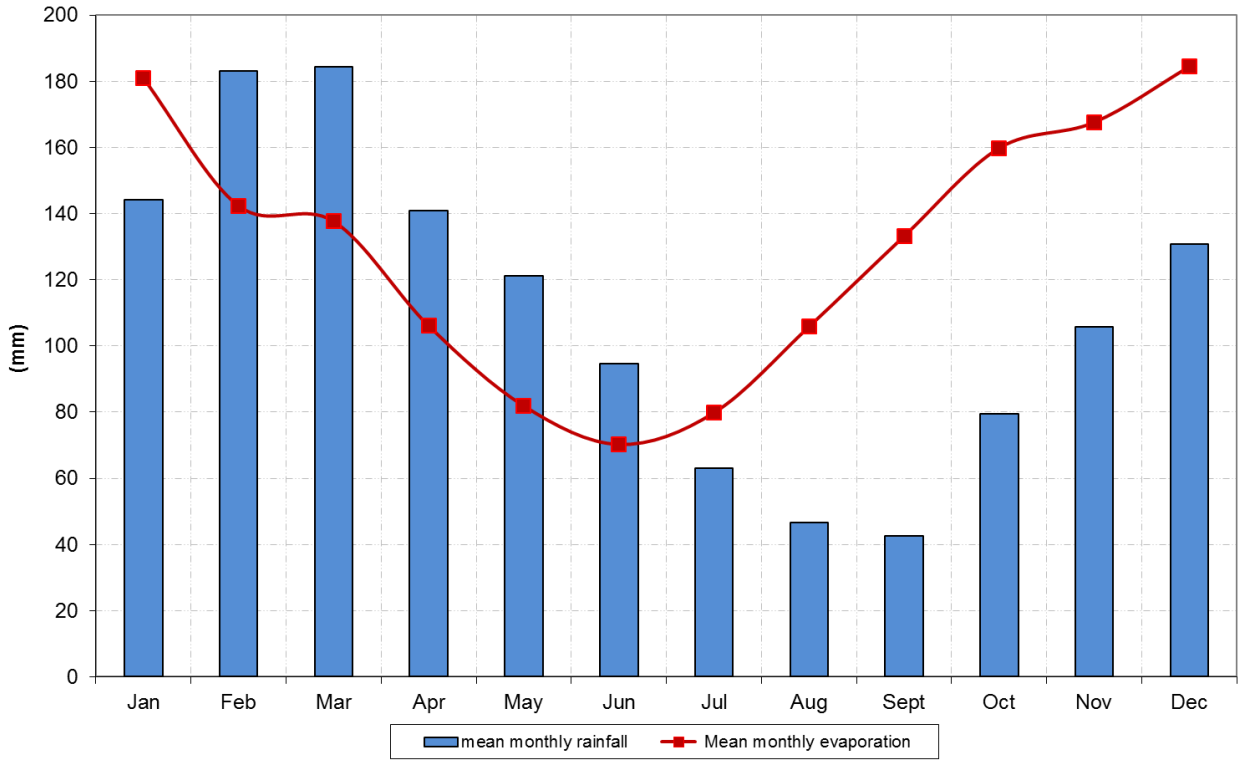

Figure 8: Average Monthly Rainfall and Evaporation at Lismore 1970 – 2016

Source: SILO (2016)

A high degree of year-to-year variation in rainfall is typical of the Rous County Council supply area. Periods of reduced rainfall are often associated with El Niño events and increased rainfall with La Niña events. For example, the region experienced a significant reduction in rainfall between late 2002 and mid-2003 and again in 2007 in association with persistent and recurrent El Niño events. In 2002, 845mm of rainfall was recorded in Lismore. In contrast, in 1974, with the advent of a strong La Niña event, 2,019mm of rain was recorded which coincided with a major flood in Lismore.

Figure 9 shows monthly rainfall totals for Lismore for extreme wet year (1974), recent dry years (2002, 2003 and 2007) compared to the average monthly rainfall from 1970 to 2016, highlighting the large variability in rainfall that can occur from month to month and year to year.

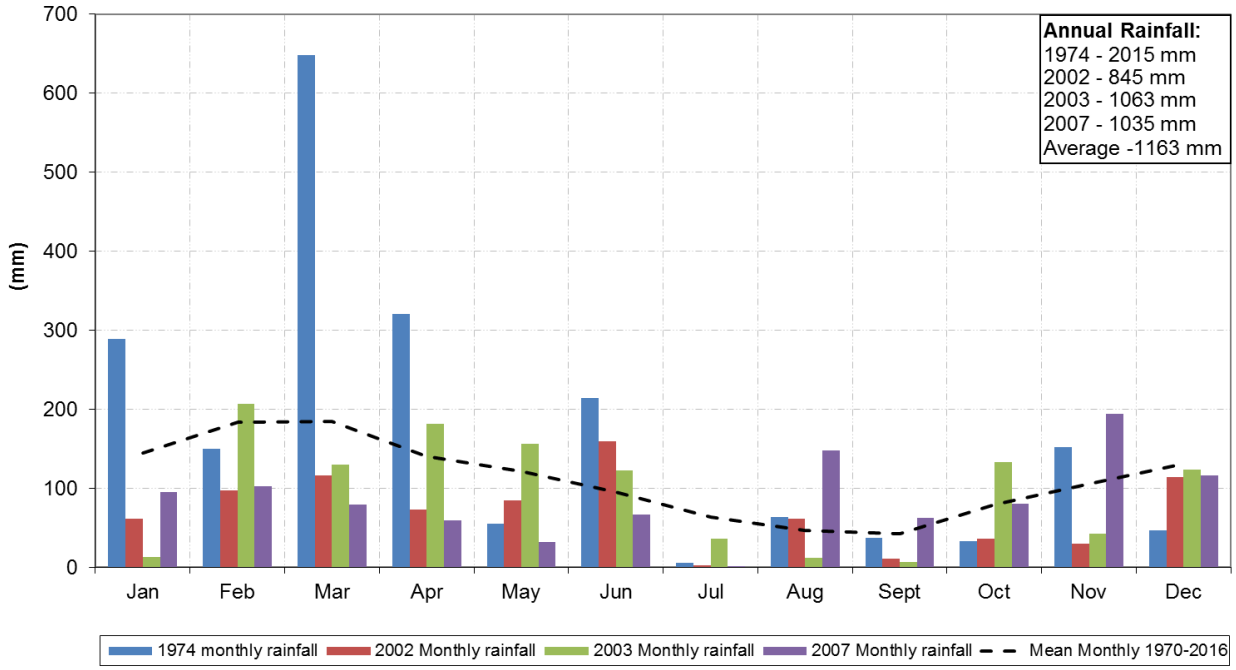

Figure 9: Mean Monthly Rainfall at Lismore 1974 to 2016 and Long Term Average Monthly Rainfall

Source: SILO (2016)

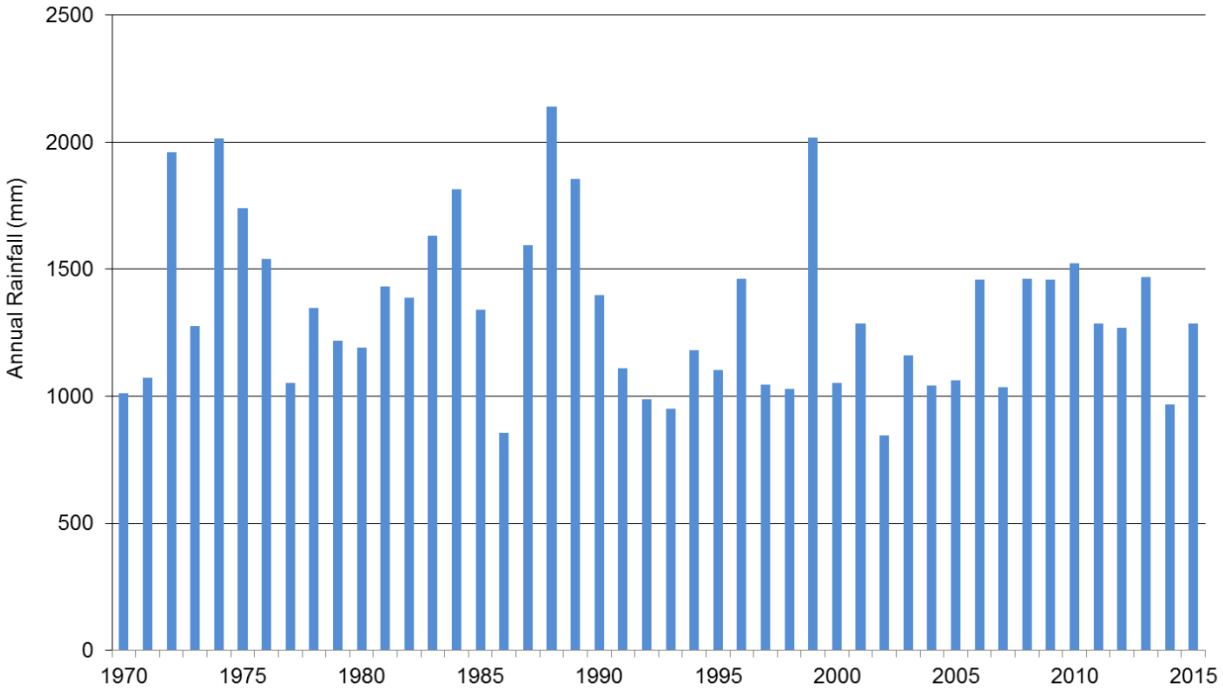

Figure 10: Annual Rainfall Totals for Lismore 1970 to 2016

Source: SILO (2016)

Water Storages and Previous Droughts

The relationship between water height (metres below full supply level) and volume of the storage are shown below for Rocky Creek Dam (Figure 11) and Emigrant Creek Dam (Figure 12).

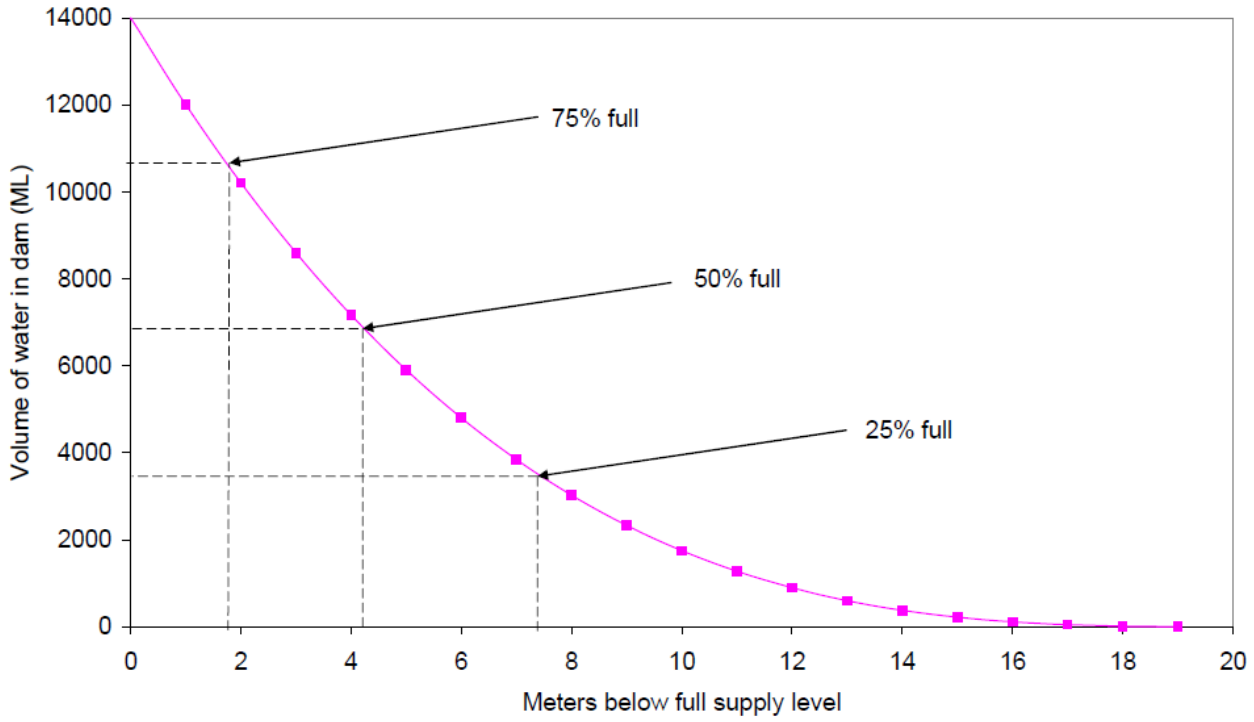

Figure 11: Rocky Creek Dam Storage Volume versus Water Level

Source: NSW Department of Commerce (2009)

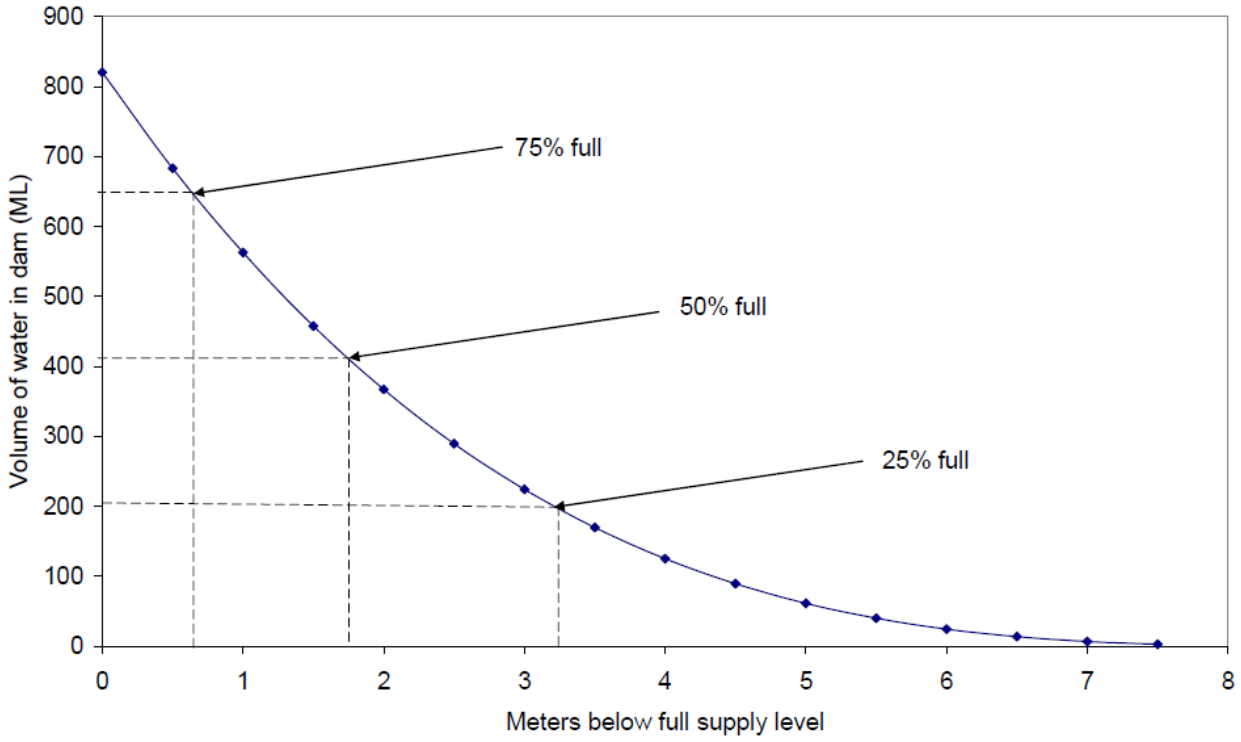

Figure 12: Emigrant Creek Dam Storage Volume versus Water Level

Source: NSW Department of Commerce (2009)

Figure 13 shows the recorded storage level in RCD, daily rainfall, water demand and water restrictions from 2002-2015. Since 2002, two drought periods have occurred in the region requiring water restrictions to be applied. The most severe drought occurred from mid-2002 to May 2003, where storage levels dropped to 25% in RCD and restrictions were ramped up to Level 5 over a number of months. Restrictions were in place for a total of 206 days (approximately 10 months). The other restriction period occurred in 2007 when storage level dropped below 60% and Level 1 restrictions where introduced for a 156 day period.

Figure 14 illustrates the observed storage response and demand changes during the 2002/03 drought when water restrictions were introduced (note that continuous storage data was not available prior to July 2002). Drawdown of the RCD storage was evident from July 2002, coinciding with below average rainfall conditions and higher than average water demand experienced in July 2002. As water restrictions were introduced and ramped up from Level 1 to Level 5, a corresponding decrease in demand was observed, although there was an approximate lag period of one month after water restrictions were introduced before reductions in demand were observed. In February 2003, RCD reached its lowest storage level (24%) and Level 5 restrictions were implemented. Demand for that month decreased to 455 ML which equated to a 45% reduction in demand from the long-term average demand for February. This indicates that water restrictions were being implemented by the community and are an effective means to reduce demand levels during drought. From late February 2003, rainfall increased and storage levels in RCD began to increase, reaching 100% capacity by June 2003. As water restrictions were eased and lifted altogether from June 2003, demand steadily increased back to average levels.

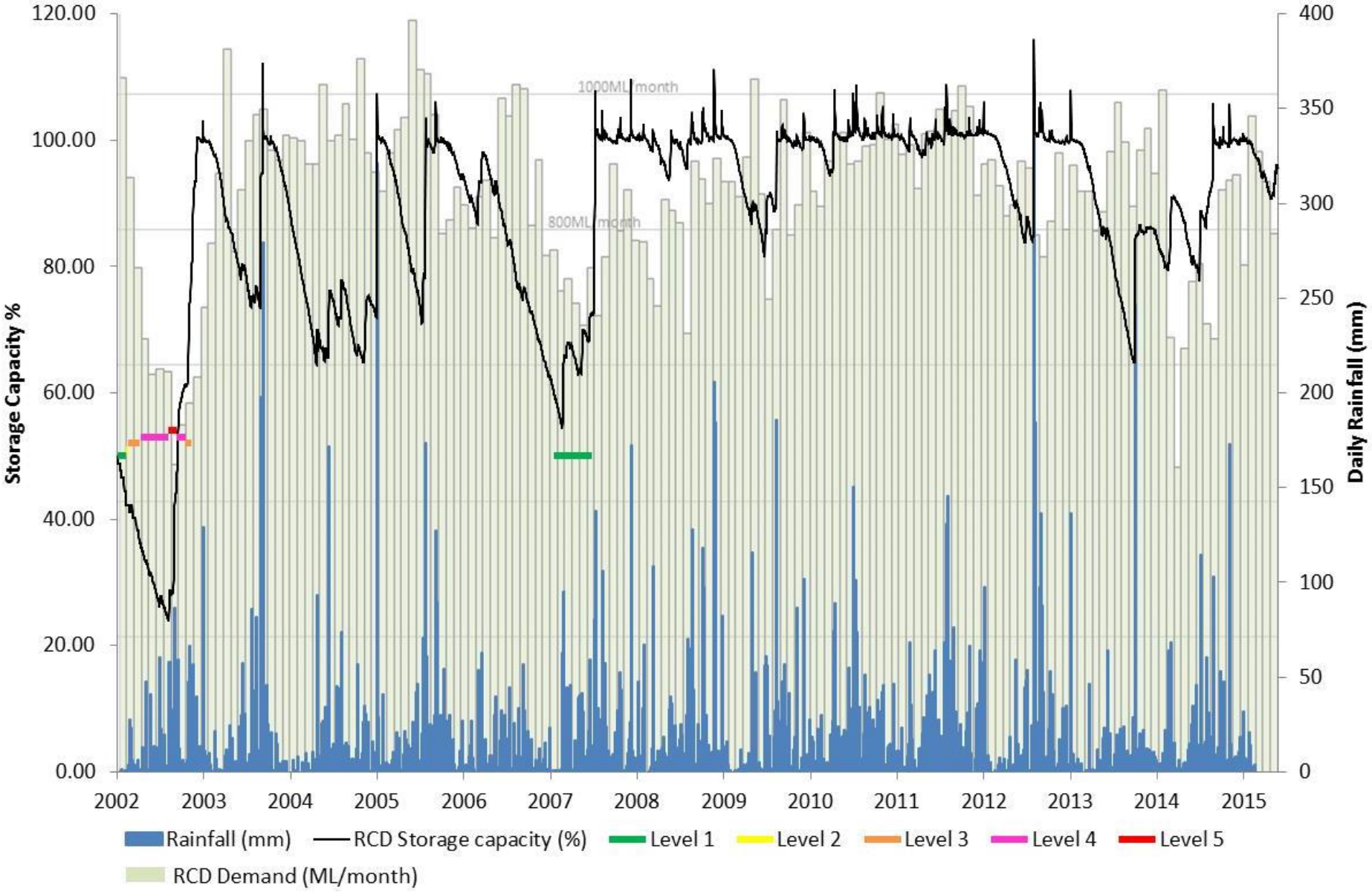

Figure 13: Rocky Creek Dam Water Demand, Restriction Periods, Storage Level and Rainfall from 2002-2015

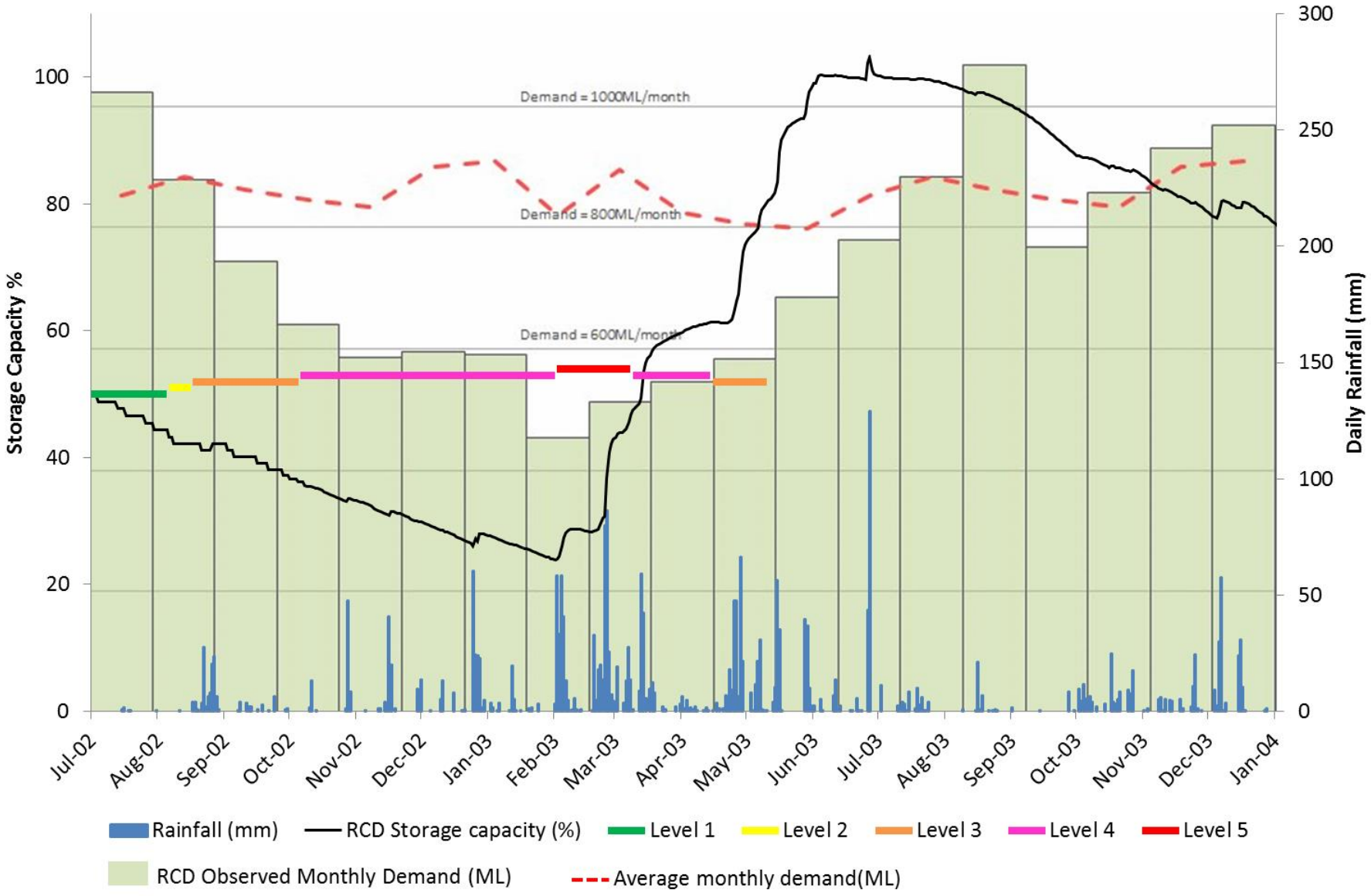

Figure 14: Rocky Creek Dam Water Demand, Restriction Periods, Storage Level and Rainfall for the 2002/03 Drought

Table 12 shows the duration of each restriction level (in days) presenting both the worsening drought phase and easing of drought conditions and lifting of restrictions.

Table 12: Days at each Restriction Level during 2002/03 Drought

Water Restriction Level	1	2	3	4	5	4	3	Restrictions Lifted
	Worsening drought →					Easing drought →		Drought broken
Days at each level	36	11	50	119	35	37	26	Total = 206 days

The Demand Management Plan (Rous County Council, 2012) reported that following the 2002/2003 drought there was reduction in per connection water consumption which, despite the growth in population, has tempered the demand on the region's water resources. An ongoing reduction in fluctuations in seasonal water demand was also noted and attributed to permanent demand management (largely outdoor) measures (Figure 15).

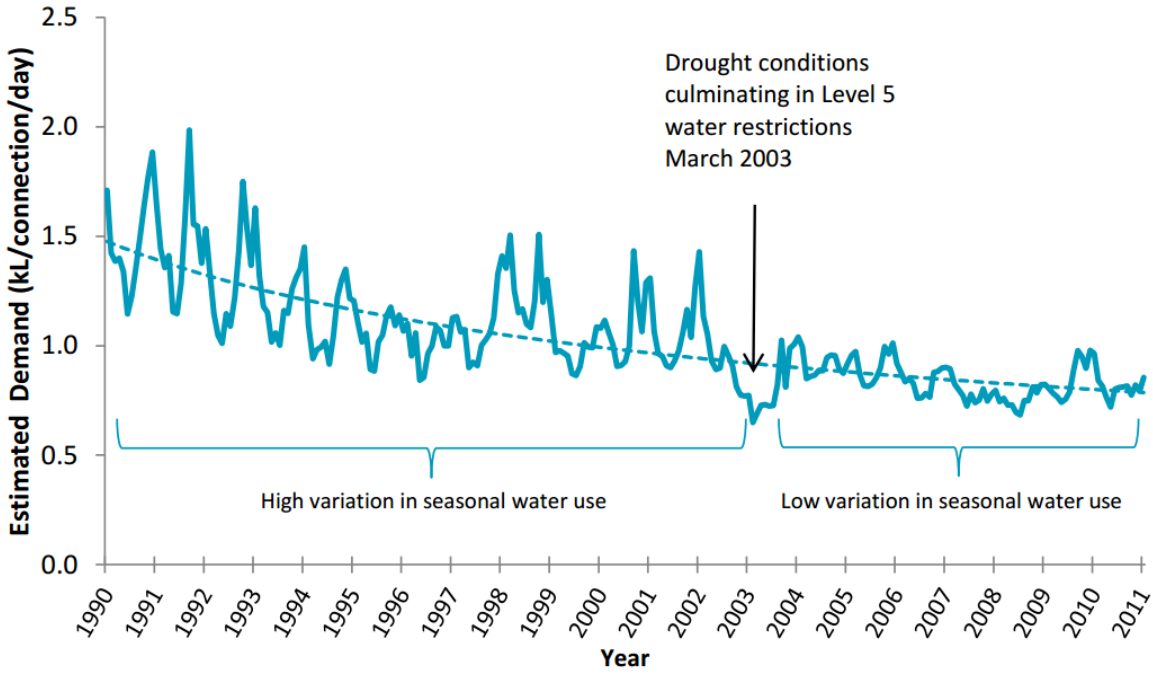

Figure 15: Per Connection Water consumption (1990-2011)

Source: Rous County Council (2012)

Figure 16 illustrates the observed storage response and demand changes during the 2007 drought. Drawdown of the RCD storage began around January 2007, with below average summer rainfall and slightly higher than average demand, also attributable to dry conditions and high outdoor water use. A reduction in demand below average was observed in May June and July of 2007, prior to water restrictions being introduced and shows that the community may start conserving water in response to dry periods even before restrictions are mandatory. The RCD 60% storage capacity trigger was reached in August 2007 and Level 1 water restrictions were introduced. Demand in the first month of water restrictions was slightly increased compared to the preceding month, however very low rainfall during this month was a likely factor, increasing the need for essential water. Rainfall in September resulted in storage levels increasing to over 60%, however restrictions remained in place (with corresponding decreased demand levels) until substantial summer rain pushed levels to 100% capacity. Again this data indicates that water restrictions are an effective means to reduce demand levels during drought.

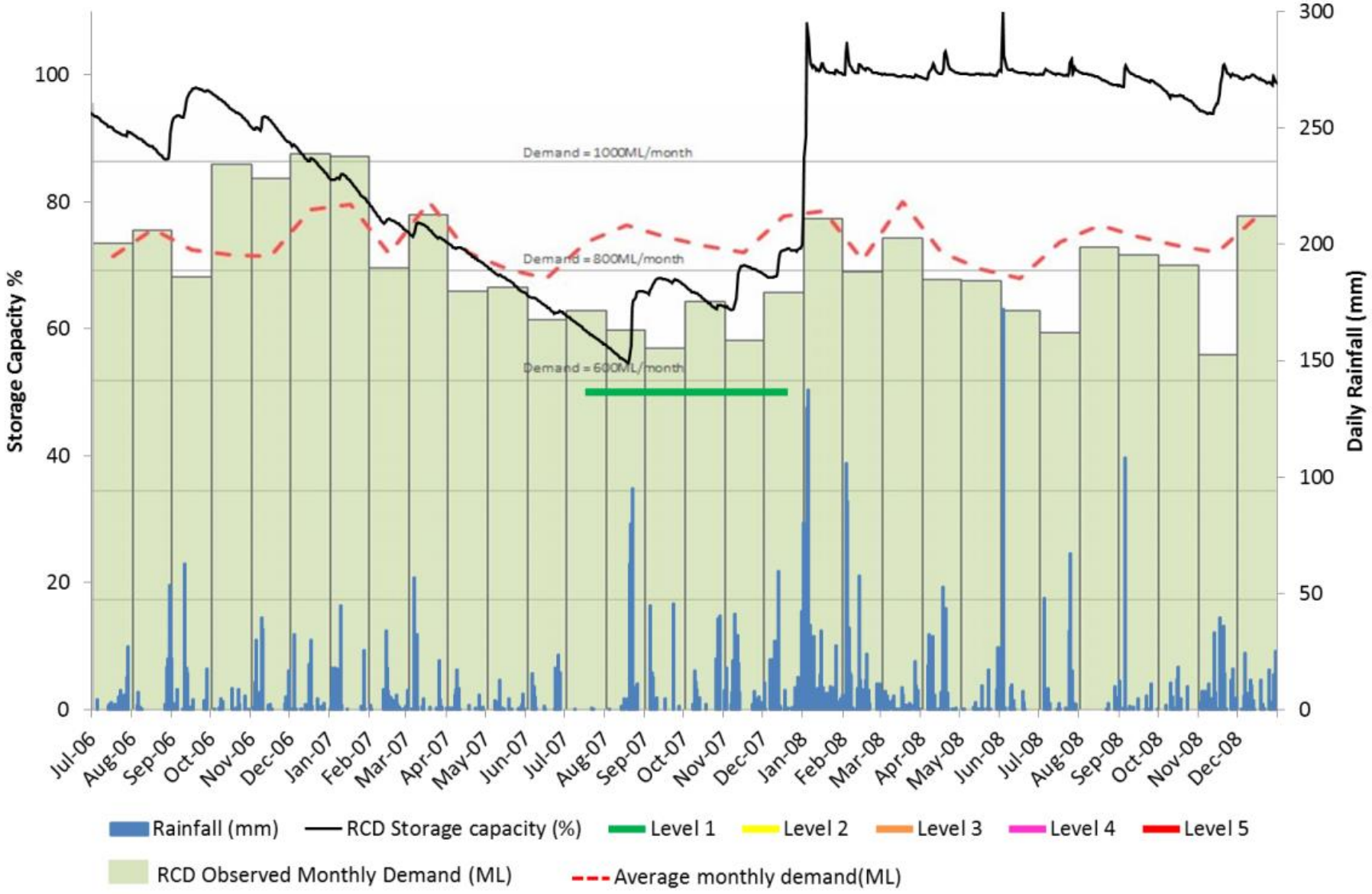
Storage Capacity %
Daily Rainfall (mm)
Demand = 1000ML/month
Demand = 800ML/month
Demand = 600ML/month
0
20
40
60
80
100
0
50
100
150
200
250
300
Jul-06
Aug-06
Sep-06
Oct-06
Nov-06
Dec-06
Jan-07
Feb-07
Mar-07
Apr-07
May-07
Jun-07
Jul-07
Aug-07
Sep-07
Oct-07
Nov-07
Dec-07
Jan-08
Feb-08
Mar-08
Apr-08
May-08
Jun-08
Jul-08
Aug-08
Sep-08
Oct-08
Nov-08
Dec-08
Rainfall (mm)
RCD Storage capacity (%)
Level 1
Level 2
Level 3
Level 4
Level 5
RCD Observed Monthly Demand (ML)
Average monthly demand(ML)

Figure 16: Rocky Creek Dam Water Demand, Restriction Periods, Storage Level and Rainfall for the 2007 Drought

Appendix 3: Review of Drought Management Plan - Hydrology Modelling Report

Appendix 4: Water Restrictions Guide

Table 13: Water Saving Measures at each Restriction Level

ID	Restriction Type[1]	Level 1: Moderate	Level 2: High	Level 3: Very High	Level 4: Severe	Emergency
Residential and Non-Residential Premises – Indoor Use						
I1	Showers, toilets, taps, washing machines	All users are requested to conserve water wherever possible.	All users are requested to conserve water wherever possible.	All users are requested to conserve water wherever possible.	Essential uses only.	Essential uses only.
Residential Urban and Rural Premises – Outdoor Use						
R1	Watering of established gardens	Watering cans or buckets permitted at any time. Irrigation systems can be used for a maximum of 15 minutes and hand held hoses can be used for 1 hour every second day, between 4.00pm and 9.00am on odd or even days matching house numbering system. All hand held hoses must be fitted with an on/off nozzle. Other irrigation and unattended hoses banned.	Watering cans or buckets permitted at any time. Irrigation systems can be used for a maximum of 15 minutes and hand held hoses can be used for 30 minutes every second day, between the hours of 4.00pm and 9.00am on odd or even days matching house numbering system. All hand held hoses must be fitted with an on/off nozzle. Other irrigation and unattended hoses banned.	Watering cans or buckets permitted at any time. Use of hand held hoses for a maximum of 10 minutes, every second day, between 4.00pm and 9.00am on odd or even days matching house numbering system. All hand held hoses must be fitted with an on/off nozzle. Other irrigation and unattended hoses banned.	Not permitted.	Not permitted.
R2	Watering of established lawns	Not permitted.	Not permitted.	Not permitted.	Not permitted.	Not permitted.

ID	Restriction Type[1]	Level 1: Moderate	Level 2: High	Level 3: Very High	Level 4: Severe	Emergency
R3	Watering of new turf, lawns and Gardens	Watering-in permitted for 1 hour only on the day of establishment. Then 1 hour daily between 4.00pm and 9.00am for 14 days after the date of establishment.	Watering-in permitted for 1 hour only on the day of establishment. Then 30 minutes daily between 4.00pm and 9.00am for 7 days after the date of establishment.	Watering-in permitted for 30 minutes only on the day of establishment. Then 15 minutes every second day, between 4.00pm and 9.00am on odd or even days matching house numbering system for 7 days after the date of establishment.	Not permitted.	Not permitted.
R4	Topping up and refilling of existing swimming pools and spas	Topping up permitted between 4.00pm and 9.00am using hand held hose fitted with an on/off nozzle. Emptying and refilling of pools/spas not permitted.	Topping up permitted between 4.00pm and 9.00am using hand held hose fitted with an on/off nozzle. Emptying and refilling of pools/spas not permitted.	Topping up permitted if required to reduce structural damage between 4.00pm and 9.00am using hand held hose fitted with an on/off nozzle. Emptying and refilling of pools/spas not permitted.	Topping up permitted if required to reduce structural damage between 4.00pm and 9.00am using hand held hose fitted with an on/off nozzle. Emptying and refilling of pools/spas not permitted.	Not permitted.
R5	Filling of new swimming pools and spas	Permitted.	Permitted. Rainwater tank must be used for pool/spa top-up.	Permitted if required to avoid structural damage. Prior approval of Council is required. Rainwater tank must be used for pool/spa top-up.	Prior approval of council is required.	Not permitted.
R6	Water play tools, toys and slides	Not permitted.	Not permitted.	Not permitted.	Not permitted.	Not permitted.

ID	Restriction Type[1]	Level 1: Moderate	Level 2: High	Level 3: Very High	Level 4: Severe	Emergency
R8	Pet care/washing	Provision of drinking water permitted. Washing pets and pet pens with bucket or hand held hose fitted with an on/off nozzle permitted between 4.00pm and 9.00am.	Provision of drinking water permitted. Washing pets and pet pens with bucket or hand held hose fitted with an on/off nozzle permitted between 4.00pm and 9.00am.	Provision of drinking water permitted. Washing pets and pet pens with bucket permitted between 4.00pm and 9.00am. Use of hoses not permitted.	Provision of drinking water permitted. Washing pets and pet pens with bucket permitted between 4.00pm and 9.00am. Use of hoses not permitted.	Provision of drinking water permitted.
R9	Fountains, ponds, water features, outdoor aquaria	Operation or top up not permitted except to maintain fish life. Installation and filling of new facilities not permitted.	Operation or top up not permitted except to maintain fish life. Installation and filling of new facilities not permitted.	Operation or top up not permitted except to maintain fish life. Installation and filling of new facilities not permitted.	Operation or top up not permitted except to maintain fish life. Installation and filling of new facilities not permitted.	Not permitted.
R10	Washing of driveways, paved areas, rooves, walls, windows and paths	Permitted prior to sale or lease of property only with Council approval. Not permitted for any other reason except for health and safety. Efficient high pressure, low flow rate cleaners with trigger control are to be used.	Permitted prior to sale or lease of property only with Council approval. Not permitted for any other reason except for health and safety. Efficient high pressure, low flow rate cleaners with trigger control are to be used.	Not permitted except for health and safety reasons by registered cleaning businesses only.	Not permitted.	Not permitted.
R11	Car/vehicle washing	Watering cans or buckets permitted at any time. Hand held hoses permitted between 4.00pm and 9.00am on odd or even days matching house numbering system. Efficient high pressure, low flow rate cleaners with trigger control are to be used if possible.	Watering cans, buckets or hand held hoses permitted for 10 minutes only between 4.00pm and 9.00am on odd or even days matching house numbering system. Efficient high pressure, low flow rate cleaners with trigger control are to be used if possible.	Efficient high pressure, low flow rate cleaners with trigger control permitted for 5 minutes between 4.00pm and 9.00am on odd or even days matching house numbering system.	Not permitted.	Not permitted.

ID	Restriction Type[1]	Level 1: Moderate	Level 2: High	Level 3: Very High	Level 4: Severe	Emergency
R12	Washing of boats, boat motors and trailers used in salt water	Permitted for 10 minutes at any time.	Permitted for 10 minutes at any time.	Permitted for 5 minutes at any time.	Not permitted.	Not permitted.
Public Facilities (including Sports Clubs) – Outdoor Use						
P1	Public swimming pools	Topping up permitted. Log of water use required. Emptying and refilling of pools not permitted.	Topping up permitted between 4.00pm and 9.00am using hand held hose fitted with an on/off nozzle. Log of water use required. Emptying and refilling of pools not permitted.	Topping up permitted, if required to reduce structural damage or ensure filter efficiency, between 4.00pm and 9.00am using hand held hose fitted with an on/off nozzle. Log of water use required. Emptying and refilling of pools not permitted.	Topping up permitted, if required to reduce structural damage or ensure filter efficiency, between 4.00pm and 9.00am using hand held hose fitted with an on/off nozzle. Log of water use required. Emptying and refilling of pools not permitted.	Not permitted.
P2	Public water play facilities	Operation or top up not permitted unless water is recirculated. Log of water use required.	Operation or top up not permitted unless water is recirculated. Log of water use required.	Operation or top up not permitted unless water is recirculated. Log of water use required.	Not permitted.	Not permitted.
P3	Irrigation of golf fairways	Not permitted.	Not permitted.	Not permitted.	Not permitted.	Not permitted.
P4	Cricket pitches, bowling greens, golf greens, sports fields	Sprinklers or hand held hoses permitted 1 hour per day between 5.00am and 7.00am. Alternative times to be approved by Council.	Sprinklers or hand held hoses permitted 30 minutes per day between 5.00am and 7.00am. Alternative times to be approved by Council.	Sprinklers or hand held hoses permitted 15 minutes per day between 5.00am and 7.00am. Alternative times to be approved by Council.	Not permitted.	Not permitted.
P5	Public outdoor showers, beach showers and outdoor taps	Permitted.	Permitted.	Permitted.	Not permitted.	Not permitted.

ID	Restriction Type[1]	Level 1: Moderate	Level 2: High	Level 3: Very High	Level 4: Severe	Emergency
P6	Public gardens, council parks and reserves	Sprinklers or hand held hoses permitted 1 hour per day between 5.00am and 7.00am. Alternative times to be approved by Council.	Sprinklers or hand held hoses permitted 30 minutes per day between 5.00am and 7.00am. Alternative times to be approved by Council.	Not permitted.	Not permitted.	Not permitted.
Business and Commercial Premises – Outdoor Use						
B1	Existing swimming pools and spas	Topping up permitted. Log of water use required. Emptying and refilling of pools not permitted.	Topping up permitted between 4.00pm and 9.00am using hand held hose fitted with an on/off nozzle. Log of water use required. Emptying and refilling of pools not permitted.	Topping up permitted, if required to reduce structural damage or ensure filter efficiency, between 4.00pm and 9.00am using hand held hose fitted with an on/off nozzle. Log of water use required. Emptying and refilling of pools not permitted.	Topping up permitted, if required to reduce structural damage or ensure filter efficiency, between 4.00pm and 9.00am using hand held hose fitted with an on/off nozzle. Log of water use required. Emptying and refilling of pools not permitted.	Not permitted.
B2	New swimming pools and spas	Filling permitted.	Permitted. Rainwater tank must be provided for pool/spa top-up.	Permitted if required to avoid structural damage or ensure filter efficiency. Prior approval of Council is required. Rainwater tank must be provided for pool/spa top-up.	Prior approval of council is required.	Not permitted.
B3	Water play facilities, water parks	Operation or top up not permitted unless water is recirculated. Log of water use required.	Operation or top up not permitted unless water is recirculated. Log of water use required.	Operation or top up not permitted unless water is recirculated. Log of water use required.	Not permitted.	Not permitted.

ID	Restriction Type[1]	Level 1: Moderate	Level 2: High	Level 3: Very High	Level 4: Severe	Emergency
B4	Fountains, ponds, water features, outdoor aquariums	Operation or top up not permitted except to maintain fish life. Installation and filling of new facilities not permitted.	Operation or top up not permitted except to maintain fish life. Installation and filling of new facilities not permitted.	Operation or top up not permitted except to maintain fish life. Installation and filling of new facilities not permitted.	Operation or top up not permitted except to maintain fish life. Installation and filling of new facilities not permitted.	Not permitted.
B5	Irrigation of sports grounds, playing fields and golf fairways	Not permitted.	Not permitted.	Not permitted.	Not permitted.	Not permitted.
B6	Cricket pitches, tennis courts, bowling greens and golf greens	Sprinklers or hand held hoses permitted 1 hour per day between 5.00am and 7.00am. Alternative times to be approved by Council.	Sprinklers or hand held hoses permitted 30 minutes per day between 5.00am and 7.00am. Alternative times to be approved by Council.	Sprinklers or hand held hoses permitted 15 minutes per day between 5.00am and 7.00am. Alternative times to be approved by Council.	Not permitted.	Not permitted.
B7	Garden watering	Sprinklers permitted 1 hour per day between 5.00am and 7.00am. Council approval required for alternative times.	Sprinklers or sprays permitted 30 minutes per day between 5.00am and 7.00am. Council approval required for alternative times.	Not permitted.	Not permitted.	Not permitted.
B8	Watering of established lawns	Not permitted.	Not permitted.	Not permitted.	Not permitted.	Not permitted.
B9	Watering of new turf, lawns and gardens	Watering-in permitted for 1 hour only on the day of establishment. Then 1 hour daily between 4.00pm and 9.00am for 14 days after the date of establishment.	Watering-in permitted for 1 hour only on the day of establishment. Then 30 minutes daily between 4.00pm and 9.00am for 7 days after the date of establishment.	Watering-in permitted for 30 minutes only on the day of establishment. Then 15 minutes every second day, between 4.00pm and 9.00am on odd or even days matching house numbering system for 7 days after the date of establishment.	Not permitted.	Not permitted.

ID	Restriction Type[1]	Level 1: Moderate	Level 2: High	Level 3: Very High	Level 4: Severe	Emergency
B10	Pet care, animal husbandry	Provision of drinking water permitted. Washing animals with bucket or hand held hose fitted with an on/off nozzle permitted between 4.00pm and 9.00am. Cleaning of pens with high pressure cleaning unit permitted.	Provision of drinking water permitted. Washing animals with bucket or hand held hose fitted with an on/off nozzle permitted between 4.00pm and 9.00am. Cleaning of pens with high pressure cleaning unit permitted.	Provision of drinking water permitted. Washing animals with bucket or hand held hose fitted with an on/off nozzle permitted between 4.00pm and 9.00am. Cleaning of pens with high pressure cleaning unit permitted.	Provision of drinking water permitted. Washing animals with bucket or hand held hose fitted with an on/off nozzle permitted between 4.00pm and 9.00am. Cleaning of pens with high pressure cleaning unit permitted.	Provision of drinking water permitted.
B11	Commercial car wash	Efficient high pressure, low flow rate cleaners with trigger control are to be used. Log of water use required.	Efficient high pressure, low flow rate cleaners with trigger control are to be used. Log of water use required.	Water must be recirculated and efficient high pressure, low flow rate cleaners with trigger control are to be used. Log of water use required.	Water must be recirculated and efficient high pressure, low flow rate cleaners with trigger control are to be used. Log of water use required.	Not permitted.
B12	Motor vehicle dealers, car detailing/repairs	Efficient high pressure, low flow rate cleaners with trigger control are to be used. Log of water use required.	Buckets permitted. Efficient high pressure, low flow rate cleaners with trigger control permitted every second day between 6.00am and 8.00am on odd or even days matching house numbering system Log of water use required.	Buckets permitted. Efficient high pressure, low flow rate cleaners with trigger control permitted every second day between 6.00am and 8.00am on odd or even days matching house numbering system Log of water use required.	Not permitted.	Not permitted.

ID	Restriction Type[1]	Level 1: Moderate	Level 2: High	Level 3: Very High	Level 4: Severe	Emergency
B13	Washing of buses, taxis, food transport, emergency services, garbage vehicles	Efficient high pressure, low flow rate cleaners with trigger control are to be used. Log of water use required.	Buckets permitted. Efficient high pressure, low flow rate cleaners with trigger control permitted every second day between 6.00am and 8.00am on odd or even days matching house numbering system Log of water use required.	Buckets permitted. Efficient high pressure, low flow rate cleaners with trigger control permitted every second day between 6.00am and 8.00am on odd or even days matching house numbering system Log of water use required.	Not permitted.	Not permitted.
B14	Washing of driveways, paved areas, rooves, walls and paths	Permitted prior to sale or lease of property only with Council approval. Not permitted for any other reason except for health and safety. Efficient high pressure, low flow rate cleaners with trigger control are to be used.	Permitted prior to sale or lease of property only with Council approval. Not permitted for any other reason except for health and safety. Efficient high pressure, low flow rate cleaners with trigger control are to be used.	Not permitted except for health and safety reasons by registered cleaning businesses only.	Not permitted.	Not permitted.
B15	Window cleaning	Buckets permitted at any time. Hand held hoses or high pressure cleaners not permitted.	Buckets permitted at any time. Hand held hoses or high pressure cleaners not permitted.	Buckets permitted at any time. Hand held hoses or high pressure cleaners not permitted.	Buckets permitted at any time. Hand held hoses or high pressure cleaners not permitted.	Not permitted.
B16	Road works and land development	Permitted for compaction and dust suppression only.	Permitted for essential compaction and dust suppression only. Encourage use on non-potable supplies.	Permitted for essential compaction and dust suppression only. Encourage use on non-potable supplies.	Permitted for essential compaction and dust suppression only. Encourage use on non-potable supplies.	Not permitted.
B17	Cleaning of construction sites	Efficient high pressure, low flow rate cleaners with trigger control are to be used.	Efficient high pressure, low flow rate cleaners with trigger control are to be used.	Efficient high pressure, low flow rate cleaners with trigger control are to be used.	Efficient high pressure, low flow rate cleaners with trigger control are to be used.	Not permitted.

ID	Restriction Type[1]	Level 1: Moderate	Level 2: High	Level 3: Very High	Level 4: Severe	Emergency
B18	Market gardens, orchards, nurseries, commercial flower gardens, turf farms	Sprinklers or sprays permitted 2 hours per day between 5.00am and 7.00am and/or 5.00pm and 7.00pm. Council approval required for alternative times.	Sprinklers or sprays permitted 1 hour per day between 5.00am and 7.00am and/or 5.00pm and 7.00pm. Council approval required for alternative times.	Sprinklers or sprays permitted 30 minutes per day between 5.00am and 7.00am and/or 5.00pm and 7.00pm. Council approval required for alternative times.	Sprinklers or sprays permitted 30 minutes per day between 5.00am and 7.00am and/or 5.00pm and 7.00pm. Council approval required for alternative times.	Not permitted.
All Non-Residential Uses						
N1	All non-residential potable water use	All users are required to conserve water in accordance with the Level 1 water saving measures.	All users are required to conserve water in accordance with the Level 2 water saving measures. Water management plan to be prepared.	Consumption in accordance with approved Water Management Plan only.	Consumption in accordance with approved Water Management Plan only.	Not permitted.

1. The restrictions apply to use of potable water only and include rainwater tanks that are topped-up with potable town water. The use of standalone rainwater/ bore water and/or recycled water is not restricted but must be identified by signage at the location of water use

Appendix 5: Recommendations for Drought Water Management Plans

Recommendations for Drought Water Management Plans

To improve the success of the Drought WMP implementation, the following actions are recommended:

- It will be necessary to develop clear, consistent guidelines supported by tools and resources;
- Templates will provide flexibility for participants in the selection of water saving opportunities;
- Where possible, subsidies will be offered to support the program, possibly linked to other funding initiatives (e.g. demand management programs);
- There may be a need to consider exemptions or lower reduction in water use where it is not possible to achieve the target reductions (e.g. for health and/or safety reasons). A Drought WMP would be required to justify this;
- Businesses will be encouraged to develop and build cooperative personal relationships with their regulatory counterpart (through ongoing demand management programs);
- Reporting requirements will be streamlined where possible;
- Recognition of businesses achieving water savings will be provided;
- Auditing will be required and a random selection auditing process (based on results of fortnightly meter readings) is considered to provide the best use of resources;
- The Drought WMPs will be underpinned by credible enforcement mechanisms. Enforcement actions will be agreed between all councils and enforced equally across the region;
- There is a need for an agreed strategy to deal with non-residential users who after a certain period (say 1 month after Drought WMPs come into effect) are not reducing demand to the target demand levels. Actions will begin with advice and persuasion (which will usually be sufficient to bring the large majority 'on board') and to escalate to enforcement only where this approach fails. Such a strategy may start with advice, escalate to warnings and include fines or installing flow restrictors in their service connections; and
- The difficulties experienced in other parts of Australia associated with premises containing multiple tenants (shopping centres) or premises housing the general public (tourism operations) will be acknowledged and addressed.

Drought WMP Guidelines will include:

- General Drought WMP information including: why they are required, who is required to prepare them, what needs to be included, what resources are available and who will approve them;
- Roles and responsibilities;
- Details of Drought WMP preparation;
- Drought WMP submission process;
- Auditing and reporting; and
- Enforcement and penalties process.

A standard Drought WMP template/checklist may assist non-residential users in participating in the scheme. The template would need to be flexible enough to cater for a variety of typical industrial, commercial, tourist, sporting club and other non-residential users. It will be important for non-residential users to have access to suitably trained council staff to assist in completion of Drought WMPs.

The following will be included in a Drought WMP template:

- Details of the type and size of business;

- Segregation of estimated water use into categories such as: process, cleaning, food preparation, bathroom/toilet, laundry, heating and ventilation and outdoor use;
- Details of plumbing fittings (e.g. number of toilets, showers, taps etc.);
- Details of water efficient appliances and fittings (e.g. dual flush toilets, WELS 3 star or more rated fittings and appliances);
- Details of any alternative water supply (e.g. rainwater tanks, stormwater harvesting, bore water etc.);
- Results of an overnight leakage check;
- Baseline water use;
- Water saving targets during drought (based on water restriction target demands) or alternative proposed targets with justification (e.g. health and safety requirements);
- Site-specific water saving measures to achieve the target reduction in water use;
- Resources, responsibilities and training;
- Budgets and timeframes; and
- Self- monitoring and reporting of water use.

Appendix 6: Operational Readiness Plan

Table 14: Operational Readiness Actions

RCD Level	Actions	Timing	Responsibilities
Preliminary	Ongoing water storage, streamflow, production monitoring	Daily	Rous County Council
	Prepare and update seasonal climate forecast and required information for communication materials	Quarterly	Rous County Council
	Design and prepare communication materials	By January 2017	Water Supply Liaison Committee
	Prepare/update water restriction webpages and social media pages	By January 2017	Water Supply Liaison Committee
	Design, approve and install road signs	By June 2017	Water Supply Liaison Committee
	Develop restriction enforcement regime and identify training requirements for Council staff	By June 2017	Water Supply Liaison Committee
	Prepare Drought WMP templates, guidelines and resources for non-residential customers	By June 2017	Water Supply Liaison Committee
	Review options and determine a preferred emergency source. Identify activation requirements and implementation timeframes. Amend operational readiness plan to incorporate activation actions.	By June 2017	Rous County Council
	Bathymetric survey of RCD to confirm dead storage capacity	By June 2017	Rous County Council
95%	Additional supply from Wilsons River Source and Emigrant Creek Dam	RCD at 95%	Rous County Council
	Commence river extraction monitoring	Daily	Rous County Council
70%	Prepare activation of existing groundwater bores (Woodburn bores, Converys Lane and Lumley Park bores): • Prepare bores for pumping; • Complete test pumping for quantity and quality; and • Determine expected supply contribution and treatment requirements.	RCD at 70%	Rous County Council
	Commence compliance training of Council staff	RCD at 70%	Rous County Council and constituent councils

RCD Level	Actions	Timing	Responsibilities
60% Level 1	Drought WMP guidance provided to non-residential customers. Materials available online.	When Level 1 restrictions are introduced	Constituent councils
	Drought WMPs to be prepared by non-residential customers for approval and implementation at Level 3.	Within 2 months of introduction of Level 1 restrictions	Constituent councils
	Council approval of Drought WMPs for non-residential customers.	Prior to introduction of Level 3 restrictions	Constituent councils
	Additional supply from existing Woodburn and Converys Lane and Lumley Park bores.	When Level 1 restrictions are introduced	Rous County Council
	Commence monitoring of groundwater extraction, bore drawdown and water quality	Daily	Rous County Council
	Compare production with target demand	Weekly	Rous County Council
45% Level 2	Prepare for activation of Ballina Shire Council's Plateau bores: • Prepare bores for pumping; • Complete test pumping for quantity and quality; and • Determine expected supply contribution and treatment requirements.	When Level 2 restrictions are introduced	Rous County Council
	Commence monitoring of the salt/freshwater interface in Wilsons River in relation to extraction point twice daily (at low and high tide).	When Level 2 restrictions are introduced	Rous County Council
	Compare production with target demand	Weekly	Rous County Council

RCD Level	Actions	Timing	Responsibilities
30% Level 3	Additional supply from Plateau bores	When Level 3 restrictions are introduced	Rous County Council
	Commence monitoring of Plateau bores groundwater extraction, bore drawdown and water quality	Daily	Rous County Council
	Compare production with target demand	Weekly	Rous County Council
	Advise activation of Drought WMPs for non-residential customers.	When Level 3 restrictions are introduced	Constituent councils
	Fortnightly meter reading for Drought WMP compliance monitoring. Follow-up actions where users are not meeting agreed demand targets.	Fortnightly during Level 3, 4 and Emergency restrictions	Constituent councils
	Auditing of WMPs including random checks to ensure the actions in the plan have been implemented and nominated water saving targets are being achieved. Follow-up actions where users are not meeting agreed demand targets.	1 audit per week during Level 3, 4 and Emergency restrictions	Constituent councils
20% Level 4	Prepare for activation of emergency source	Timing to be confirmed by emergency source planning (see Preliminary actions)	Rous County Council
	Compare production with target demand	Daily	Rous County Council
10% Emergency	Activate emergency source	When Emergency Level restrictions are introduced	Rous County Council
	Compare production with target demand	Daily	Rous County Council

Appendix 7: Short-term Seasonal Outlook Tool

Short-Term Seasonal Outlook Tool

A Short-term Seasonal Outlook Tool has been developed for the Rous County Council supply area to estimate probable storage levels in Rocky Creek Dam over a forecast period of three months. The model uses various data inputs including historical storage level, consumption data and seasonal climate forecasts issued by the Bureau of Meteorology (BOM). This tool has significant limitations largely due to the variable accuracy of BOM weather predictions and should not be used in isolation. However, when considered alongside other available information, the outlook tool can assist water managers to make predictions about the need for water restrictions and drought management practices in the coming months, thereby increasing operational readiness for drought conditions.

The tool is based on a rainfall, evaporation, water production balance model. Currently the tool is in the form of a simple Microsoft Excel Spreadsheet that contains the historical data required for analysis. In order to run the model and gain a three month projection of storage levels, current input data is required.

Inputs

Climate data is sourced from SILO (http://www.longpaddock.qld.gov.au/silo). Data is patch point data for location 28 36'S 153 21'E which is located north of Rocky Creek Dam approximately in the centre of Rocky Creek Dam catchment. The continuous dataset dates back to 1889 and is a comprehensive representation of the local climate. Climate data parameters utilised in the tool include rainfall and evaporation which are used to calculate historic net rainfall and inflow into the dam and evaporation to calculate evaporative loss from the dam. A daily Rocky Creek Dam production data set starting in 2002 is used for consumption values. Data prior to 2002 exists, however reliable continuous data are only available only since 2002. A continuous dataset of Rocky Creek Dam capacity is also utilised however the recent volume in storage history need to be added to the dataset before each model run.

The forecast used is the "*BOM Climate outlooks – monthly seasonal"*, which is a three-monthly seasonal rainfall forecast providing probabilities of different rainfall amounts occurring. The data can be easily accessed from the BOM website and updated within the tool. The RCD storage level and BOM climate outlook should be updated each time the model is run. Long-term trends in historical climate and RCD production data are used in the model so these should be updated on a five-year basis.

Table 15: Seasonal Outlook Tool Input Data

Data	Source	Suggested Method of Update
Storage levels	Rous County Council records	Input latest daily storage level data into relevant table in the spreadsheet.
BOM Climate outlook	BOM Website (http://www.bom.gov.au/climate/outlooks/#/rainfall/exceedance/10/seasonal/0)	Retrieve information from website and enter into relevant table within spreadsheet.
Historical climate	All climate data sourced from SILO (http://www.longpaddock.qld.gov.au/silo). Data is patch point data for location 28°36'S 153°21'E which is located north of Rocky Creek Dam approximately in the centre of Rocky Creek Dam catchment.	Every 5 years (long-term trends in historical data are used in the tool)
Rocky Creek Dam daily production	Rous County Council records	Every 5 years (long-term trends in historical data are used in the tool)

Outputs

Analysis of the above data reveals various trends and correlations. The main correlation of importance is the correlation between recent rainfall and changes in dam capacity. This correlation is applied to current storage levels and predicted forecast rainfall to give a forecast of predicted storage level changes according to predicted rainfall. The output gives an indication of the probability of different rainfall and storage level scenarios occurring over the three-month forecast period. The key output of the tool is a graph illustrating the various forecast scenarios with reference to the storage history of the last 9 months and long-term monthly statistics.

The model was run for the period January to April 2016. Results are shown in the following figure and summarised as follows:

- Even for the worst-case rainfall scenario (0-150mm in next 3 months of which the model predicts a 0% chance of occurrence), the model predicts that storage levels in Rocky Creek Dam will not reach 60% (the trigger for Level 1 water restrictions) in this period; and
- Using the most likely rainfall scenario of 500-700mm falling in the next three months, the model predicts that dam storage levels will remain over 80% full and this is in line with the average historical storage levels for this time of year.

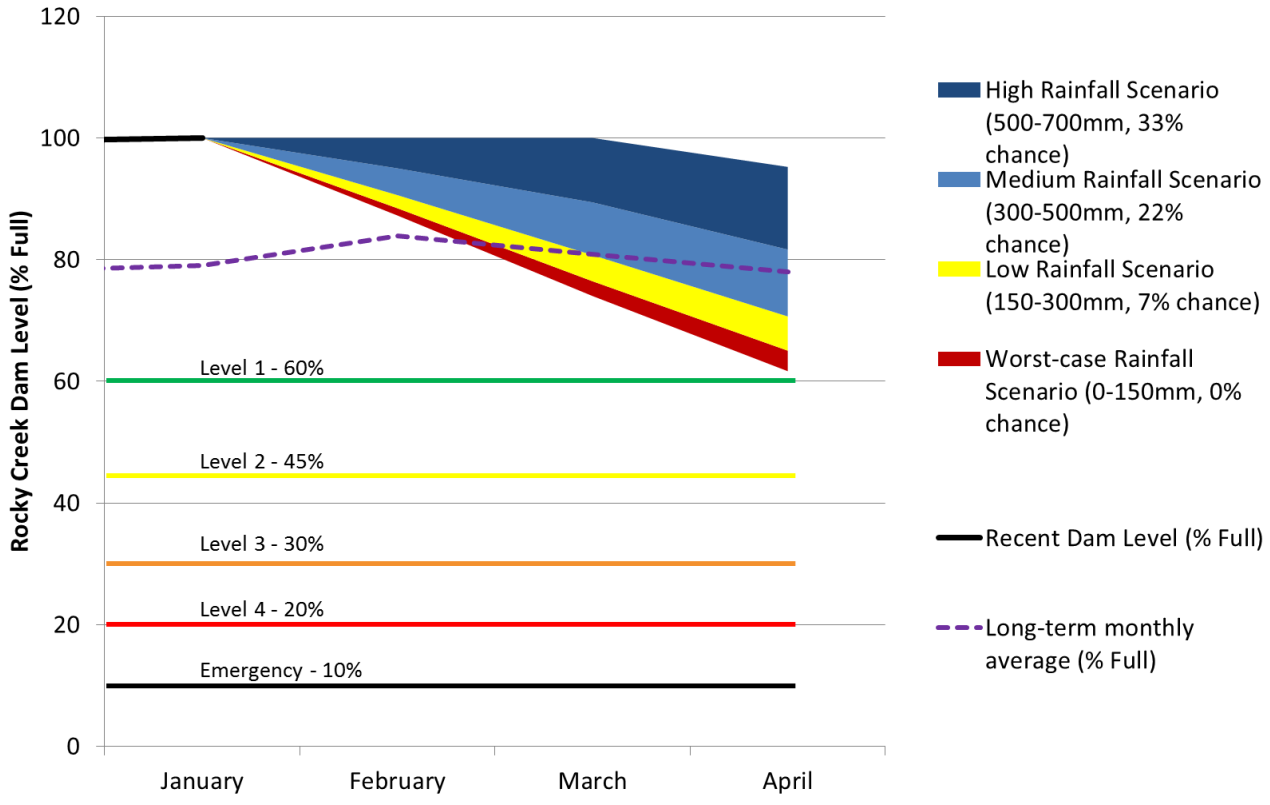

Figure 17: Rous County Council Short-term Outlook Tool output graph.

Limitations

No rainfall-runoff modelling is undertaken as part of the tool. The tool is based purely on historic rainfall and evaporation, dam storage level and past production data and the correlations between these factors. The empirical historical relationships between rainfall and storage behaviour are then applied to forecast rainfall scenarios to predict dam storage level behaviour. There are other factors that influence the relationship between recorded rainfall and dam storage levels that have not been incorporated into the correlations

including soil moisture, rainfall intensity and distribution of rainfall throughout the Rocky Creek Dam catchment.

Different correlations between rainfall and storage behaviour on a variety of different time scales and lag effects were explored during the development of the tool. The best correlation was between the total rainfall of the previous 2 days and the change in storage volume at the end of that period. On a more practical level, the total monthly rainfall correlates well with storage behaviour. Although there is some variation, the correlation coefficient is around 80%. This means that 80% of the response in storage change can be directly attributed to net rainfall and only 20% to other factors which haven't been accounted for (e.g. soil moisture, rainfall intensity, pattern of rainfall within the catchment, etc.). A calibrated rainfall-runoff hydrological model would be required to improve this correlation.

The three-month outlook reported by the tool is largely dependent on the forecast from BOM. BOM forecasts are currently the most reliable and easily accessible form of weather forecast data available, however, the prediction accuracy of these forecasts are variable at best. For example, the current three month forecast issued by BOM on 28th January 2016 only has 'moderate' (55-65%) model accuracy. Model accuracy is a measure of how well the model has performed at that time of year in the past.

Overall, the Rous County Council tool is reasonably accurate at predicting dam storage behaviour over the short term on a given rainfall pattern. In practice there are larger sources of error in other factors such as the BOM forecasts.

The correlations between rainfall and storage levels should be updated and reviewed in the future to capture any potential changes in climate, production and storage level trends. The recommended timeframe for this is every five years as discussed in Table 15.

Application

The tool was originally developed to help inform Rous County Council of the likelihood of Rocky Creek Dam reaching water restriction levels within a short (3 month) outlook period. For example, if Rocky Creek Dam levels start receding and/or a dry period is forecast, Rous County Council would apply the forecast rainfall to the tool to give an indication of the likelihood and timeframe of the dam reaching a certain level. Using this information in conjunction with other decision making tools, the risk of a water restriction event can be assessed and decisions can be made regarding preparations for restrictions and/or implementing demand reduction practices. From a drought management perspective the tool will be incorporated into the Operational Readiness Plan, with the tool forming a part of the risk assessment process.

Potential Improvements

As discussed above, there are environmental factors that influence storage level behaviour that have not been incorporated into the development of the tool. To include these factors into such a tool would require significant rainfall-runoff hydrological modelling of the Rocky Creek Dam catchment.

Although BOM forecasts are currently the most reliable, easily accessible form of weather forecast data available, this component is the single biggest potential error factor within tool. The accuracy of the BOM forecasts should be monitored over time by noting the model accuracy of each climate outlook. Any opportunities to utilise more accurate forecast sources should be investigated and considered for use in the tool, either in conjunction with or instead of the BOM forecast.

Given the overwhelming influence of uncertainties in the BOM forecasts, any improvements in determining the rainfall-storage relationship through modelling is not currently justified. The tool therefore has been developed to its useful limit at this stage.

Appendix 8: Emergency Supply Options

Emergency Supply Options

Rous County Council has identified a range of alternative water source options as part of previous studies which are summarised in the following tables.

Wilsons River Source (operated outside of normal licensing conditions)

Rous County Council has constructed a permanent system to transfer Wilson's River water to the Nightcap WTP. The extraction of this water is subject to extraction rules defined by DPI-Water license 30SL066818. These rules allow Rous County Council to pump 25% of the available flow (up to 30 ML/d) when the river flow is above cease-to-pump limits. However it is expected that there is about 17,000ML of water stored in the tidal pool, which could be pumped to Nightcap WTP using the existing infrastructure, if the licence conditions were temporarily suspended. Rous County Council has the infrastructure in place to enable this source to be used. This is currently the main emergency supply option for Rous County Council, which commences when RCD reaches 20%.

One key risk factor of this option is that during drought conditions the salt water/fresh water interface moves upstream in the Wilsons River, which could compromise freshwater supply. Experience in the 2002/03 drought showed that this movement occurred slowly and did not compromise this emergency source. Prolonged drought and use of the source may result in the interface moving to the intake point. Therefore an alternative back-up emergency source is needed.

Marom Creek Weir

The Marom Creek weir source is owned by Ballina Shire Council and is the primary water source for the village of Wardell. The *2009 Regional Water Management Strategy* (NSW Department of Commerce, 2009) determined that with the permission of the Council, it would be possible to extract and deliver 3 ML/d of water to Rous County Council via the Wollongbar Reservoir for supply to a defined area of Wollongbar/Alstonville. This source has been used effectively in this way during previous droughts. Marom Creek is regularly replenished by coastal rainfall which does not reach inland to Rocky Creek Dam. It is therefore a potential small source of water for emergency supply for the Wollongbar/Alstonville region.

Existing Groundwater Bores

Rous County Council and Ballina Shire Council have a number of existing groundwater bores which are utilised during dry periods (RCD below 60%). There is potential for extraction of greater quantities of water from this source in an emergency situation, however, groundwater will also be affected by long dry periods and the secure yield from these sources is not currently known.

Ballina Shire Council also holds extraction licences for two investigation bores near Lennox Head which produce brackish water licensed for extraction of 388 ML/a each (NSW Office of Water pers. comm.).

Coastal Sands Groundwater Source

DPI-Water has recently prepared the *Draft Water Sharing Plan for the North Coast Coastal Sands Groundwater Sources* (DPI-Water, 2016). The draft plan provides details on the physical properties of the water source, environmental requirements, yield and long-term average annual extraction limits. The two coastal sands sources within the Rous County Council supply area are the Richmond Coastal Sands Groundwater Source (Richmond CSGS) and the Tweed-Brunswick Coastal Sands Groundwater Source (Tweed-Brunswick CSGS) (Figure 18).

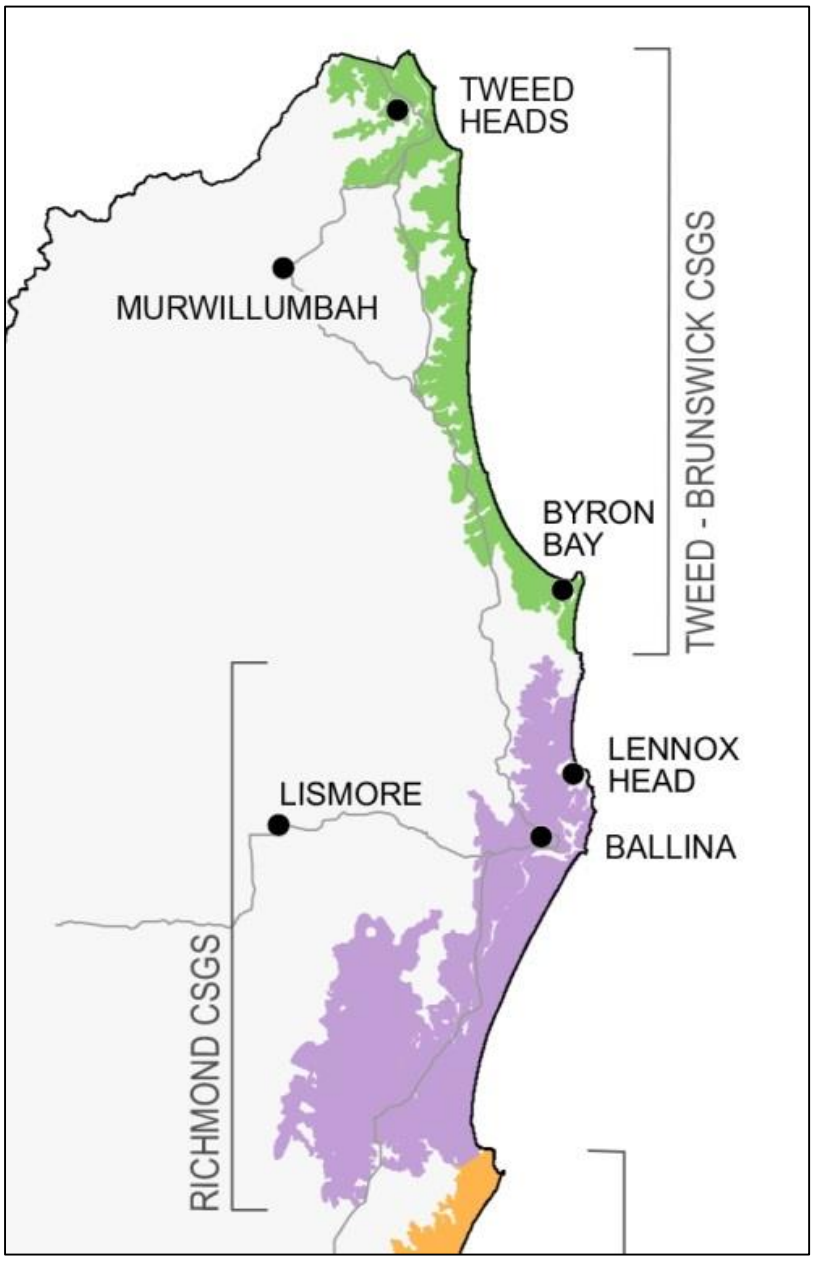

Figure 18: Map of the Richmond and Tweed-Brunswick Coastal Sands Groundwater Source

Source: DPI-Water (2016)

The Richmond CSGS covers an area of 360 km^2 and is bounded by the towns of Lennox Head to the north and of Evans Head to the south. The Tweed - Brunswick CSGS covers an area of 160 km^2 and is bounded by the town of Tweed Heads to the north and the town of Suffolk Park to the south. Yields within the Richmond CSGS are typically moderate. Yields within the Tweed-Brunswick CSGS are typically low to moderate. However, higher yields can be achieved in both sources when excavations are utilised or in areas where thick sequences are present. The water quality is typically fresh due to direct rainfall infiltration through inert quartz sand. However water quality issues may arise due to high iron content and over extraction resulting in the ingress of salt water from adjoining estuarine bodies. Holocene aged coastal sands may also contain potential acid sulfate soils which results in restricted pumping of groundwater to prevent the formation of poor water quality (DPI-Water, 2016).

The proposed long-term average annual extraction limit for the Richmond CSGS is 19,000 ML/a incorporating the current entitlement and an allowance for future water requirements within the term of the

plan. Part 12 of the plan allows for the long-term average annual extraction limit to be increased to up to 48,900 ML/a (DPI-Water, 2016).

The proposed long-term average annual extraction limit for the Tweed-Brunswick CSGS is also 19,000 ML/a incorporating the current entitlement and an allowance for future water requirements within the term of the plan. Part 12 of the plan allows for the long-term average annual extraction limit to be increased to up to 21,750 ML/a (DPI-Water, 2016).

The existing Woodburn bores operated by Rous County Council are located within the Richmond CSGS. Increased extraction from this source may be possible through a variation to the current extraction licence under Section 66 of the *Water Management Act 2000.*

Installation of additional bores to access water from this source would require considerable work to identify suitable areas, drill test bores, carry out production testing and water quality testing. Some preliminary work has been undertaken as part of previous studies to identify potential locations for groundwater bores (Rous County Council Future Water Strategy). However, further investigation is required to determine specific sites within these broad areas, provide suitable water treatment facilities and construct pipelines to link these sources to water supply infrastructure.

Fractured Basalt Groundwater Sources

Fractured Rock aquifers including Alstonville Basalt and North Coast Fractured Rock aquifers present another option for emergency extraction based on their reliable yields, generally good water quality and proximity to existing urban centres and water supply infrastructure. The key constraint to assessing the feasibility of groundwater to augment town water supply is that the Water Sharing Plans for many areas have not yet been finalised and so the total volume of water available for town water supply (extraction limits) and extraction rules and regulations involved in extraction are not currently known. Preliminary assessments undertaken by the NSW Office of Water indicate that each of the various aquifers in northern NSW can sustain some increase in extraction for town water supply purposes subject to further detailed investigation.

Based on the available information the following potential bore production volumes are estimated for the aquifers in the study area. It is important to note that depending on local conditions, yield may vary significantly between locations within the same aquifer and pumping tests would be required in order to confirm actual yield. Restrictions imposed by a Water Sharing Plan or water extraction licence may also affect the total amount of water that can be extracted. There are no data available on potential maximum bore production and the data in Table 16 are provided as an estimate only.

Table 16: Estimated Potential Bore Production – Fractured Basalt

Aquifer	Estimated likely bore production	Estimated maximum bore potential production (per bore)	Estimated maximum production from borefield containing 10 bores
Fractured Basalt (including Alstonville Basalt, North Coast Fractured Rock aquifers)	15 – 235 ML	600 ML/a	6,000 ML/a

Source: Adapted from Parsons Brinckerhoff, 2011

Further investigation is required to determine specific sites within these broad areas, provide suitable water treatment facilities and construct pipelines to link these sources to water supply infrastructure.

Portable Desalination Plants

Desalination is a process of producing fresh water by removing dissolved solids (primarily salts) from a water source such as seawater, estuarine water, treated wastewater or brackish groundwater. Desalination produces high quality water without relying on rainfall, so it is resilient to drought and climate change. There are many issues to consider when considering desalination as a water supply option including the source of water (either seawater, estuarine or brackish groundwater), brine disposal, energy consumption and costs.

Use of portable desalination units, installed as late as possible if and when needed, is one way of diversifying Rous County Council's supply sources and reducing the risk of running out of water in an extreme drought. The units would be removed when no longer required. Temporary desalination facilities offer a flexible contingency measure at a relatively low expected cost compared with other measures, as they would only be installed in a very rare drought and as late as possible.

Hunter Water recently investigated the use of portable desalination as an emergency water source. Small desalination plants can fit into several shipping containers or be skid-mounted to make them easier to transport and install. The units, each producing around 1-3 ML of treated water a day, could be installed at one or more sites and scaled up or down as required (NSW Department of Finance and Services, 2014).

Further work is required to progress this option as a viable emergency source including site selection studies, approval requirements, technical and environmental investigations, and a review of procurement options. Ongoing research into potential improvements in desalination technology will be monitored on an on-going basis.

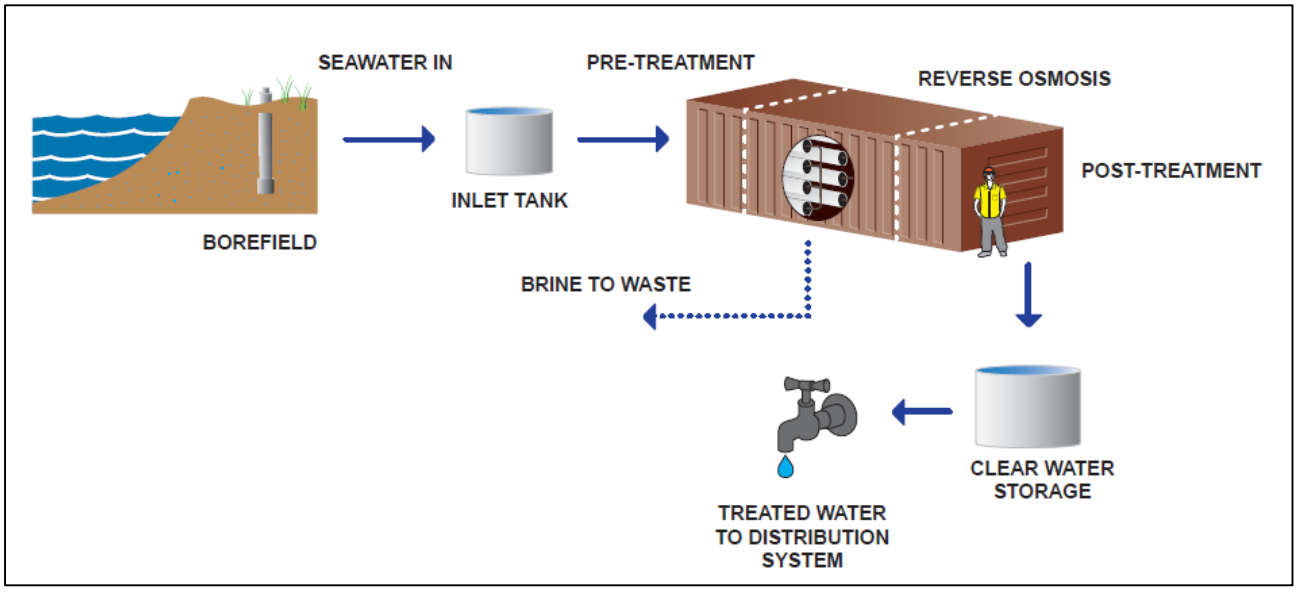

Figure 19: Schematic Diagram of Temporary, Portable Desalination Units

Source: NSW Department of Finance and Services (2014)

Indirect Potable Reuse

Rous County Council's Future Water Strategy (MWH, 2014) considered indirect potable reuse (IPR) to deliver highly treated reclaimed water from Alstonville, Ballina or Lennox Head STPs directly into Emigrant Creek Dam for subsequent extraction, treatment and transfer using existing infrastructure. The additional yield available would be 1,300 ML/a from Ballina and Lennox Head STPs and 700 ML/a from Alstonville STP which could be used to offset environmental flows. Community acceptance of the use of recycled water for potable water supplies would need to be considered. In the recommended long-term water supply strategy, IPR was proposed to be used in conjunction with groundwater augmentation if groundwater is not able to provide the required volume of water in future.

Water Cartage from Neighbouring Water Supply Systems

There are two key issues with this option that make it unlikely to be viable as an emergency supply:

1. Availability of water - during a period of extended drought, neighbouring water utilities are also likely to be implementing water restrictions and therefore the water available for cartage may be restricted or not available. In the case of Tweed Shire Council water supply, all external water sales are banned when Clarrie Hall Dam drops below 90%.
2. High cost and logistical constraints - The *2009 Regional Water Management Strategy* (NSW Department of Commerce, 2009), estimated that a supply of 15 ML/d to Rous County Council's customers would require 750 movements of 20,000 litre tankers per day. Assuming each tanker could fill up and empty its contents into the bulk water reservoirs of Rous County Council twice a day then 375 tankers would be needed every day. There would be difficulties obtaining this number of tankers, particularly if there was a regional drought with compete demands for tankers. In addition, the cost of Rous hiring the tankers / drivers would be prohibitive, at $500 per day per tanker the cost would be $187,500 per day.

For these reasons water cartage from neighbouring water supply systems is not considered a viable emergency source for Rous County Council.

Water Cartage from Toonumbar Dam

Toonumbar Dam is owned by State Water with a capacity of 11,000 ML. The dam is located in the Iron Pot Creek catchment area north west of Casino within Kyogle LGA. Toonumbar is used primarily for irrigation and recreational purposes. A 400 MWh/year hydro generator is also connected to the Dam and is operated at times of water release or dam overflows. Blue green algae problems have been reported in the dam during dry periods.

To be used in emergency supply, the water requires pumping from the dam and trucking to water treatment facilities. Alternatively, releases from the dam could be made to top up the existing Casino water supply at Jabour Weir. Due to its proximity to Casino, and Kyogle, it would be most efficient to supply water to these localities. RVC has reported that as a minimum the 254 ML of dead capacity will be held for town water supply and domestic/stock purposes (RVC, 2006). State Water has verbally indicated that at Level 5 restrictions emergency legislation in parliament will be required to ensure that sufficient water is maintained at Toonumbar Dam for Casino and Kyogle town water supplies (RVC, 2006).

Depending on the state of local supplies at the time of drought conditions, Toonumbar Dam is a potential source for Casino and Kyogle. However the cost of water cartage to the nearest Rous County Council supply system would likely be high given the distance to Lismore (approximately 74 km), Coraki (approximately 91 km), and Rocky Creek Dam (approximately 95 km). For these reasons Toonumbar Dam is not considered a viable emergency source for Rous County Council.

Dead Storage in RCD

The 2013 Yield Modelling Report (NSW Urban Water Solutions, 2013) assumed dead storage of Rocky Creek Dam to be 150 ML and this is understood to be based on a post-construction survey of the dam (in the 1940s) and before it was filled. Since that time, periodic inspection of the dam substrate by divers (and video footage) has indicated that infilling of the dam has been minimal. Given the largely pristine and densely vegetated catchment upstream of the dam, fed by waterways with rocky substrates and intact riparian vegetation minimum infilling would be expected.

In order to confirm both accessible storage levels (down to 0%) and the amount of dead storage potentially available (below the level currently accessible), a hydrographic (bathymetric) survey will be undertaken. Any

changes in the amount of dead storage available (either more or less than previously thought) may affect operational requirements and drought management actions.

Activation requirements for potential emergency sources

Each option has specific lead-in times and the Drought Management Plan needs to set out activation requirements for emergency sources with timing to allow for sources to be operational when needed.

Table 17: Activation Requirements for Potential Emergency Sources

Potential Emergency Source	Activation Requirements	Timing
Wilsons River Source	• Seek permission from DPI-Water to operate outside normal licensing rules	2 weeks
Marom Creek Weir	• Seek permission from DPI-Water to operate outside normal licensing rules	2 weeks
Plateau bores	• Prepare bores for pumping • Complete test pumping for quantity and quality • Determine expected supply contribution and treatment requirements • Commence pumping and treatment	>1 month
Woodburn bores	• Prepare bores for pumping • Complete test pumping for quantity and quality • Determine expected supply contribution and treatment requirements • Commence pumping and treatment	>1 month
Additional Coastal Sands Groundwater	• Determine suitable site/s • Approval requirements; • Technical and environmental investigations. • Complete test pumping for quantity and quality • Determine expected supply contribution and treatment requirements • Commence pumping and treatment	>3 months
Fractured Basalt Groundwater	• Determine suitable site/s • Approval requirements; • Technical and environmental investigations. • Complete test pumping for quantity and quality • Determine expected supply contribution and treatment requirements • Commence pumping and treatment	>3 months
Temporary Desalination Plants	• Determine suitable site/s • Source package treatment plants • Establish power supplies • Determine brine disposal procedures	>3 months
Indirect Potable Reuse	• Technical and environmental investigations • Community consultation • Approvals • Infrastructure design and construction	>2 years

Appendix 9: Communication Plan

Table 18: Communication Actions

RCD Level	Key Message	Communication Actions	Responsibilities
>70%	Everyday water saving measures	Ongoing community education in accordance with demand management program	Rous County Council
		Quarterly Water Supply Liaison Committee meeting	Water Supply Liaison Committee
		Maintain town signs in approved locations.	Constituent councils
		Communication tools and materials prepared as per Operational Readiness Plan	As per Operational Readiness Plan
70%	Rocky Creek Dam is at 70%. Level 1 restrictions will be imposed at 60%.	Convene 70% Water Supply Liaison Committee meeting	Water Supply Liaison Committee
		Advise key government agencies of current situation	Rous County Council
		Advise Councillors and customer service staff of current situation	Rous County Council and constituent councils
		70% media release and advertisement	Rous County Council
		Update Rous County Council/Council webpage and social media sites	Rous County Council and constituent councils
65%	Rocky Creek Dam is at 65%. Level 1 restrictions will be imposed at 60%.	Convene 65% Water Supply Liaison Committee meeting	Water Supply Liaison Committee
		Advise key government agencies of current situation	Rous County Council
		Advise Councillors and customer service staff of current situation	Rous County Council and constituent councils
		65% media release and advertisement	Rous County Council
		Update Rous County Council/Council webpage and social media sites	Rous County Council and constituent councils

RCD Level	Key Message	Communication Actions	Responsibilities
60% Level 1	Rocky Creek Dam is at 60%. Level 1 water restrictions are in place	Convene Level 1 Water Supply Liaison Committee meeting	Water Supply Liaison Committee
		Advise key government agencies of current situation	Rous County Council
		Advise Councillors and customer service staff of current situation	Rous County Council and constituent councils
		Level 1 media release and advertisement	Rous County Council
		Adjust town signs to Level 1	Constituent councils
		Update Rous County Council/Council webpage and social media sites	Rous County Council and constituent councils
		Commence compliance/enforcement actions	Constituent councils
55% Level 1	Rocky Creek Dam is at 55%. Level 1 restrictions are in place. Level 2 restrictions will be imposed at 45%	Convene 55% Water Supply Liaison Committee meeting	Water Supply Liaison Committee
		Advise key government agencies of current situation	Rous County Council
		Advise Councillors and customer service staff of current situation	Rous County Council and constituent councils
		55% media release and advertisement	Rous County Council
		Update Rous County Council webpage and social media sites	Rous County Council
50% Level 1	Rocky Creek Dam is at 50%. Level 1 restrictions are in place. Level 2 restrictions will be imposed at 45%	Convene 50% Water Supply Liaison Committee meeting	Water Supply Liaison Committee
		Advise key government agencies of current situation	Rous County Council
		Advise Councillors and customer service staff of current situation	Rous County Council and constituent councils
		50% media release and advertisement	Rous County Council
		Update Rous County Council webpage and social media sites	Rous County Council
		Print Level 2 leaflets	Rous County Council
		Ongoing compliance/enforcement actions	Constituent councils

RCD Level	Key Message	Communication Actions	Responsibilities
45% Level 2	Rocky Creek Dam is at 45%. Level 2 water restrictions are in place	Convene Level 2 Water Supply Liaison Committee meeting	Water Supply Liaison Committee
		Advise key government agencies of current situation	Rous County Council
		Advise Councillors and customer service staff of current situation	Rous County Council and constituent councils
		Level 2 media release and advertisement	Rous County Council
		Adjust town signs to Level 2	Constituent councils
		Distribute Level 2 leaflets	Rous County Council
		Update Rous County Council/Council webpage and social media sites	Rous County Council and constituent councils
		Ongoing compliance/enforcement actions	Constituent councils
40% Level 2	Rocky Creek Dam is at 40%. Level 2 restrictions are in place. Level 3 restrictions will be imposed at 30%	Convene 40% Water Supply Liaison Committee meeting	Water Supply Liaison Committee
		Advise key government agencies of current situation	Rous County Council
		Advise Councillors and customer service staff of current situation	Rous County Council and constituent councils
		40% media release and advertisement	Rous County Council
		Update Rous County Council webpage and social media sites	Rous County Council
		Ongoing compliance/enforcement actions	Constituent councils
35% Level 2	Rocky Creek Dam is at 35%. Level 2 restrictions are in place. Level 3 restrictions will be imposed at 30%	Convene 35% Water Supply Liaison Committee meeting	Water Supply Liaison Committee
		Advise key government agencies of current situation	Rous County Council
		Advise Councillors and customer service staff of current situation	Rous County Council and constituent councils
		35% media release and advertisement	Rous County Council
		Update Rous County Council webpage and social media sites	Rous County Council

RCD Level	Key Message	Communication Actions	Responsibilities
		Ongoing compliance/enforcement actions	Constituent councils
		Print Level 3 leaflets	Rous County Council
30% Level 3	Rocky Creek Dam is at 30%. Level 3 water restrictions are in place	Convene Level 3 Water Supply Liaison Committee meeting	Water Supply Liaison Committee
		Advise key government agencies of current situation	Rous County Council
		Advise Councillors and customer service staff of current situation	Rous County Council and constituent councils
		Level 3 media release and advertisement	Rous County Council
		Adjust town signs to Level 3	Constituent councils
		Distribute Level 3 leaflets	Rous County Council
		Update Rous County Council/Council webpage and social media sites	Rous County Council and constituent councils
		Ongoing compliance/enforcement actions	Constituent councils
25% Level 3	Rocky Creek Dam is at 25%. Level 3 restrictions are in place. Level 4 restrictions will be imposed at 20%	Convene 25% Water Supply Liaison Committee meeting	Water Supply Liaison Committee
		Advise key government agencies of current situation	Rous County Council
		Advise Councillors and customer service staff of current situation	Rous County Council and constituent councils
		25% media release and advertisement	Rous County Council
		Update Rous County Council webpage and social media sites	Rous County Council
		Ongoing compliance/enforcement actions	Constituent councils
		Print Level 4 leaflets	Rous County Council

RCD Level	Key Message	Communication Actions	Responsibilities
20% Level 4	Rocky Creek Dam is at 20%. Level 4 water restrictions are in place	Convene Level 4 Water Supply Liaison Committee meeting	Water Supply Liaison Committee
		Advise key government agencies of current situation	Rous County Council
		Advise Councillors and customer service staff of current situation	Rous County Council and constituent councils
		Level 4 media release and advertisement	Rous County Council
		Adjust town signs to Level 4	Constituent councils
		Distribute Level 4 leaflets	Rous County Council
		Update Rous County Council/Council webpage and social media sites	Rous County Council and constituent councils
		Ongoing compliance/enforcement actions	Constituent councils
17.5% Level 4	Rocky Creek Dam is at 17.5%. Level 4 restrictions are in place. Emergency Level restrictions will be imposed at 10%	Convene 17.5% Water Supply Liaison Committee meeting	Water Supply Liaison Committee
		Advise key government agencies of current situation	Rous County Council
		Advise Councillors and customer service staff of current situation	Rous County Council and constituent councils
		17.5% media release and advertisement	Rous County Council
		Update Rous County Council webpage and social media sites	Rous County Council
		Ongoing compliance/enforcement actions	Constituent councils
15% Level 4	Rocky Creek Dam is at 15%. Level 4 restrictions are in place. Emergency Level restrictions will be imposed at 10%	Convene 15% Water Supply Liaison Committee meeting	Water Supply Liaison Committee
		Advise key government agencies of current situation	Rous County Council
		Advise Councillors and customer service staff of current situation	Rous County Council and constituent councils
		15% media release and advertisement	Rous County Council
		Update Rous County Council webpage and social media sites	Rous County Council

RCD Level	Key Message	Communication Actions	Responsibilities
		Ongoing compliance/enforcement actions	Constituent councils
12.5% Level 4	Rocky Creek Dam is at 12.5%. Level 4 restrictions are in place. Emergency Level restrictions will be imposed at 10%	Convene 12.5% Water Supply Liaison Committee meeting	Water Supply Liaison Committee
		Advise key government agencies of current situation	Rous County Council
		Advise Councillors and customer service staff of current situation	Rous County Council and constituent councils
		12.5% media release and advertisement	Rous County Council
		Update Rous County Council webpage and social media sites	Rous County Council
		Ongoing compliance/enforcement actions	Constituent councils
		Print Emergency Level leaflets	Rous County Council
10% Emergency	Rocky Creek Dam is at 10%. Emergency Level water restrictions are in place	Convene Emergency Level Water Supply Liaison Committee meeting	Water Supply Liaison Committee
		Advise key government agencies of current situation	Rous County Council
		Advise Councillors and customer service staff of current situation	Rous County Council and constituent councils
		Emergency Level media release and advertisement	Rous County Council
		Adjust town signs to Emergency Level	Constituent councils
		Distribute Emergency Level leaflets	Rous County Council
		Update Rous County Council/Council webpage and social media sites	Rous County Council and constituent councils
		Ongoing compliance/enforcement actions	Constituent councils

Communication Tools

Potential print, radio and television media outlets are listed in the following tables.

Table 19: Local Print Media Details

Newspaper	Day of Issue	Deadline for Display Advertising	Deadline for Classifieds	Contact
Northern Star	Daily	2 days prior to issue	1 day prior to issue	(02) 6620 0500
Northern Rivers Echo	Thursday	Monday 5pm	Monday 5:00pm	(02) 6620 0533
Ballina Shire Advocate	Thursday	1 week prior	Friday 12.00 noon	(02) 6618 4700
Byron Shire News	Thursday	Tuesday	Wednesday 12:00 noon	(02) 6685 6358
Byron Shire Echo	Wednesday	Monday 12:00 noon	Monday 12:00 noon	(02) 6684 1777
Richmond River Express Examiner	Wednesday	Friday	Monday 12:00 noon	(02) 6662 2666
Lennox Wave	Monthly	Varies	Varies	0425 221 570

Table 20: Local Radio Stations

Radio Station	Contact
ABC North Coast	1300 659 994
Radio ZZZ FM/2LM	(02) 6624 2433
Bay FM (Byron Bay)	(02) 6680 7999
Paradise FM (Ballina)	(02) 6686 0101
Richmond Valley Radio	(02) 6682 2133
2NCR 92.9 River FM Lismore	(02) 6622 7939

Table 21: Regional Television Networks

Radio Station	Contact
NBN	(02) 6625 2499
Prime 7	(02) 6627 5777

Figure 20 provides a conceptual restrictions meter which will be used in road signage and other communication tools including, website publication, social media or printed media to quickly convey water restriction status.

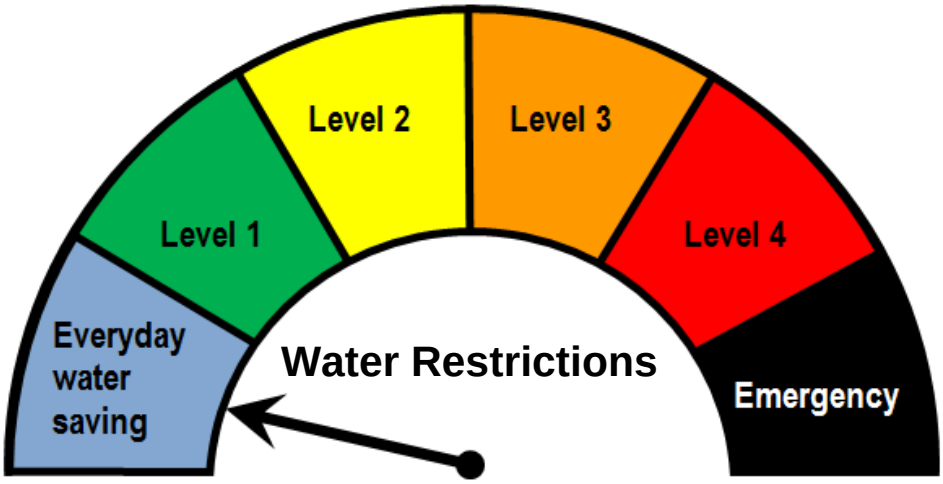

Figure 20: Example Water Restrictions Meter