

# INSPECTING SERVICE RESERVOIRS FOR WATER QUALITY NOW!



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## 1.0 INTRODUCTION

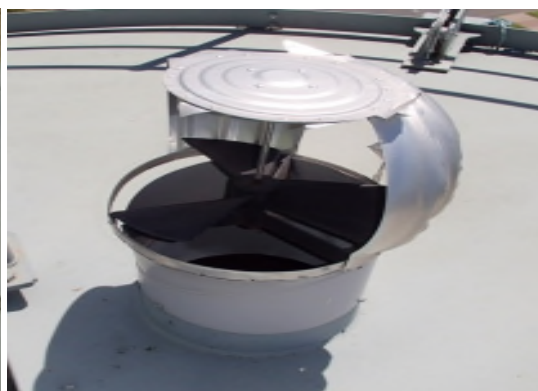
Water quality within service reservoirs is now being given more consideration when conducting inspection programs. NSW Department of Primary Industry - Water (DPI Water) have issued a protocol (Circular No. LWU 18), which acknowledges the three barriers required for drinking water to be suitable for safe consumption.

1. Effective disinfection to kill, inactivate or remove pathogens in the water supply.
2. Ensure distribution integrity to prevent contamination.
3. Maintain free chlorine residual in the water distribution system to protect against minor contamination and to indicate potential breaches in distribution system integrity.

The initiatives commenced in NSW deserve to be expanded into the other States, so that all consumers can have confidence in the drinking water they have been told they can trust. Inspections based on the DPI Water requirements focus on entry hatches, platform areas, roof structures and ventilation systems to ensure effective barriers are in place to prevent contaminants such as faecal material, vermin and debris entering into our water supplies (Barrier 2). See Figures 1 and 2 for examples of defective barriers.



**Figure 1:** *Roof Ridge Cap Missing*



**Figure 2:** *Faulty Rotating Vent*

## 2.0 INSPECTION METHODS

Good photographic images form the base line of all inspections carried out – without this evidence, the client is relying on the inspector's viewpoint only. Images and written data should also complement each other and 'tell a story' to others who view the findings later on.

Field data needs to be consistent and accurate - the only way to achieve this effectively, is for the main inspector to input the data and rename the images each day as the impressions and memories remain fresh. Technical skills are also important for accurate reporting, but the most overlooked aspect of a good inspector, is someone who feels comfortable within the environment being inspected.

It is no use having a highly qualified person who does not like working at heights or within confined spaces, or who has no effective camera or writing skills – these are all things that have to be learned through constant training and exposure to field inspection situations.



**Figure 3:** *Unsecured Entry Hatch*



**Figure 4:** *Open Roof Areas Allowing Drainage and Vermin Entry*

While most defective areas are obvious, some of the worst contamination entry points are also the hardest to identify. This is where experience comes into play, based on recognising the available evidence such as bird activity around the roof area, staining and debris on platforms from ponded water residues, hatches that leak when the bucket of water test (BoW) is applied, and feathers or nesting material on the internal water line areas.



**Figure 5:** *Bucket of Water Test*



**Figure 6:** *Internal Evidence of BoW Test Failure*

The Barrier 2 items can mostly be identified and recorded without entering the water, but there are other areas within a service reservoir that may be affecting water quality, such as corroded internal ladder systems (Figure 7), pipework and posts.



**Figure 7:** *Corroded Ladder*



**Figure 8:** *Excessive Sediment and Debris*

Along with excessive sediment loadings, poorly designed inlet and outlet pipework and debris (Figure 8) that has entered the tank, it is important to identify issues that will be impacting disinfection residuals within the storage (Barrier 3).

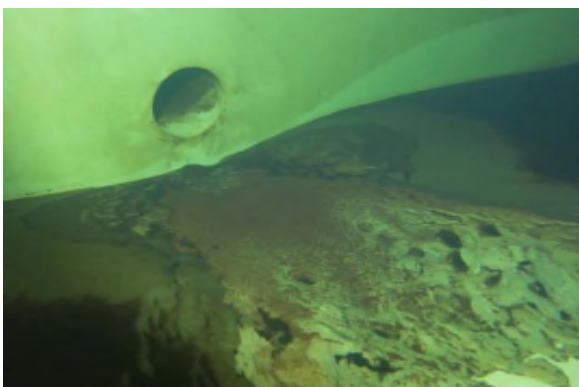


**Figure 9:** *Diver Inspections*



**Figure 10:** *Remote Operated Vehicle*

While this segment can be done by diving or Remote Operated Vehicle (ROV) (Figures 9 & 10), not everyone is competent in recognising some of the specialised issues. Pipework designs for example are often overlooked during contamination orientated inspections.



**Figure 11:** *Inlet Flow Disturbing Sediments*



**Figure 12:** *An Inlet Nozzle Directing Water Flow Up Off the Floor Area*

If incoming water is stirring up existing sediments (figure 11) or outlets have no effective raised edge barriers in place to stop debris from entering reticulation system, then the inspection process is not complete (see figure 12 for an effective barrier).

### **3.0 A REGIONAL INSPECTION PROGRAM**


The Lower Macquarie Water Utility Alliance (LMWUA) is a group of 12 western NSW Councils, who have joined together to share resources and skills. It makes sense to combine projects and supply requirements, so that wholesalers, consultants and contractors can amortise their travelling time out to areas, previously too far away for them to visit economically.

The DPI Water Circular 18 Inspection Program was one such combined project that the LMWUA decided to go ahead with. The alliance has over 82 storage tanks between them, so a far reaching inspection program was tendered out to suitably qualified contractors. In addition to the DPI Water requirements, it was decided to include Security, WH&S, Structural and Coatings issues within the scope, to make use of the extensive travelling required to visit all the tank sites.

All tanks were inspected using the same parameters, to ensure an accurate, overall assessment was obtained across the group. Solutions to the issues identified were also required, along with recommendations of suitable personnel able to carry out the renovations. A lot of common issues soon evolved, particularly dealing with entry hatches, platforms and roofing designs, so it was relatively easy to offer proven 'fixes' to these common problems.

Each client was given an individual reporting package of images and a series of 9 electronic reports (see Figure 13 for an example report) on their own assets, to suit various interests within the Council management systems. The alliance project manager was given training and security access to all of the assets, so that the 'big picture' management of compliance reporting and renovations could be continued. ASAM R/T is a live data base system which can be searched, updated and accessed via PC, tablet or smart phone at any place, any time. Projects can be managed and the progress documented, step by step. Specialised reports to suit various interest groups can be generated, while a search engine finds relevant information quickly. Clients can also update their data online as issues are resolved.

Bi-monthly meetings of the LMWUA members have had regular updates from the inspection team, to ensure the final results are communicated and understood effectively. New ideas for renovations and specialist contractors will also be introduced to the group, as the next stage of the Circular 18 inspection process (fixing the defects) is implemented.

ASAM Project Management System Report					
22/09/2015					
Inspection Date:	17/06/2011	Client Name:	All State City Council		
WS #:	0	Reservoir Name:	Reservoir Hill No2		
Job No:	024944	Project Number:	0		
Cleaning Due:	21/9/2008	Inspection Due:	21/9/2008	Register No:	39
Raised By:	jillasam49			Date:	8/5/2015
Map Standard:	WGS 84				
Co-ord 1:	S 28 05 585	E 152 49 368			
Co-ord 2:					
<b>Project Category -</b>		<b>NOW</b>		<b>NOW Projects</b>	
<u>Maintenance Item:</u>					
NOW - Vermin entry and Hatch cover					
<u>Comments:</u>					
Possoms have been entering this tank on a frequent basis - the area under the platform, where it sits on top of the wall has been identified and needs to be sealed off ASAP. The hatch cover is sealed but the roof is draining in under the hatch frame area, where the roof sheets join the platform					
<b>Action taken by nominated staff member/contractor:</b>					
A temporary barrier of chicken wire has been put in place under the platform area to prevent possum entry. The tank has been isolated and divers have been contacted for a clean.					
<b>Accepted or modified and approved for action:</b>		<b>Date:</b>	22/07/2015	<b>Yes</b>	<input checked="" type="checkbox"/>
<u>Comments:</u>					
Three contractors have been approached to submit a quote to renovate the hatch and platform area. Responses from 2 companies have been received by 30 July 15, but \$ are more than in budget. 01 Sept 15 Tank was cleaned and 9 skeleton remains were found! Tank has been put back in service.					
<b>Finance approved:</b>		<b>Date:</b>		<b>No</b>	<input type="checkbox"/>
<u>Comments:</u>					
Hatch renovations have been postponed until the 16/17 FY.					
<b>Work order issued:</b>		<b>Date:</b>		<b>No</b>	<input type="checkbox"/>
<u>Comments:</u>					
<b>Work Order completed and accepted:</b>		<b>Date:</b>		<b>No</b>	<input type="checkbox"/>
<u>Comments:</u>					

**Figure 13:** *An Example of a NOW Report*

#### 4.0 INSPECTION OUTCOMES

The most important aspect of any inspection program is how the client receives and takes ‘ownership’ of the results. Poor outcomes may not be obvious at first, but when water quality failures continue to occur, structural failures become obvious and budgets appear to have been allocated in the wrong areas, then the inspection process needs to be re-assessed. Was it commissioned to ‘tick a box’ on the compliance register or was it genuinely begun the find and rectify the water quality issues? Figure 13 shows how the clients can demonstrate their commitment to the issues identified and maintain a record of the rectification process through to completion.

#### 5.0 CONCLUSION

Inspection programs that have been initiated in the last twelve months, due to the requirements of the DPI Water Circular 18 protocol have ensured that a focus on preserving water quality within Service Reservoirs has taken place across NSW. While the LMWUA program allowed for a large, representative sample to be examined, many smaller groups have also been inspected and the results have been fairly consistent. There has been an ongoing contamination problem within our distribution systems for many years and it is only now, that recognition and remedial actions are being directed to ensure our water is healthy and safe for the public to consume.