

# Local Water Utility Releases

Review of the Monitoring of the Quality of Water

Released to LWUs

June 2019

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# 1. Background and Context

## 1.1 WaterNSW Roles and Responsibilities for Local Water utilities

WaterNSW has some 31 Local Water Utility (LWU) customers across the state for which it releases water from various dams. Water is released from WaterNSW dams and reservoirs in response from orders from these and other customers and is extracted from rivers and streams at various points downstream. A number of the LWU customers have multiple Licences, extracting water at various locations for different communities.

Unlike water Supplied by WaterNSW to its customers in the Greater Sydney area and from the Fish River Supply Scheme, WaterNSW has no obligations regarding the quality of the water released for LWUs. This reflects the fact that WaterNSW has very limited control over the quality of the water entering its rural storages, and in most cases the water is extracted from rivers some distance downstream from the release point. It is therefore subjected to a range of water quality influences prior to extraction. While there is some water quality monitoring in storages and streams, that monitoring is not specifically designed to inform LWU customers.

## 1.2 Operating Licence Requirements

The WaterNSW Operating Licence 2017-2022 (Clause 3.4) contains the following requirements regarding Bulk Water released to Local Water Utilities for Drinking Water purposes. This Review addresses Clauses 3.4.6 and 3.4.7.

Licence Clause	Requirement
3.4.1	Water NSW must maintain a register of all Local Water Utilities: a) for which Water NSW maintains a Water Allocation Account; and b) to which Water NSW releases water that will be used for the purposes of Drinking Water (Local Water Utility Customers), (LWU Register).
3.4.2	The LWU Register must include contact details for each Local Water Utility Customer, and the Water Source and approximate location from which the Local Water Utility Customer Extracts water.
3.4.3	Water NSW must maintain and implement a procedure for providing information to Local Water Utilities (LWU Information Request Procedure). Water NSW must follow the LWU Information Request Procedure when any Local Water Utility requests information to inform that utility's Drinking Water quality assurance program. Water NSW must maintain the LWU Information Request Procedure during the term of this Licence.
3.4.4	Water NSW's LWU Information Request Procedure must: a) describe how a Local Water Utility is to request information; b) describe how Water NSW will respond to the request in a timely manner; and c) define any fees and charges that may be charged by Water NSW to recover reasonable costs incurred for responding to an information request, how these will be calculated, and how they are to be paid.
3.4.5	Water NSW must make details of the LWU Information Request Procedure available free of charge on its website for downloading by any person.

3.4.6	By 31 December 2018, Water NSW must, in consultation with NSW Health, the Local Water Utility Customers on the LWU Register and its customer advisory groups established under clause 6.5, complete a review of its water quality monitoring, of water released by Water NSW to Local Water Utilities.
3.4.7	By 30 June 2019, Water NSW must provide IPART with a report detailing the outcomes of the review referred to in clause 3.4.6. The report should describe measures that were identified and the timing by which they could be implemented. Any barriers to immediate implementation of identified measures, including limitations to funding, should be outlined in the report.

The Licence notes that: The purpose of clause 3.4 is to ensure that there are mechanisms in place for Water NSW to share information which it currently has, or is best placed to collect with interested Local Water Utilities, where that information could usefully inform a Local Water Utility's Drinking Water quality assurance program.

## 2. Current Situation

### 2.1 WaterNSW Local Water Utility Customers

Table 1 lists Local Water Utilities which are part of the scope of this review under clauses 3.4.6 and 3.4.7

Local Water Utility	Location	Water Source
Bogan Shire Council	Nyngan	WaterNSW Release
Albury City Council	Albury	WaterNSW Release
Balranald Shire Council	Balranald	WaterNSW Release
Berrigan Shire Council	Berrigan	WaterNSW Release
Cobar Shire Council	Cobar	WaterNSW Release
Edward River Council	Deniliquin	WaterNSW Release
Essential Water	Menindee	WaterNSW Release
Federation Council	Corowa	WaterNSW Release
Cowra Shire Council	Cowra	WaterNSW Release
Dubbo City Council	Dubbo	WaterNSW Release
Forbes Shire Council	Forbes	WaterNSW Release
Goldenfields Water County Council	Temora	WaterNSW Release
Cootamundra/Gundagai Regional Council	Gundagai	WaterNSW Release
Gwydir Shire Council	Bingara	WaterNSW Release
Hay Shire Council	Hay	WaterNSW Release
Inverell Shire Council	Inverell	WaterNSW Release
Murrumbidgee Council	Jerilderie	WaterNSW Release
Lachlan Shire Council	Condobolin	WaterNSW Release
Midwestern Regional Council	Mudgee	WaterNSW Release
Moree Plains Shire Council	Moree	WaterNSW Release
Murray River Council	Mathoura	WaterNSW Release
Murrumbidgee Council	Darlington Pt	WaterNSW Release
Muswellbrook Shire Council	Muswellbrook	WaterNSW Release
Parkes Shire Council	Parkes	WaterNSW Release
Riverina Water County Council	Wagga Wagga	WaterNSW Release
Singleton Council	Singleton	WaterNSW Release
Tamworth Regional Council	Tamworth	WaterNSW Release
Snowy Valleys Council	Tumut	WaterNSW Release
Upper Hunter Shire Council	Scone	WaterNSW Release
Walgett Shire Council	Walgett	WaterNSW Release
Warren Shire Council	Warren	WaterNSW Release

#### Notes

- Some Councils have multiple extraction points servicing different communities
- Table 1 does not list customers supplied as part of the Greater Sydney Supply System which are Supplied under Raw Water Supply Agreements, customers Supplied from the Fish River Supply or from

the Wentworth to Broken Hill Pipeline under Customer Agreements which contain agreed arrangements for water quality monitoring and data sharing.

- The scope of this Review is those LWUs for which WaterNSW releases surface water

## **2.2 Operational Interaction**

WaterNSW schedules and releases water to LWU and other customers on a daily basis in response to Water Orders. WaterNSW operational staff located throughout the state have established relationships with LWU operators and are in regular contact as they seek to understand customer requirements and actively manage the delivery system. These relationships supplement the existing formal arrangements for access to data and provide a mechanism for LWUs to obtain information, data and advice to assist LWUs manage their water quality obligations.

## **2.3 Water Quality Monitoring and Data Availability**

While no specific monitoring is undertaken of the quality of water released for Local Water Utilities, WaterNSW does collect a range of water quality information at various locations across the State as part of a number of initiatives and programs. Information regarding water level and flow is also collected at a large number of locations for operational, flood management and other purposes.

All monitoring data is available to Local Water Utilities via the LWU Information Request Procedure. A number of the data sets are also publicly available in various forms via the WaterNSW website.

Section 3 provides further detail regarding these monitoring programs including data collected, purpose, monitoring locations and data availability.

## 3. Review Process

### 3.1 Existing Monitoring Program Scope and Location Data

The establishment of WaterNSW has brought together a number of water quality monitoring programs previously undertaken separately. These include:

#### **State Water Quality Assessment & Monitoring Program**

Some 120 river sites are sampled on behalf of DOI Water on a monthly basis throughout the State as part of this program which provides a long-term data-set to enable resource assessment by the Department. Data is provided to the Department on a regular basis and available to external parties on request.

#### **Declared Catchment Water Quality Monitoring Program**

This intensive program is focussed on the streams and storages within the Declared Catchment as part of the water supply to Greater Sydney. It includes over 200 sites which are monitored for a wide range of parameters including on a routine basis (discrete laboratory analysis), or via static on-line instruments and vertical profilers. This data is actively interpreted and analysed on an ongoing basis, with data, results and advice provided to WaterNSW Bulk customers in the Greater Sydney Area (Sydney Water, Shoalhaven Water, Wingecarribee Council and Goulburn-Mulwaree Council), and Oberon and Lithgow Councils which are supplied from the Fish River Scheme. Data is available to external parties on request.

#### **Rural Algal Monitoring Program**

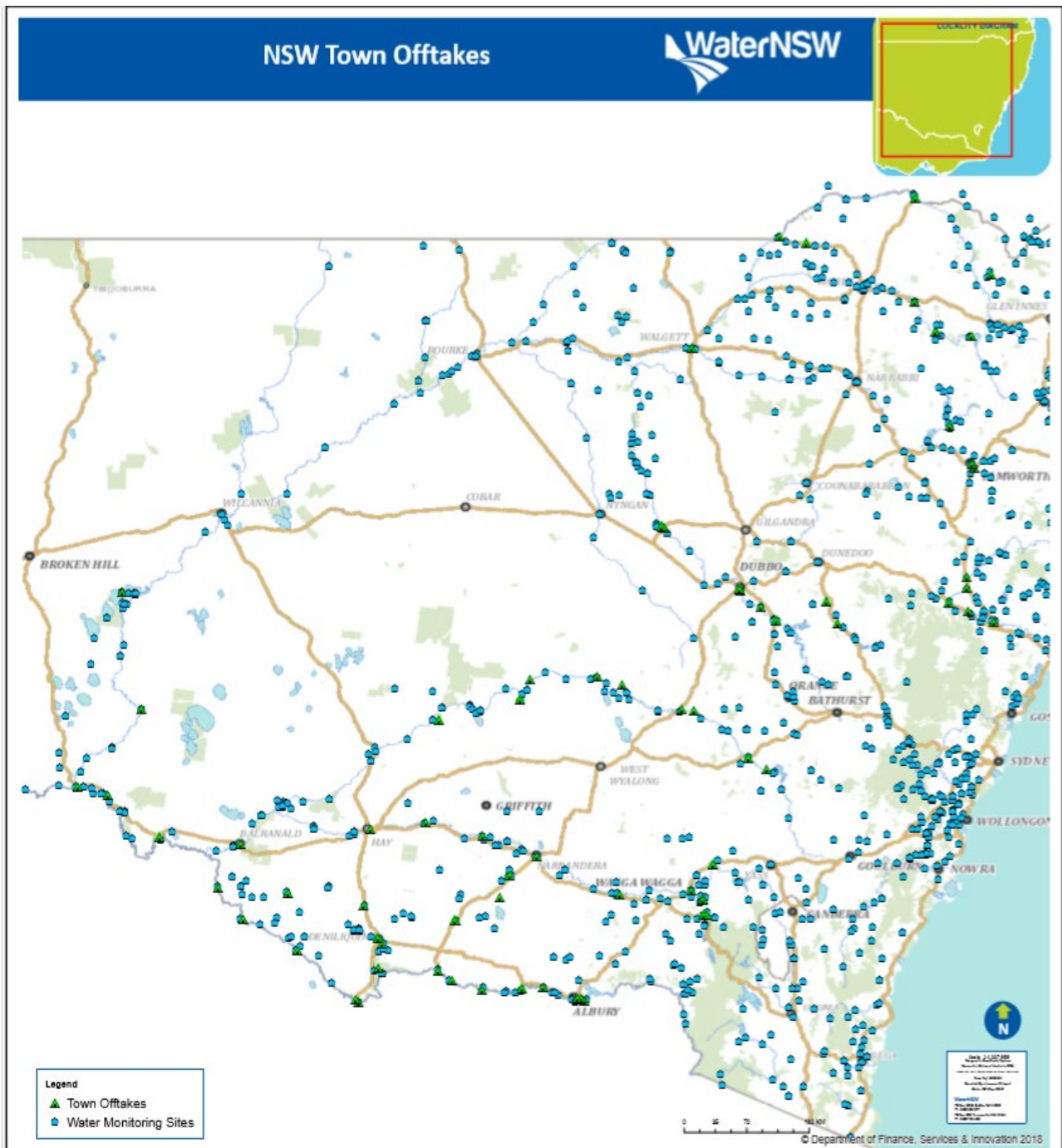
Designed to support the Regional Algal Coordination process, this program monitors algae at over 180 locations throughout the state in storages and streams. Sample frequencies are adjusted in response to algal levels to enable the issuing of Algal Alerts consistent with the National Health and Medical Research Council guidelines for recreational contact.

Algal alerts are published via an interactive map on the WaterNSW website, including live feeds to data for each site. Algal alerts are issued in accordance with the Guidelines on a routine basis. Recipients of alerts include Local Water Utilities.

#### **State-Wide Hydrometric Program**

WaterNSW operates and maintains some 1200 hydrometric monitoring stations across the state, many of which monitor water level and/or flow on a continuous basis. Most of these stations are on-line and data is available real-time via the WaterNSW website. Some of these stations also include limited water quality data monitored by on-line instruments. Parameters at various locations include conductivity/salinity, temperature, pH, Dissolved Oxygen and turbidity. All data is available real-time via the WaterNSW website.

Figure 1 shows the existing surface water monitoring locations, and LWU offtake locations



WaterNSW also has an extensive groundwater monitoring program, which is not part of this review.

### Third Party Monitoring

In addition to monitoring undertaken by WaterNSW, LWUs across the state monitor the quality of water at offtake points as part of their operations, using both continuous (on-line) and discrete (laboratory analysis) methods.



The regional algal alert process also draws on some monitoring undertaken by third parties (such as local councils and other storage operators), with data incorporated into and made available as part of the WaterNSW alert process outlined above.

## 3.2 Consultation

A consultation program was designed for the Review to gather input and feedback from:

- NSW Health
- LWUs
- Customer Advisory Groups

Key components of the program included

- Clarification of purpose, and scope with NSW Health to ensure that the Review achieved the desired outcomes. NSW Health provided particular assistance with identifying forums for consultation and identification of specific point of contact in some LWUs, via both the Water Unit and local Public Health Units
- An initial briefing and subsequent updates for all Customer Advisory Groups
- Discussions and briefings with a number of existing forums attended by LWU representatives across the state
- Provision of an on-line survey. The Survey was provided to all LWUs on the WaterNSW LWU contact list and included provision for LWUs to request subsequent dialogue. Appendix 1 provides details regarding the Survey and responses
- Follow up discussions with NSW Health and specific Local Water Utilities

The consultation program is summarised below.

Audience	Dates	Comments
NSW Health	November 2017 – May 2019	Clarification of scope, briefing on progress, feedback and input
Customer Advisory Groups	September 2017	Initial briefing and input into scope
	April 2018	Update and feedback sought
	September 2018	Update and feedback sought
Local Water Utilities	May 2018	On-line Survey
	July 2018 – January 2019	Follow up discussions
	April 2018	Namoi/Peel Alliance
	April 2018	CENTROC Alliance
	April 2018	Lower Macquarie Alliance
	July 2018	NSW Water Directorate
	August 2018	Riverina and Murray Region Organisation of Councils

The consultation was designed to gather information regarding:

- LWUs knowledge of existing WaterNSW water quality programs
- LWUs historic and existing access to and use of that data
- Water Quality issues of concern to LWUs
- Suggestions regarding the type of, and preferred means of access to water quality data and related information
- Any specific suggestions for enhancing the monitoring program

### 3.3 GIS Interrogation

WaterNSW's Spatial Modelling tools have been used to:

- Bring together data associated with all existing monitoring programs including site location detail, monitoring parameters and frequency
- Incorporate locational and other data associated with all Licences held by relevant Local Water Utilities
- Build a model to estimate the upstream catchment boundary of all offtake locations
- Identify and map all existing upstream monitoring locations, irrespective of whether water quality is currently measured
- Estimate the distance upstream of all existing monitoring locations by run of river using available geospatial data

The outputs of the Spatial Modelling were used to identify both existing water quality monitoring associated with each LWU offtake, and potential opportunities to enhance the monitoring network.

### **3.4 Identification of Emerging Opportunities for Data Accessibility**

Since the development of WaterNSW's current Operating Licence, a range of initiatives have been undertaken to improve data management, accessibility and transparency. The Review has taken into account both initiatives that have been completed, and those currently planned as part of existing programs of work. These are discussed further in Section 6.

In the context of the existing drought, some opportunities for additional monitoring to assist with drought responses have been identified. Where relevant, the Review has taken these proposed enhancements into account.

## 4. Consultation Feedback

### 4.1 NSW Health

Initial discussions with NSW Health Water Unit confirmed that the driver for the Review was a desire to leverage off data and related expertise in WaterNSW and help LWUs better manage their water quality risk. Discussions regarding the scope of the Review and potential outcomes confirmed that:

- The first objective was to ensure that existing water quality data is known about and available for LWUs
- A secondary objective may involve targeted increases in or amendments to the monitoring program, which could enable improved decision making and risk reduction
- Outcomes of the review may not necessarily be confined to water quality data in isolation. Other data and information which can be used to provide advanced notice of factors that could influence treatment process efficacy could be useful. Examples includes changes in flow rates or temperature
- Real-time data is likely to provide the greatest benefits for LWUs, as it enables decision making (including timely adjustments to treatment processes) based on current and anticipated circumstances. Real-time data avoids the costs and delays associated with data that requires sampling and laboratory analysis
- It is recognised that some measures may be able to be implemented in the short term, while others could take significant time. Furthermore, if measures involve significant cost, this may need to be considered by IPART in future price determinations
- Suggested consultation mechanisms for consideration included LWU Alliance, the Water Directorate, and relevant Local Public Health Units

Subsequent discussions with NSW Health provided the opportunity to discuss progress, and in particular to identify appropriate follow up consultation with individual LWUs.

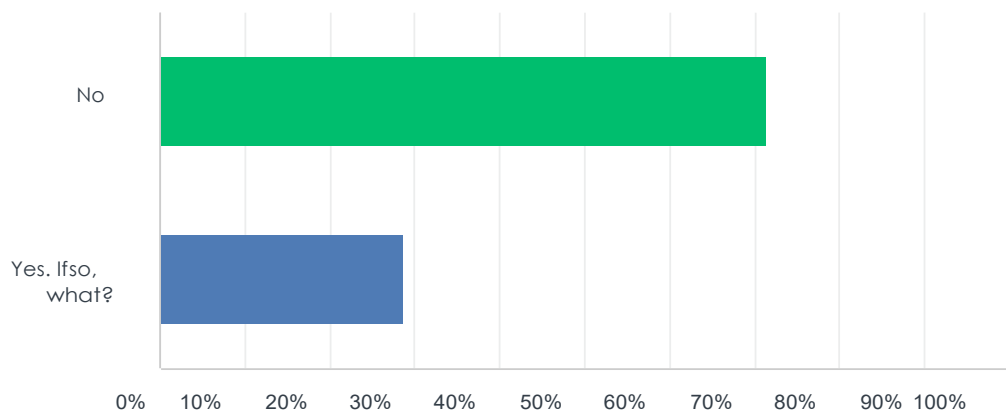
### 4.2 LWU Survey

The survey was developed in conjunction with NSW Health and sent to all Local Water Utilities on the WaterNSW LWU Contact List. This included some LWUs which are not part of the scope of the Review as they are not supplied with water released from storages (such as Lithgow and Oberon Councils). While responses from these councils are included in the Survey Responses in Appendix 1, specific issues related to those LWUs have been followed up and will be addressed outside of the review as part of the relevant Customer Agreements, which provide for water quality requirements including monitoring and data sharing.

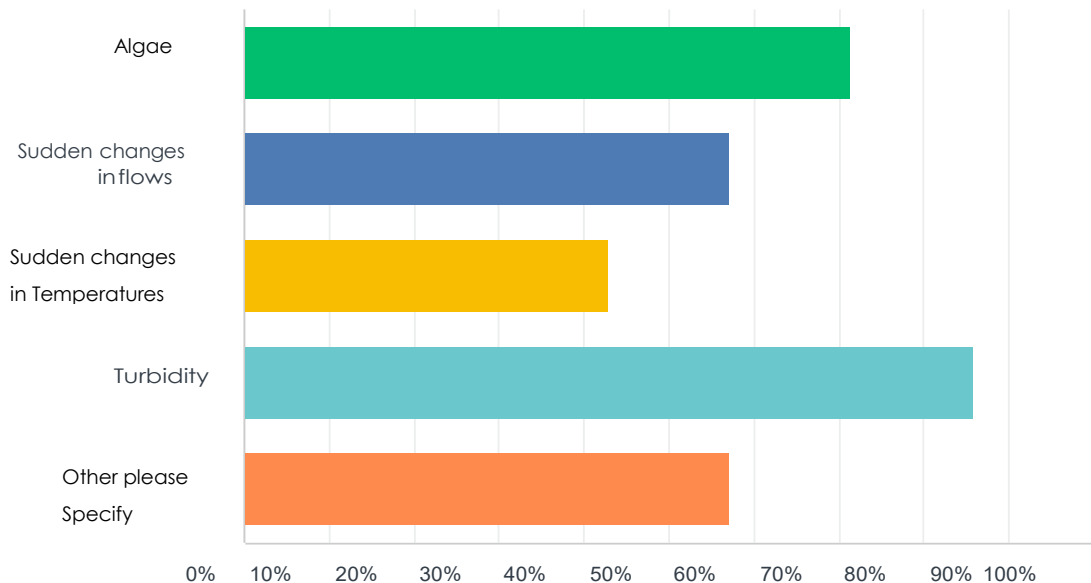
Results of the survey are summarised below:

- The existing data request procedure is not currently used by any of the LWUs which responded to the survey
- There was a generally low level of knowledge regarding existing water quality data collected and held by WaterNSW (see below)
- Some LWUs currently access data from existing on-line sources via the WaterNSW Real-Time data website (including on line water quality and related information such as dam releases and river flows)
- LWUs also receive and act on algal alerts
- There was some (limited) interest in accessing other water quality data not currently available on-line (such as in-lake water quality information from routine laboratory analysis)
- Key water quality risk factors (in order of decreasing importance), are Turbidity, Algae, changes in flows, Temperature, Dissolved Oxygen (DO), pH, and Electrical Conductivity/salinity (EC) (see below)
- There is definite interest in the ability of WaterNSW to provide notifications or alerts using existing data collection

**Are you aware of any water quality related data or information WaterNSW holds that you would find useful?**



### What water quality risks are you most concerned about?



Appendix 1 contains the details results from the survey.

### 4.3 Local Water Utility Discussions

Feedback from discussions with the LWU Alliances, Water Directorate, RAMROC and individual Councils is summarised below:

- There are generally strong local contacts with WaterNSW staff which work well in terms of notifications such as operational changes
- There is a strong interested in early warning of releases, changes in flow rates etc
- Early warning of turbidity changes would be particularly welcome
- Not all LWUs are familiar with existing water quality data held by WaterNSW
- There are strong linkages with Algal alerts, and interest in the ability to push selected alerts to key stakeholders
- In addition to alerts based on specific triggers, alerts based on rates of change of key parameters would be beneficial
- There is acknowledgment that in some locations, the Local Water Utilities themselves may be best placed to do additional monitoring due to locational advantages, and potential interest in exploring a model where costs are shared between WaterNSW, LWUs and potentially other stakeholders (such as NSW Health)
- There may be some (limited) opportunities to rationalise monitoring where both a LWU and WaterNSW are collecting similar data (contingent on establishing appropriate data sharing arrangements)

- In some circumstances, LWUs may currently be collecting water quality information which would be of value to other (downstream) LWUs. To facilitate this, there could be a potential for WaterNSW to explore the option of providing a data portal to facilitate sharing of such data
- In locations where a LWU offtake is in close proximity to a storage, there could be value in sharing any available temperature profile data.
- There would be value for WaterNSW sharing data and alerts in the event that it is notified of incidents such as fuel spillages from accidents on public roads
- There is strong Interest in exploring the benefits from adding water quality parameters to existing hydrometric sites in strategic locations, as this takes advantage of existing site installations and communications services, and enables correlation of water quality data with river level and flow rates
- In some cases, weir pools downstream of dams strongly influence water quality, so there may be merit in monitoring these
- The potential to move from providing data and alerts to providing predictions would be valued
- There was some interest WaterNSW providing access from laboratory analysis as this could be used by LWUs as an input for long term planning as opposed to for use in operational decision making
- There was some interest in sharing the costs of any additional monitoring

In every discussion with LWU groups or individually, participants were encouraged to nominate any specific suggestions for additional monitoring (ie location and parameters) where this data would provide for enhanced decision making and risk management. The only suggestion received was an interest in the provision of water quality data for Gundagai.

#### **4.4 Customer Advisory Groups**

Customer Advisory Groups were provided with briefings and updates and were generally supportive of the initiative. While discussions were held to clarify the scope and intent of the Review, no specific suggestions for inclusion were received during this component of the consultation.

## 5. Current WaterNSW Initiatives

### 5.1 Initiatives Implemented Since Commencement of Review

Since the commencement of the Review, WaterNSW has:

- Consolidated all publicly available water data including water quality data into the WaterNSW web site
- Commenced publishing of live feeds to algal data via an interactive map on the WaterNSW website. Previously only the alert levels were published
- Completed the Wentworth to Broken Hill Pipeline. As a result water to Essential Water for Broken Hill is no longer provided by release from a WaterNSW storage. Water is now provided from the Murray River via the new pipeline. A Raw Water Supply Agreement with Essential Water includes agreed provisions for water quality including monitoring and provision of data
- Launched the Water Insights Portal on its Website. The Portal is designed to make water information, including water quality information easier to find and navigate. The aim of the Portal is to enable customers to make more informed water resource planning decisions by presenting up to date and visual information and help the community and other stakeholders understand what water is present in the system, either in the storage or the river. Information for the Murrumbidgee valley is now available and includes:
  - Storage volume
  - Inflows
  - Rainfall
  - Water allocation
  - Water distribution
  - Inter-valley trade

Additional NSW rural valleys will be progressively added over the coming months.

- Developed and released the WaterLive app. The app:
  - provides quick access to real-time water data to supplement the real-time data website and is available for iPhone and Android
  - allows water users to access information from handheld devices for surface water including major rivers, major dam levels, dam inflows and groundwater data. WaterLive provides access to real-time information from over 1,200 water monitoring sites throughout the state



- includes information on stream, storage or groundwater levels, streamflows, storage volumes, water temperatures, rainfall and various types of water quality data
- includes the ability to set favourites, and a "watches" function which allows users to quickly see whether the water level at a site has exceeded a set level for example

Water Insights and the WaterLive app provide significant increases in accessibility and functionality for LWUs to access water volume and water quality data as well as other relevant information relevant to their operations. They deliver some of the improvements suggested as part of the consultation during this Review.

Planned future enhancements to the functionality of WaterNSW data management systems are outlined below.

## **5.2 Initiatives Currently Underway**

### **Database and Data Management Functionality**

As part of its business system upgrade project, WaterNSW will be consolidating databases and providing improved analytical functionality. Still in its scoping phase and subject to funding in future price paths, this project provides an opportunity to enable WaterNSW customers to access water quantity and quality data, with the potential for self service functionality providing for alerts based on levels and trending of various parameters. This initiative will apply to both real time and sampled (laboratory based) water quality data.

At this stage it is anticipated that the improved functionality relevant to this review will be available by 2022. To be funded as part of the broader WaterNSW ICT improvement program, incremental costs would be incurred to deliver the functionality suggested as part of the consultation during this Review.

### **Insights Portal and WaterLive app**

Further enhancements scheduled for 2019/20 include:

- Inclusion of other river valley information into the Insights Portal
- The addition of an alert functionality into the WaterLive app. This will enable LWUs to receive alerts based on flows and water quality thresholds and trends
- Harmonisation of externally available data within the Insights Portal with both web and mobile access

### **River Modelling Improvements**

WaterNSW is currently developing a suite of new river models for all rural valleys. Designed primarily to improve operational decision making, these models may have the potential to provide further information about current and projected river behaviour. The potential may arise for customers, including LWUs to have access to information such as travel times between river nodes established in the modelling. While the location of nodes and accuracy of modelling will be influenced by and constrained

by available river and catchment data, there may be potential to provide further insights into the potential timing of changes in flow or water quality. As these models are currently under development, the precise functionality, and potential benefits for LWUs are yet to be determined.

### Monitoring Enhancements

As part of the response to the drought, the Department of Industry (Water) has request WaterNSW to install Dissolved Oxygen sensors at 14 existing river monitoring locations as listed below. These sensors are to be installed in the next few months. The addition of these sensors was taken into account in the finalisation of the Review.

Site No	Location
412004	Lachlan River at Forbes
412006	Lachlan River at Condobolin Bridge
412011	Lachlan River at Lake Cargelligo Weir
412047	Bensons drop weir downstream Lake Brewster outlet
412038	Lachlan River upstream Willandra Weir
412039	Lachlan River at Hillston
412005	Lachlan River at Booligal
422003	Barwon River at Collarenebri
422001	Barwon River at Dangar Bridge (Walgett)
422027	Barwon River at Geera
422002	Barwon River at Brewarrina
425039	Darling River at Warraweena
425003	Darling River at Bourke Weir
425004	Darling River at Louth

## 6. Findings of Review

This section draws together the input gathered during the consultation phase and provides a summary of the potential improvements. For each LWU Licence offtake location, the outcomes of the GIS analysis are summarised, include the proximity of existing monitoring locations (and parameters), and, where appropriate, nearby locations where additional monitoring could potentially be of benefit to LWUs. The analysis takes into account the current and planned initiatives of WaterNSW.

Commentary is provided regarding potential barriers, costs and timing where appropriate.

### 6.1 Existing Data Awareness and Availability

- The review has identified that LWUs have a limited understanding of the water quality data currently held by WaterNSW. Furthermore, there is limited knowledge of the range of mechanisms currently in place to access and interact with this data. Significant improvements to access and functionality have been made available since the review commenced. **(completed)**
- There is an opportunity to provide LWUs with specific information regarding the data and its availability. Targeted information including lists of available data, locational information, and functionality available by the Water Insights Portal and WaterLive app would be of benefit. **(short term opportunity)**

### 6.2 Enhancements to Data and Information Availability

- The ability to receive alerts for key sites and data streams has the potential to be of significant benefit, depending on the proximity of monitoring locations. This functionality will be available via the RealTime app for real time water quantity and quality data by June 2020, as part of currently funded and planned improvements to WaterNSW systems. Data available via the app is limited to continuous on-line data which is also available via the WaterNSW Real Time website. It does not include sampled (laboratory) data. **(medium term opportunity)**
- Enhanced access to other water quality data sets, including sampled data. Feedback during the consultation period indicated that while this data is not vital for daily decision making, enhanced access would be beneficial for longer term planning. This suggestion is anticipated to be available as part of the currently planned business system improvements, subject to funding in the WaterNSW price path beyond 2021. **(potential medium-long term opportunity)**
- Consultation indicated a desire for access to improved intelligence to inform potential future water quality behaviour. Once the new suite of river models is developed and operational, WaterNSW may be in a position to share available information regarding anticipated flows and travel times. This information would not predict water quality per se, and is likely to be significantly constrained by the data available to develop and run the models. Nevertheless it has the potential to provide some

insights to LWUs. WaterNSW will determine the feasibility of this as the models are further developed.

**(potential medium term opportunity)**

- There may be potential to establish a dedicated Portal specifically designed for LWUs on the WaterNSW Website. This Portal would provide a single point of entry for LWUs to identify and access data, set alerts etc. The potential exists for the Portal to also provide access to the GIS tools used as part of this Review, providing an easy to use interface for LWU customers. Design and access provisions for such a Portal would need careful consideration to ensure confidentiality of any information (such as Licence information) was preserved. WaterNSW will explore the interest in this opportunity in ongoing discussions with LWUs. **(potential medium term opportunity)**

### 6.3 Monitoring Program Enhancements

#### Potential Opportunities

The table below provides a summary of the existing monitoring and enables the identification of potential future augmentations upstream of each Licenced LWU offtake. All water quality parameters identified during the consultation phase are included. Further detail is provided in Appendix 2.

Local Water Utility	LICENCE	Estimated distance to closest site (km)	Data Currently Collected at closest site	Total number of sites with opportunities
ALBURY CITY COUNCIL	50WA500029	3	Level Rainfall	1
	50WA502078	5	Level Flow Conductivity Temperature	1
	50WA500001	10	Level Flow Conductivity Temperature	1
BALRANALD SHIRE COUNCIL	40WA400001	50	Level Flow DO	1
	60WA580004	180	Level Flow EC DO	1
BERRIGAN SHIRE COUNCIL	50WA500005	95	Level Flow Conductivity Temperature	1
	50WA500008	54	Level Flow Conductivity Temperature	1
COOTAMUNDRA/ GUNDAGAI REGIONAL COUNCIL	40WA400007	<1	Level Flow Conductivity Temperature	4
COWRA SHIRE COUNCIL	70WA600007	50	Level Flow Conductivity Temperature	2
	70WA600010	9	Level Flow Conductivity Temperature	2
DUBBO REGIONAL COUNCIL	80WA702822	<1	Level Flow	4
	80CA700582	3	Level Flow	4
	80WA700021	22	Level Flow Conductivity Temperature	1
	80WA700024	25	Level	3
EDWARD RIVER COUNCIL	57WA500011	1	Level Flow	2
	50WA500023	7	Level Flow Conductivity Temperature	2
	50CA401414	3	Level Flow Conductivity DO	3
ESSENTIAL WATER	60WA580001	1	Level	3
FEDERATION COUNCIL	50WA500019	80	Level Flow Conductivity Temperature	1
	50WA500026	47	Level Conductivity Temperature	3
	50WA500015	35	Level Conductivity Temperature	1
FORBES SHIRE COUNCIL	70WA602982	12	Level Flow	2
GOLDENFIELDS WATER COUNTY COUNCIL	40WA400010	33	Level Flow Conductivity Temperature	3
GWYDIR SHIRE COUNCIL	90CA804619	6	Level Flow	2
	90WA800019	<1	Level Flow	2

HAY SHIRE COUNCIL	40WA400013	83	Level Flow	1
INVERELL SHIRE COUNCIL	90CA812362	15	Level Flow	2
LACHLAN SHIRE COUNCIL	70WA600020	50	Level Flow	1
	70WA600023	0	Level	1
MIDWESTERN REGIONAL COUNCIL	80WA700012	9	Level Flow	2
	80WA700015	24	Level Flow	3
MOREE PLAINS SHIRE COUNCIL	90CA812360	50	Level Flow	2
	90CA812498	49	Level Flow Conductivity Temperature	2
MURRAY RIVER COUNCIL	50CA503865	35	Level Flow	2
	50WA500032	7	Level Flow Conductivity Temperature	1
	50WA500035	65	Level	1
	50WA500041	90	Level Flow	1
	50WA500044	110	Level Flow Conductivity Temperature	1
	50WA503785	70	Level	1
MURRUMBIDGEE COUNCIL	40WA400016	25	Level Flow Conductivity Temperature	1
	40WA400019	27	Level Flow	2
MUSWELLBROOK SHIRE COUNCIL	20WA200007	<1	Level Flow Conductivity Temperature	3
	20WA200010	2	Level Flow Conductivity, Temp Rain	4
NARRANDERA SHIRE COUNCIL	40WA400022	48	Level Flow Conductivity Temperature	2
PARKES SHIRE COUNCIL	70WA600026	61	Level Flow	2
RIVERINA WATER COUNTY COUNCIL	40WA400025	50	Level	1
	40WA400029	10	Level Flow	3
	40WA405557	47	Level Flow	1
SINGLETON COUNCIL	20WA200016	17	Level Flow Conductivity Temperature	5
	20WA200019	22	Level Flow Conductivity Temperature	3
SNOWY VALLEYS COUNCIL	40WA400035	<1	Level Flow	3
	40WA400044	12	Level Flow Conductivity Temperature	2
	40WA405197	6	Level Flow	3
	40WA400041	5	Level Flow	3
TAMWORTH REGIONAL COUNCIL	90CA818988	<1	Level	4
	90WA800004	6	Level Flow	3
	90WA819388	2	Level	4
UPPER HUNTER SHIRE COUNCIL	20WA200013	18	Level Flow Conductivity Temperature	1
WALGETT SHIRE COUNCIL	90WA809855	7	Level Flow	3
WARREN SHIRE COUNCIL	80CA700648	13	Level Flow	2
	80WQ704315			
	80CA700997	7	Level Flow	2
	80WA700018			
WENTWORTH SHIRE COUNCIL	60WA580007	13	Conductivity Temperature	5
	60WA580010	8	Conductivity Temperature	3
	60WA580013	<1	Level Flow Conductivity Temperature	2

The table identifies the closest existing monitoring location where data is available real-time. Also identified are available upstream sites with the potential to provide data of use to LWUs. Where multiple sites are available upstream, any sites further than 100km have generally been excluded, except where they are the next available site.

In summary,

- Potential opportunities for increased monitoring have been identified for 31 LWUs
- Many LWUs have more than one Licence
- In some cases, Licence locations coincide or are in close proximity
- Some monitoring sites could potentially provide benefits to more than one Licence location
- In total there are some 64 individual Licences where opportunities potentially exist
- Approximately 150 total potential opportunities have been identified, although in a number of cases, the same monitoring site is upstream of multiple LWU Licence locations, meaning that the number of unique opportunities is somewhat less.
- In cases where the nearest monitoring location is within 1 km of the Licence offtake location, there is unlikely to be a material gain from increased monitoring. These parameters would already be monitored by the LWU and the close proximity would mean any increased monitoring would provide little increase in lead time

### Cost Implications

The table below provides an indication of the indicative range of capital and operational costs.

Capital costs include equipment purchase and labour, and vary considerably depending on the configuration of each site and desired parameters.

Operating costs vary depending on the number and type of sensors, and the desired frequency of visits to check and maintain the sites, including cleaning sensors.

All costs are the incremental costs associated with adding parameters to existing hydrometric sites with existing telemetry and real time capability. The range of costs reflects the cost of up to five sensors (Turbidity, Temperature, DO, pH and EC).

<b>Additional Sensors</b>	<b>Capital Cost Range (\$ per site)</b>	<b>Operating Cost Range (\$ per site pa)</b>
1-5	5000 – 20000	3000 – 15000

Detailed costs for specific sites will be subject to:

- Confirmation of benefits for individual parameters, by site, in discussion with LWUs, taking into account the characteristics of the LWU Water Treatment facilities and the range of local and upstream conditions
- An assessment of each site in terms of design, configuration, current monitoring and other equipment, and capability for expansion
- Confirmation of the appropriate design and maintenance requirements

Depending on the final number of sites where monitoring is enhanced, and the configuration of individual sites, the potential total cost (based on 100 sites) would be

	Capital Cost Range (\$m)	Operating Cost Range (\$m pa)
<b>Potential Total Cost (100 sites)</b>	0.5 – 2	0.3 – 1.5

**(potential short-medium opportunity)**

**Note: individual enhancements could be delivered in the short-medium term if funded by direct agreements with LWUs. WaterNSW would develop individual specifications, costings and fees on a site by site basis with interested LWUs.**

#### 6.4 Other Suggestions

Other matters raised during the consultation phase are discussed below

- Some LWUs suggested WaterNSW could provide a role in providing notifications of incidents such as potential contamination from road accidents. It was noted during the discussions that WaterNSW has close connections with LWUs at a local and operational level, and that these are effective in providing notification of potential changes in river conditions or other matter as WaterNSW becomes aware. NSW Health has confirmed that formal arrangements for provision of information related to potential pollution events are in place by the emergency services organisations, via the local Public Health Units.
- As part of the business system upgrade initiative, WaterNSW will explore the potential for it to provide a service which enables LWUs to share data which they collect and may be of value to other LWUs. The costs associated with this initiative are not currently available. Potential barriers for the success of this initiative would include the establishment of formal mechanisms (including technical arrangements) for data sharing, and resolution of any issues related to liability if one LWU relied on data from a third party. A more appropriate arrangement would be for LWUs to liaise directly with their counterparts where material benefits are available.

## 7. Recommendations & Next Steps

WaterNSW will share the outcomes of the Review through its Customer Advisory Groups, and progress discussion of opportunities with LWU customers as part of its Account Management Processes.

The following sections discuss specific initiatives in the areas of data access and availability (existing data), and potential enhancements to the monitoring program (new data).

### 7.1 Data Access and Availability

A number of significant enhancements to data availability have been made since the Review commenced.

The opportunity exists for WaterNSW to provide LWUs with specific information regarding current data and its availability. Targeted information will include:

- lists of available data & locational information
- Water Insights Portal functionality
- WaterLive app functionality

WaterNSW will progress initiatives to improve accessibility including

- WaterLive app enhancement to provide alerts for existing real time data (June 2020)
- Enhanced access to all relevant water quality data sets, including alerts (subject to IPART funding)

### 7.2 Monitoring Program Enhancements

WaterNSW is shortly to commence consultation with its various customer groups to discuss current and potential water monitoring services, including customers' willingness to pay. The outcome of this Review provides WaterNSW with an opportunity to:

- Progress detailed discussions with interested LWUs regarding the outcomes of the review and confirming the potential benefits for each identified monitoring location
- Develop detailed capital and operating costs for desired enhancements
- Incorporation of the outputs in commercial agreements or the next pricing submission as appropriate

Local Water Utilities currently hold high security licences, as do many other customers, and LWUs account for only a small proportion of high security water. Inclusion of funding for these enhancements in the prices for high security water would mean that the majority of the costs was born by other users, many of whom would gain little value from the enhanced monitoring.

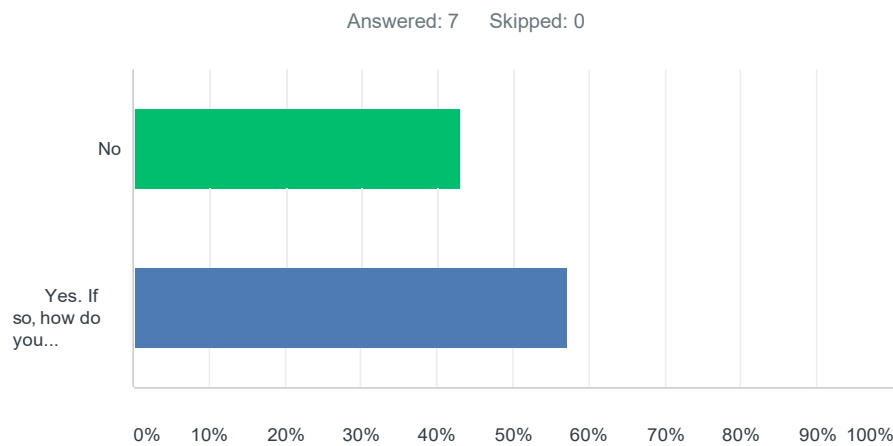


The most appropriate method to fund any monitoring enhancements designed to specifically benefit LWUs would be for WaterNSW to enter into specific agreements with individual LWUs for provision of the data on a fee for service basis. This arrangement would have the additional benefit that installation of the enhanced monitoring could proceed immediately once agreement was reached, and would not be subject to the timing of pricing reviews.

WaterNSW will also share the outcomes of the review through its Customer Advisory Groups, and progress detailed discussions with individual LWUs as part of its Key Account Management processes. These discussions will provide the opportunity for WaterNSW to brief LWUs about its roadmap for enhanced data accessibility. They will also be an opportunity for individual LWUs to fast track enhancements to the monitoring program through individual agreements with WaterNSW to fund specific monitoring and data provision arrangements.

## Appendix 1 – LWU Survey Results

Q1 Do you currently access or rely on any water quality data or information from WaterNSW?

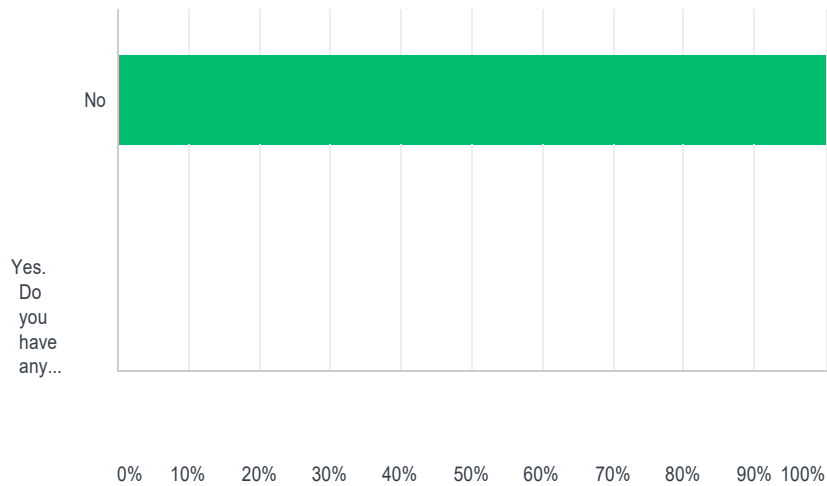


Answer Choices	Responses	
No	100.00%	7
Yes. Do you have any suggestions for how we could improve the procedure?	0.00%	0
<b>TOTAL</b>		<b>7</b>

#	Yes. If so, how do you obtain this?	Date
1	Only receive monthly report on lake Oberon water quality, with nothing in regards to Potable water from Duckmaloi WFP	5/16/2018 10:56 AM
2	Email & online	5/10/2018 10:59 AM
3	When quality issues are advised algal outbreak etc	5/10/2018 9:05 AM
	Internet	5/9/2018 1:42 PM

## Q2 Do you currently make use of the WaterNSW Information Request Procedure?

Answered: 7 Skipped: 0



Answer Choices	Responses
No	100.00% 7
Yes. Do you have any suggestions for how we could improve the procedure?	0.00% 0
<b>TOTAL</b>	<b>7</b>

#	Yes. Do you have any suggestions for how we could improve the procedure?	Date
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There are no responses

### Q3 What other data or information do you access?

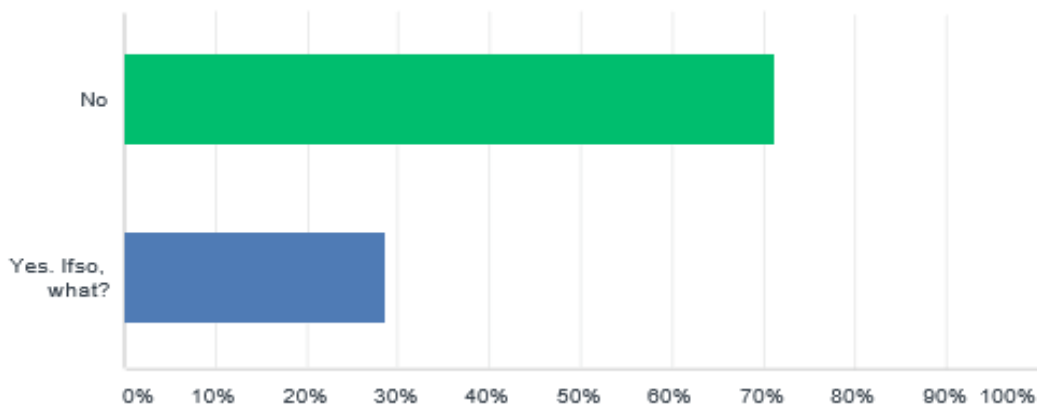
Answered: 5

Skipped: 2

#	Responses	Date
1	Water Quality monitoring data from Duckmaloi treatment plant & Also at supply handover points. Accurate flow recording of water usage from FRWS scheme.	5/16/2018 10:56 AM
2	Chlorine disinfection in water. The effects of iron and manganese and how to remove it. Studies on materials used to reticulate water	5/15/2018 9:07 AM
3	When purchasing water for remote villages	5/10/2018 9:05 AM
4	Copeton Dam levels and Gwydir River flows	5/9/2018 1:54 PM
5	Dam information and releases	5/9/2018 1:29 PM

### Q4 Are you aware of any water quality related data or information WaterNSW holds that you would find useful?

Answered: 7 Skipped: 0

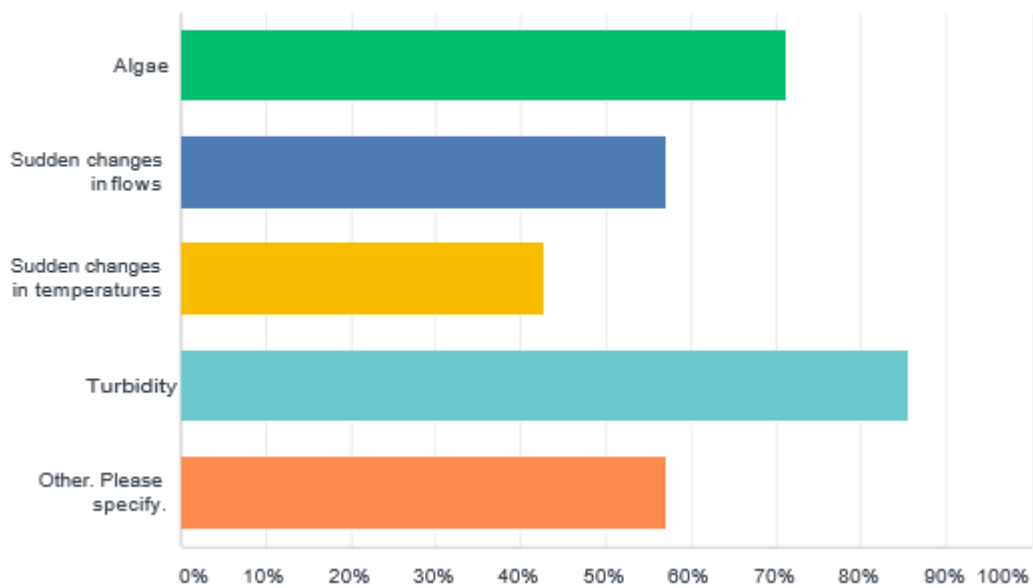


Answer Choices	Responses
No	71.43% 5
Yes. If so, what?	28.57% 2
<b>TOTAL</b>	<b>7</b>

#	Yes. If so, What?	Date
1	Water Quality monitoring data from Duckmaloi treatment Plant & Also at supply handover points	5/16/2018 10:56 AM
2	Dam Catchment and Impound Water Quality	5/9/2018 1:29 PM

## Q5 What Water quality risks are you most concerned about?

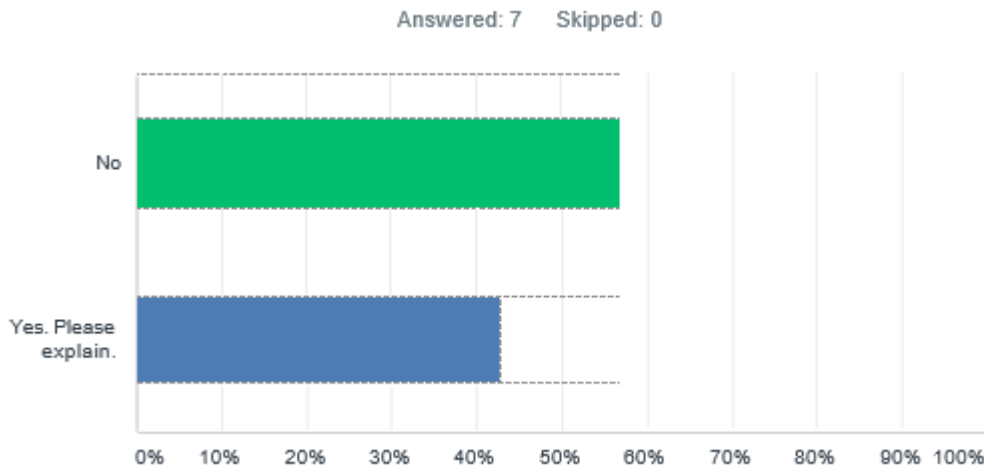
Answered: 7 Skipped: 0



ANSWER CHOICES	RESPONSES	
Algae	71.43%	5
Sudden changes in flows	57.14%	4
Sudden changes in temperatures	42.86%	3
Turbidity	85.71%	6
Other. Please specify.	57.14%	4
Total Respondents: 7		

#	OTHER. PLEASE SPECIFY.	DATE
1	compliance with ADWG	5/16/2018 10:56 AM
2	Iron and manganese. Bacteria in retic systems.	5/15/2018 9:07 AM
3	EC	5/10/2018 10:59 AM
4	Low oxygen, sudden change in pH	5/10/2018 9:05 AM

Q6 Are there gaps in information or data that you would find useful in  
 Understanding short term risks and optimizing plant operations?  
 Understanding long term risks?

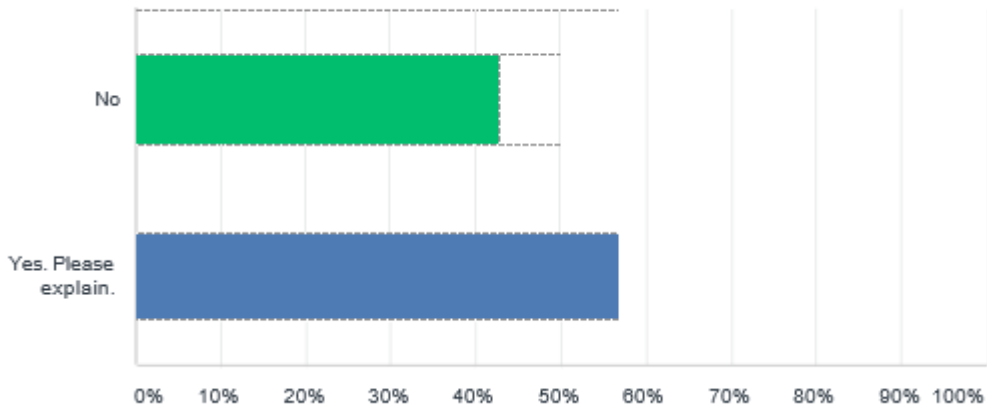


Answer Choices	Responses
No	57.14% 4
Yes. Please explain.	42.86% 3
<b>TOTAL</b>	<b>7</b>

#	YES. PLEASE EXPLAIN.	DATE
1	Requirements on council to undertake further treatment to comply with ADWG	5/16/2018 10:56 AM
2	Bore water use and iron build up in reservoirs and retic systems	5/15/2018 9:07 AM
3	Not sure of what data is available	5/9/2018 1:54 PM

Q7 Do you have any suggestions for additional steps WaterNSW or other could take to: Gather data from new monitoring locations? Gather additional data from existing monitoring locations? Provide access to data (including your preferred means of access)?

Answered: 7 Skipped: 0



Answer Choices	Responses
No	42.86% 3
Yes. Please explain.	57.14% 4
<b>TOTAL</b>	<b>7</b>

#	YES. PLEASE EXPLAIN.	DATE
1	to be completed with Ismart program and data sharing as per Ismart inception meeting held with council.	5/16/2018 10:56 AM
2	turbidity readings and their causes	5/15/2018 9:07 AM
3	WaterNSW Murry River Data Wentworth Region	5/10/2018 10:59 AM
4	Notification of existing data collected	5/9/2018 1:54 PM



Q8 If you would like to have further individual discussions regarding this review, please nominate the most appropriate contact person and contact details

Answered: 4 Skipped: 3

ANSWER CHOICES	RESPONSES
Name	100.00%
Company	100.00%
Address:	0.00%
Address 2:	0.00%
City/Town:	0.00%
State:	0.00%
Postcode:	0.00%
Country	0.00%
Email Address	100.00%
Phone Number	100.00%

## Appendix 2 – Potential Monitoring Opportunities

The table below identifies, for each LWU Licensed Offtake, existing monitoring locations, parameters collected, and estimated distance from the offtake. As discussed in Section 6.3, the potential exists to add additional parameters and utilise existing infrastructure and telecommunications to share data with LWUs.

Local Water Utility	Licence	Monitoring Site Name	Monitoring Site ID	Estimated distance (km)	Data Currently Collected
ALBURY CITY COUNCIL	50WA500029	Hume Dam Storage	401027	3	Level Rainfall
	50WA502078	Murray @ Heywoods	409016	5	Level Flow Conductivity Temperature
	50WA500001	Murray @ Heywoods	409016	10	Level Flow Conductivity Temperature
BALRANALD SHIRE COUNCIL	40WA400001	Murrumbidgee d/s Redbank	410041	50	level flow DO
	60WA580004	Murrumbidgee d/s Balranald	410130	180	level flow EC DO
BERRIGAN SHIRE COUNCIL	50WA500005	Murray @ Yarrawonga	409025	95	Level Flow Conductivity Temperature
	50WA500008	Murray @ Yarrawonga	409025	54	Level Flow Conductivity Temperature
COOTAMUNDRRA GUNDAGAI REGIONAL COUNCIL	40WA400007	Murrumbidgee @ Gundagai	410004	<1	Level Flow Conductivity Temperature
		Tumut @ Brungle Bridge	410039	36	Level Flow Temperature
		Murrumbidgee u/s Gobarra	410195	32	Level Flow Conductivity Temperature
		Murrumbidgee @ Glendale	410068	90	Level Flow Conductivity Temperature
COWRA SHIRE COUNCIL	70WA600007	Storage @ Wyangala	412010	52	Level
		Lachlan d/s Wyangala	412067	50	Level Flow Conductivity Temperature
	70WA600010	Storage @ Wyangala	412010	11	Level
		Lachlan d/s Wyangala	412067	9	Level Flow Conductivity Temperature
DUBBO REGIONAL COUNCIL	80WA702822	Macquarie @ Wollombi	421900	35	Level
		Macquarie @ Wellington	421003	50	Level
		Macquarie D/S Burrendong Dam	421040	75	Level Flow Conductivity Temperature
		Macquarie @ Dubbo	421001	<1	Level Flow
	80CA700582	Macquarie @ Wollombi	421900	38	Level
		Macquarie @ Wellington	421003	53	Level

		Macquarie d/s Burrendong Dam	421040	78	Level Flow Conductivity Temperature
		Macquarie @ Dubbo	421001	3	Level Flow
	80WA700021	Macquarie d/s Burrendong Dam	421040	22	Level Flow Conductivity Temperature
	80WA700024	Macquarie @ Wellington	421003	25	Level
		Macquarie d/s Burrendong Dam	421040	50	Level Flow Conductivity Temperature
		Bell @ Newrea	421018	43	Level Flow Conductivity Temperature
EDWARD RIVER COUNCIL	57WA500011	Billabong, Wanganella	41010810	1	Level Flow
		Billabong Ck @ Conargo	410017	70	Level Flow
	50WA500023	Edward @ Toonalook	409047	7	Level Flow Conductivity Temperature
		Edward @ Offtake	409008	35	Level Flow Conductivity Temperature
	50CA401414	Edward @ Deniliquin	409003	3	level flow EC DO
		Edward @ Toonalook	409047	10	Level Flow Conductivity Temperature
Edward @ Offtake		409008	38	Level Flow Conductivity Temperature	
ESSENTIAL WATER	60WA580001	Lake Pamamaroo	425021	10	Level
		Lake Menindee @ Outlet	425044	1	Level
		Darling @ Menindee Township	425001	1	Level
FEDERATION COUNCIL	50WA500019	Murray @ Corowa	409002	80	Level Flow Conductivity Temperature
	50WA500026	Murray @ Albury	409001	47	Level Conductivity Temperature
		Murray @ Doctors Pt	409017	57	Level Flow Conductivity Temperature
		Murray @ Heywoods	409016	77	Level Flow Conductivity Temperature
	50WA500015	Murray @ Howlong	409037	35	Level Conductivity Temperature
FORBES SHIRE COUNCIL	70WA602982	Lachlan@ Jemalong Weir	412036	60	Level, Flow
		Bumbuggan Ck @ Offtake	412017	12	Level Flow
GOLDENFIELDS WATER COUNTY COUNCIL	40WA400010	Murrumbidgee d/s Burrunjuck	410008	48	Level Flow Conductivity Temperature

		Burrunjuck Storage	410131	50	Level
		Murrumbidgee @ Glendale	410068	33	Level, Flow Conductivity Temperature
GWYDIR SHIRE COUNCIL	90CA804619	Gwydir @ Pinegrove	418012	6	Level, Flow
		Gwydir d/s Copeton	418026	49	Level, Flow
	90WA800019	Gwydir @ Gravesend	418013	<1	Level, Flow
		Gwydir @ Pinegrove	418012	50	Level, Flow
HAY SHIRE COUNCIL	40WA400013	Murrumbidgee @ Carrath Br	41000281	83	Level, Flow
INVERELL SHIRE COUNCIL	90CA812362	Pindari Storage	416030	21	Level
		Severn @ Ducca Marri	416067	15	Level, Flow
LACHLAN SHIRE COUNCIL	70WA600020	Bumbuggan Ck @ Offtake	412017	50	Level, Flow
	70WA600023	Lake Cargelligo Storage	412107	0	Level
MIDWESTERN REGIONAL COUNCIL	80WA700012	Cudgegong d/s Windamere	421079	30	Level, Flow Conductivity Temperature
		Cudgegong @ Rocky Water H	421149	9	Level, Flow
	80WA700015	Cudgegong @ Wilbertree Rd	421150	24	Level, Flow
		Cudgegong @ Rocky Water H	421149	45	Level, Flow
		Cudgegong d/s Windamere	421079	65	Level, Flow Conductivity Temperature
MOREE PLAINS SHIRE COUNCIL	90CA812360	Macintyre @ Kanowna	416048	50	Level, Flow
		Macintyre u/s Boomi Weir	416043	90	Level, Flow
	90CA812498	Macintyre @ Holdfast	416012	49	Level, Flow Conductivity Temperature
		Dumaresq @ Glenarbo	416040	51	Level, Flow Conductivity, Temp
MURRAY RIVER COUNCIL	50CA503865	Waddy Ck d/s Regulator	409098	35	Level, Flow
		Murray @ Barham	409005	110	Level, flow, EC, DO
	50WA500032	Edward @ Offtake	409008	7	Level, Flow Conductivity Temperature
	50WA500035	Murray @ Gulpa	409006	65	Level
	50WA500041	Murray @ Waddy Ck d/s Regulator	409098	90	Level, Flow
	50WA500044	Edward d/s Stevens	409023	110	Level, Flow Conductivity Temperature
	50WA503785	Murray @ Gulpa	409006	70	Level
MURRUMBIDGEE COUNCIL	40WA400016	B/Bong u/s Innes Bdg	410170	25	Level, Flow Conductivity Temperature
	40WA400019	Tombullen d/s Weir	41010970	27	Level, Flow
Murrumbidgee d/s Gogel W		410082	44	Level, Flow	

MUSWELLBROOK SHIRE COUNCIL	20WA200007	Hunter @ Muswellbrook Bridge	210002	<1	Level, Flow Conductivity Temperature
		Hunter @ Aberdeen	210056	19	Level, Flow Conductivity Temperature
		Hunter d/s Glenbawn	210015	35	Level, Flow Conductivity Temperature
	20WA200010	Hunter @ Denman	210055	2	Level, Flow Conductivity, Temp Rain
		Hunter @ Muswellbrook Bridge	210002	30	Level, Flow Conductivity Temperature
		Hunter @ Aberdeen	210056	50	Level, Flow Conductivity Temperature
		Hunter d/s Glenbawn	210015	65	Level, Flow Conductivity Temperature
	NARRANDERA SHIRE COUNCIL	40WA400022	Murrumbidgee d/s B/Bed	410023	52
Old Man Ck @ Kywong			410093	48	Level, Flow Conductivity Temperature
PARKES SHIRE COUNCIL	70WA600026	Mandagery u/s Eugowra	412030	65	Level, Flow Conductivity Temperature
		Lachlan @ Nanami	412057	61	Level, Flow
RIVERINA WATER COUNTY COUNCIL	40WA400025	Murrumbidgee @ Eringoarrah	410143	50	Level
	40WA400029	Yanco Ck, Offtake	410007	42	Level, Flow
		Yanco Ck d/s Tarabah Weir	41000213	10	Level, Flow
		Murrumbidgee Narrandera	410005	62	Level, Flow Temperature
	40WA405557	Colombo Ck, Morundah	410014	47	Level, Flow
SINGLETON COUNCIL	20WA200016	Hunter @ Liddell	210083	42	Level, Flow Conductivity Temperature
		Hunter d/s Saddlers	210151	65	Level, Flow Conductivity Temperature
		Hunter @ Denman	210055	87	Level, Flow Conductivity Temperature
		Hunter @ Mason Dieu	210128	30	Level, Flow
		Hunter @ Long Point	210134	17	Level, Flow Conductivity Temperature
	20WA200019	Hunter @ Denman	210055	40	Level, Flow Conductivity, Temp

		Hunter @ Muswellbrook Bridge	210002	70	Level, Flow Conductivity Temperature
		Hunter d/s Saddlers	210151	22	Level, Flow Conductivity Temperature
SNOWY VALLEYS COUNCIL	40WA400035	Tumut @ Tumut	410006	<1	Level, Flow
		Tumut @ Oddys Bridge	410073	16	Level, Flow Cond. Temp
		Goobragandra @ Lacmalac	410057	12	Level, Flow Conductivity, Temp
	40WA400044	Blowering Storage	410102	14	Level
		Tumut @ Oddys Bridge	410073	12	Level, Flow Cond. Temp
	40WA405197	Tumut @ Tumut	410006	20	Level, Flow
		Tumut @ Oddys Bridge	410073	36	Level, Flow Cond. Temp
		Nimbo Ck d/s Offtake	41000200	6	Level, Flow
	40WA400041	Nimbo Ck d/s Offtake	41000200	5	Level, Flow
		Tumut @ Oddys Bridge	410073	35	Level, Flow Cond. Temp
Tumut @ Tumut		410006	19	Level, Flow	
TAMWORTH REGIONAL COUNCIL	90CA818988	Peel @ Tamworth	419009	<1	Level
		Peel @ Piallamore	419015	14	Level, Flow
		Peel ds Chaffey Dam	419045	35	Level, Flow Temperature
		Dungowan Ck	419103	20	Level, Flow
	90WA800004	Manilla @ Brabri	419020	6	Level, Flow
		Manilla d/s Splitrock	419043	32	Level, Flow
		Manilla @ Upper Manilla	419056	20	Level, Flow
	90WA819388	Peel @ Tamworth	419009	2	Level
		Peel @ Piallamore	419015	16	Level, Flow
		Peel d/s Chaffey Dam	419045	37	Level, Flow Temperature
Dungowan Ck		419103	22	Level, Flow	
UPPER HUNTER SHIRE COUNCIL	20WA200013	Hunter d/s Glenbawn	210015	18	Level, Flow Conductivity Temperature
WALGETT SHIRE COUNCIL	90WA809855	Namoi @ u/s Walgett	419091	7	Level, Flow
		Namoi @ Goangra	419026	40	Level, Flow Conductivity Temperature
		Namoi @ Yarraldool	419108	70	Level, Flow
WARREN SHIRE COUNCIL	80CA700648 80WQ704315	Macquarie @ Gin Gin	421031	46	Level, Flow
		Macquarie @ Warren Weir	421004	13	Level, Flow
	80CA700997 80WA700018	Macquarie @ Gin Gin	421031	40	Level, Flow
		Macquarie @ Warren Weir	421004	7	Level, Flow
WENTWORTH SHIRE COUNCIL	60WA580007	Curlwaa Pontoon	41310028	13	Conductivity Temperature
		Murray @ Merbein Pontoon	41310027	25	Conductivity Temperature

		Chaffey's Pontoon	4130026	30	Conductivity Temperature
		Redcliffs Pontoon	41310025	50	Conductivity Temperature
		Mcliffs d/s Pontoon	41310024	82	Conductivity Temperature
	60WA580010	Redcliffs Pontoon	41310025	8	Conductivity Temperature
		Mcliffs d/s Pontoon	41310024	40	Conductivity Temperature
		Murray @ Mcliffs2	413002	45	Level Conductivity Temperature
	60WA580013	Darling @ Pooncarie	425005	<1	Level, Flow Conductivity Temperature
		Anabranche @ Offtake	425050	80	Level, Flow