Conducting Underway Asset Inspections of Port Macquarie & Cowarra Dams

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Port Macquarie-Hastings Council

Presentation Outline

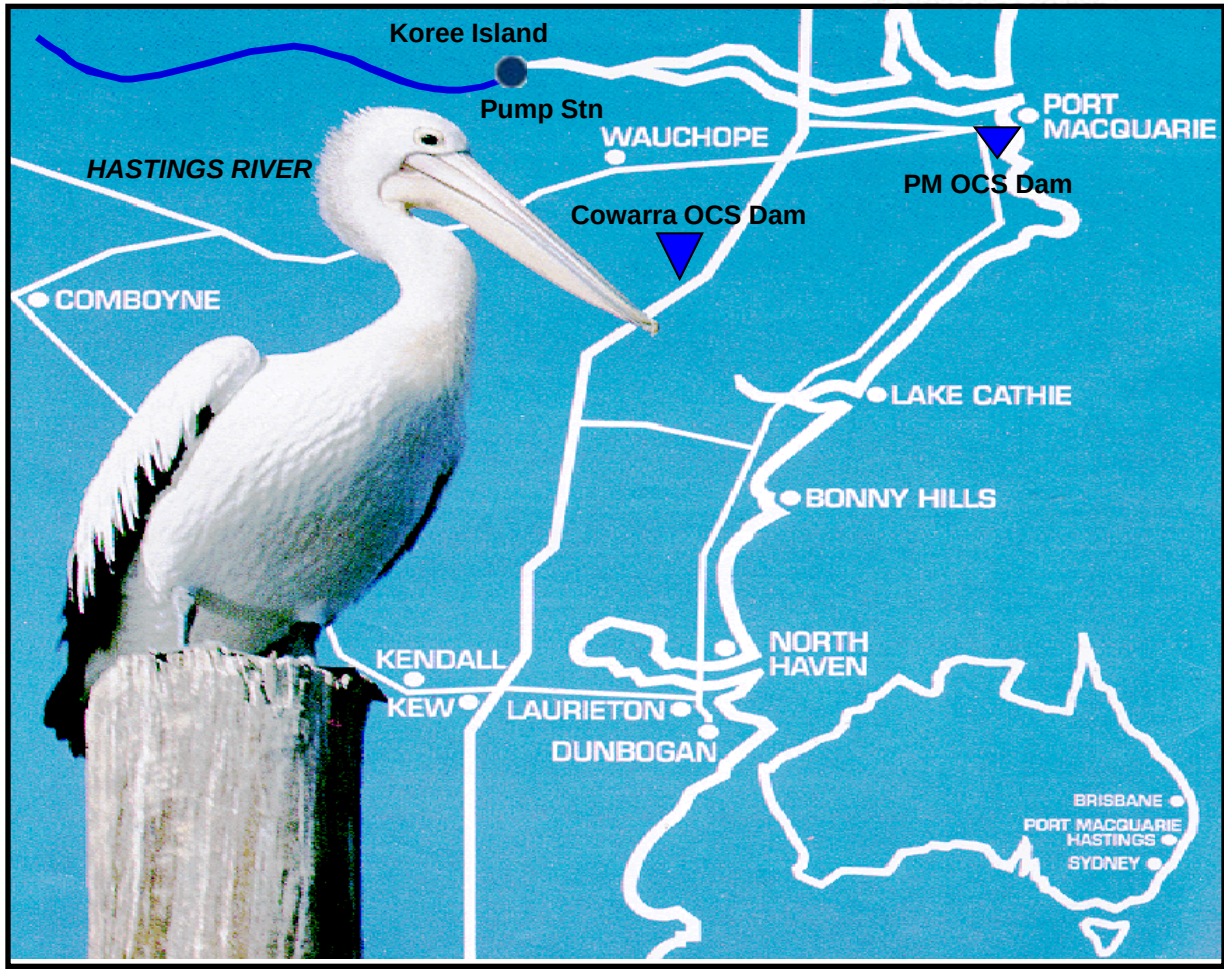
- **Hastings Region & Existing Water Supply Schemes**

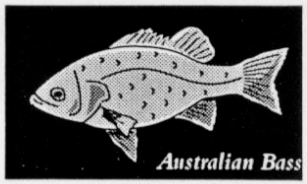
- **Port Macquarie Dam**
  - Emergency Incident – 9th December 2010
  - Replacing submerged aeration pipeline & anchors – September 2012

- **Cowarra Dam**
  - Inspection of underwater assets, including; intake tower gates & screens, water quality sensors & instrumentation

Hastings Water Supply Scheme

- Water is pumped from the Hastings River without water treatment
- Water pumped from the river is used to fill two off creek storage dams at Port Macquarie & Cowarra
- Monitoring & control of the environmental impact of river pumping





Port Macquarie Off-Creek Storage Dam

- Port Macquarie Dam, 2,500ML
- Constructed in 1978 by NSW Public Works
- Maximum water depth of 16 metres
- Concrete Intake Tower with 4 gated windows
- Intake Tower access only available via boat
- Submerged mixer unit attached to tower
- Submerged aeration line, anchored to dam floor

Port Macquarie Off-Creek Storage Dam

Port Macquarie Off-Creek Storage Dam – 2,500ML

Downstream Development of Port Macquarie Dam

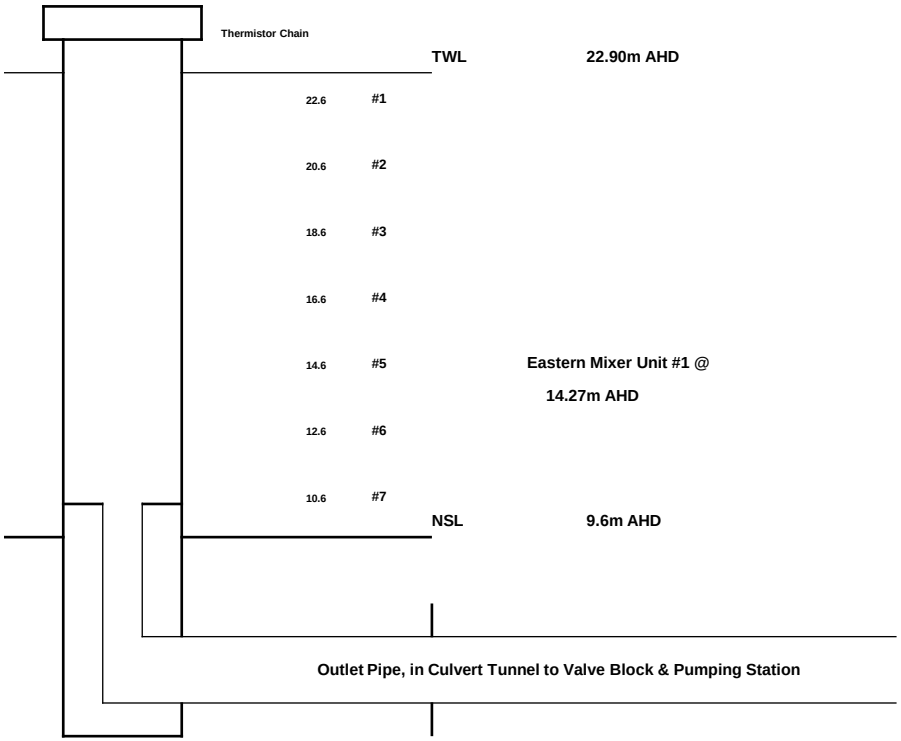

PIT ENTRY INSTRUCTIONS

Port Macquarie Dam Intake Tower

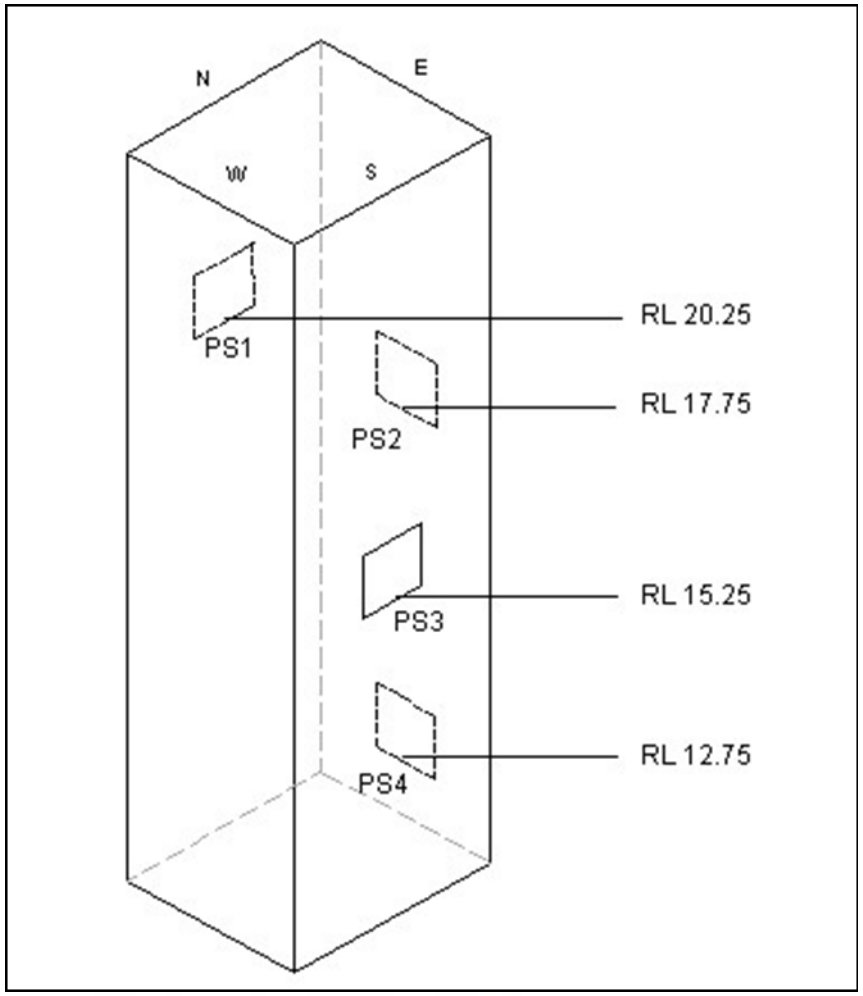
PORT MACQUARIE HASTINGS

PORT DAM - INTAKE TOWER

Top of Dam Wall	25.60m AHD
Top of Saddle Dam Wall	24.70m AHD
Top of Tower	23.87m AHD
TWL	22.90m AHD
NSL	9.6m AHD



1. Mixer Unit operates continuously
2. Aeration system operates daily from 12 midnight to 5am



Dam Emergency Incident – 9th December 2010

- 8am Thursday 9th December 2010, SCADA Alarm alerts Dam Operator to flooding in Port Macquarie Dam Outlet Tunnel
- 8:10am Dam Operator attends site to discover loud noise of water running to drain inside outlet tunnel
- Visual inspection of the tunnel from entry hatch confirmed water in the base of the tunnel & very loud noise of water escaping under pressure
- 8:15am Dam Operator advises Water Supply Manager & Dam Safety Emergency Notification Plan implemented to advise/notify/seek advice from NSW DSC, advise/notify LEMO & SES Controller

Port Macquarie Dam Safety Emergency Plan

Notification for Evaluation of Conditions other than Flooding or Earthquake

Emergency Condition	Threat of Dam Failure	Actions	Organisation	Position	Contact	Phone (Business Hours)	Phone (After Hours)
Protection Alert Damage may be visible but not serious enough to cause immediate failure of the Embankment, including: - Increased Seepage - Increased Seepage turbidity - Embankment Slump - Increase in Pore Pressure - Embankment Crack	No	Activate Protection Alert Advise UWMA&A Decide: Is there an imminent threat of failure?	Port Macquarie - Hastings Council	Water Supply Manager	Murray Thompson	Ph: (02) 6581 8563 E-mail: murray.thompson@pmhc.nsw.gov.au	Ph: (02) 6582 1995 M: 0418 652 611 Pager: 132222 (quote pager no. 52557)
				Operations Engineer	Robert Scott	Ph: (02) 6581 8533 E-mail: robert.scott@pmhc.nsw.gov.au	Ph: (02) 6586 4542 M: 0418 425 663 Pager: 132222 (quote pager no. 52557)
		Notify SES of Assessment of the dam Monitor Conditions of Dam and advise NSW DSC & DC Dams & Civil	UWMA&A	Manager Dam Safety	Paul Heinrichs	Ph: (02) 8281 7736 E-mail: paul.heinrichs@dwe.nsw.gov.au	Ph: (02) 9416 2753 M: 0419 464 762
		Monitor situation	NSW DSC	Executive Engineer	Norm Himsley	Ph: (02) 9895 7349 E-mail: norm@damsafety.nsw.gov.au	Ph: (02) 9498 6166
		Technical Support	DC	Principal Engineer	John Lenehan	Ph: (02) 9372 7819 E-mail: john.lenehan@commerce.nsw.gov.au	Ph: (02) 9872 3409 M: 0411 156 338
Red Alert Dam failure in progress or severe damage such as: - Major change to any of the above conditions outlined for a Protection Alert - Seepage through Embankment - Seepage through abutments - Cracks in Concrete Structures - Major Movement of Outlet Works Tunnel	Yes	Activate Red Alert Advise Port Macquarie SES Local Controller Advise UWMA&A Advise DSC Executive Engineer	Port Macquarie - Hastings Council	Water Supply Manager	Murray Thompson	Ph: (02) 6581 8563 E-mail: murray.thompson@pmhc.nsw.gov.au	Ph: (02) 6582 1995 M: 0418 652 611 Pager: 132222 (quote pager no. 52557)
				Operations Engineer	Robert Scott	Ph: (02) 6581 8533 E-mail: robert.scott@pmhc.nsw.gov.au	Ph: (02) 6586 4542 M: 0418 425 663 Pager: 132222 (quote pager no. 52557)
		Notify LEMO Notify Port Macquarie Police Activate Hastings Local Flood Plan Activate Ocean Drive Manufactured Home Estate, Emergency Evacuation Plan Notify Local Media	Port Macquarie SES	Local Controller	Ray Richards	Ph: (02) 6583 2322	Ph: (02) 6582 1444
		Monitor Conditions of Dam and advise NSW DSC & DC Dams & Civil	UWMA&A	Manager Dam Safety	Paul Heinrichs	Ph: (02) 8281 7736 E-mail: paul.heinrichs@dwe.nsw.gov.au	Ph: (02) 9416 2753 M: 0419 464 762
		Emergency Management Notify Local Media	Port Macquarie Police	LEOCON	Paul Fehon Commander Superintendent	Ph: (02) 6583 0133 (all hours) E-mail: feho1pau@police.nsw.gov.au	M: 0408 605 090
		Emergency Management in Port Macquarie - Hastings Council local area	Port Macquarie - Hastings Council	LEMO	Steve Finlay	Ph: (02) 6581 8111	
		Monitor situation Notify Chairman DSC Notify Minister	NSW DSC	Executive Engineer	Norm Himsley	Ph: (02) 9895 7349 E-mail: norm@damsafety.nsw.gov.au	Ph: (02) 9498 6166
		Technical Support	DC	Principal Engineer	John Lenehan	Ph; (02) 9372 7819 E-mail: john.lenehan@commerce.nsw.gov.au	Ph: (02) 9872 3409 M: 0411 156 338

Dam Emergency Incident – 9th December 2010

- 8:30am Dam Intake Tower accessed by boat & all window gates closed, with water leakage in the Outlet Tunnel being continuously monitored
- 8:45am Dam Pumping Station isolated & scour activated on outlet pipeline
- 9:00am water leakage in Outlet Tunnel reduced and noise of escaping water also greatly reduced
- 9:30am all isolations confirmed & confined spaces entry made inside Outlet Tunnel by PMHC staff
- 9:30am into the unknown the brave few proceeded with some caution & great deal of apprehension !!!!!

Broken PVC Pipeline ???

Dam Emergency Incident – 9th December 2010

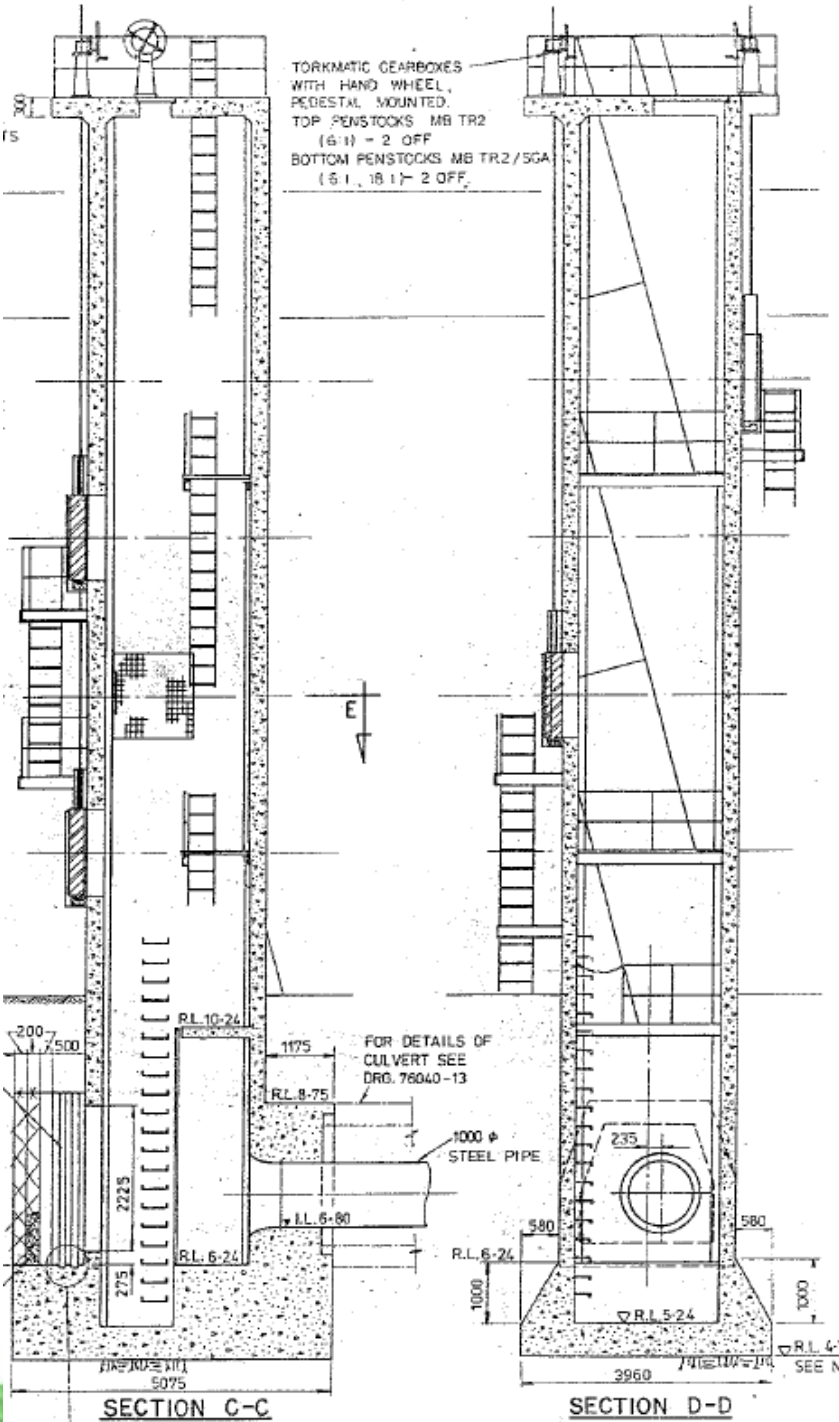
- Work-as-Executed drawings checked for details of the leaking PVC pipe, to confirm an appropriate repair methodology & discussed with NSW DSC,
- PMHC immediately completed temporary repairs inside the Outlet Tunnel to cap-off the PVC pipe,
- Recommissioned Intake Tower & Pumping Station to maintain water supply to Port Macquarie,
- Maintained regular contact and provided regular updates to NSW DSC, LEMO & SES, and
- Arrangements made to complete underwater investigation and permanent repairs asap with AquaLift Diving Team

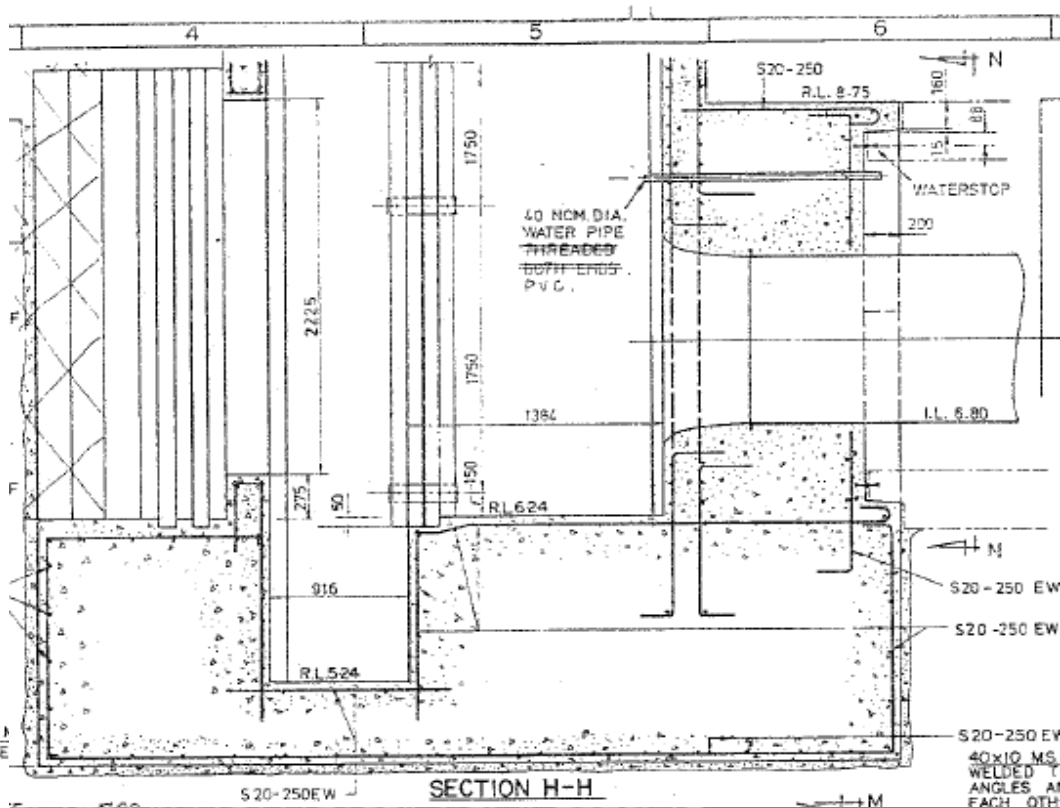
Port Macquarie Dam
WAX Drawings

PORT MACQUARIE HASTINGS

Intake Tower Cross Sections

Indicating 40mm dia water pipe PVC from base of intake tower into the outlet tunnel



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DANG
EMERGE
ISOLAT
CRANE

Dam Emergency Incident – Follow Up !!!!

- Work-as-Executed drawings updated to recorded capped-off pipework and removal of 40mm dia PVC water line from Intake Tower into Outlet Tunnel,
- Incident Report completed and submitted with photographs to both NSW DSC and local LEMO,
- Debrief held with PMHC staff involved with the Incident Management and Repair activities, and
- Diving inspection programme updated to include future underwater inspections of the capped-off PVC pipework inside the Intake tower

PURE H_2O NEEDS OXYGEN

The Air Curtain

Introducing a curtain of air into the lower levels of a catchment will boost dissolved oxygen levels, limit seasonal turnover and reduce treatment costs.

When considering installation of an Air Curtain to improve water quality within large storage structures, three key issues should be addressed in the design phase.

1. Water should be efficiently aerated from the lower levels without disturbing existing sediments.

2. The structure should be simple to build and cost effective to maintain.

3. A proven design should be followed.

As in the design of potable water storage tanks, many mistakes are continued rather than eliminated due to the absence of accurate working knowledge amongst planners, designers and constructors.

DBS and Aqualift® have inspected, rectified and constructed many air curtain systems with proven results.

Our specialised diving background understands the performance of materials and equipment in a submerged environment that is often overlooked by land based designers.

The DBS designed Air Curtain creates a natural mixing of oxygen throughout the surrounding water.

A simple but effective system that ensures pure water and healthy marine life.

The Air Curtain was designed to prevent reservoir oxygen depletion and algal problems produced by Thermal Stratification.

Since the late 18th Century, the phenomenon of thermal stratification has been recognised by water supply engineers as one of the main reasons for deterioration of water quality in reservoirs.

Water tends to stratify into warm water near the surface and cold water lower down. The top water (epilimnion) is mixed freely by the wind and oxygenated from contact with the atmosphere, but normally only extends to a depth of 3 - 6 metres. Below this depth, the denser, colder water (hypolimnion), which may represent up to 85% of the reservoir volume, is cut off from contact with the atmosphere, and becomes stagnant and oxygen-deficient.

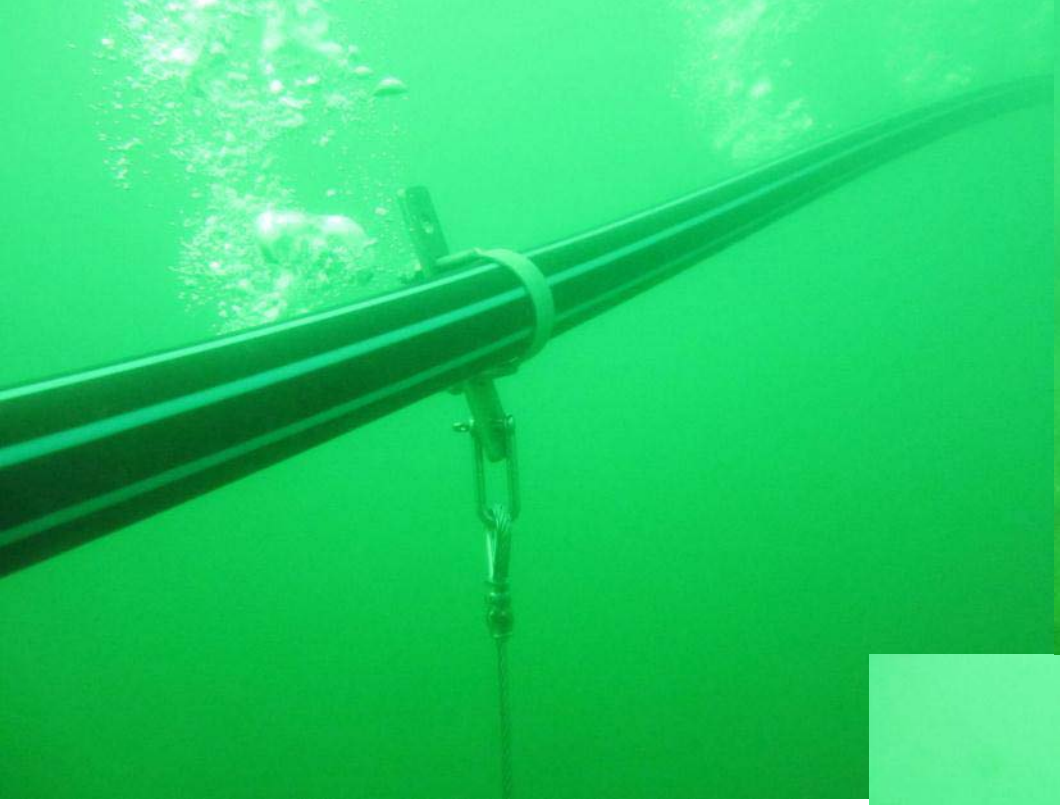
The DBS Air Curtain will alleviate the following problems associated with thermal stratification:

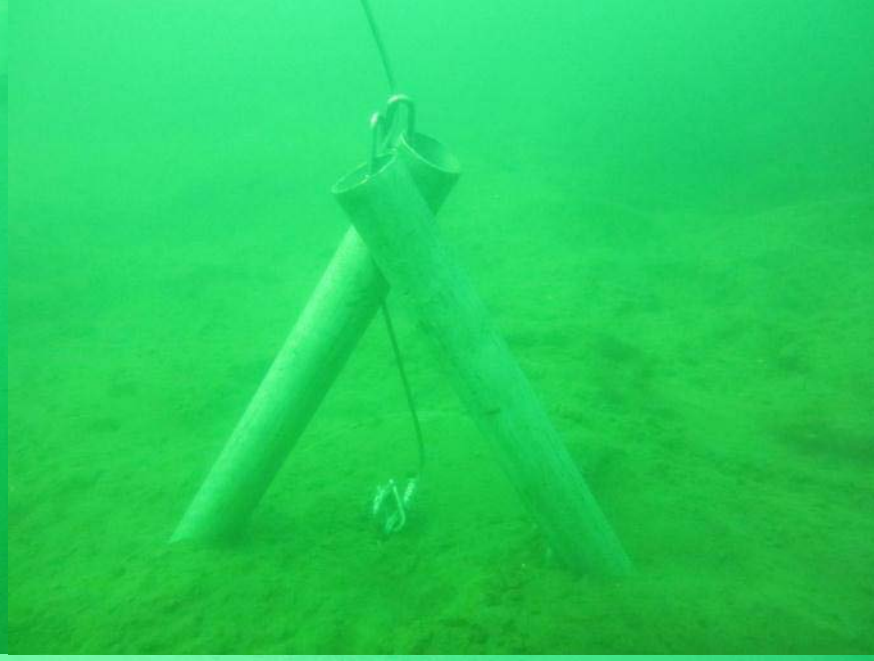
- Increased algal growth.
- Unpleasant tastes and odours.
- Rapid corrosion of metals and cements.
- Increased temperature and evaporation of the epilimnion.
- Uptake of dissolved iron and manganese leading to water staining.
- Undesirable nutrient build up and relative decline of desirable organisms.

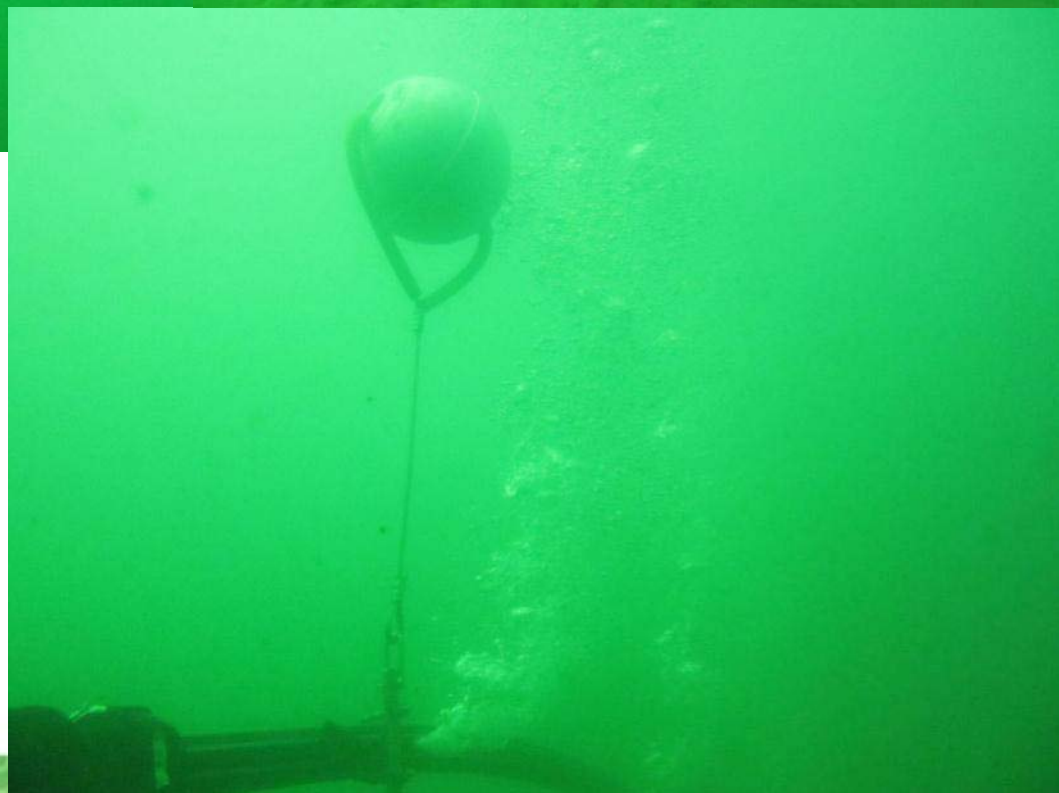
DBS Diver Based Solutions Pty Ltd

DBS: *Intelligent Solutions Clear Results*
123 Nambucca Crescent Pimpama Queensland 4209 • Email david@aqualift.com.au • Ph 07 5546 6680 Fax 07 5546 7002


GVM 10500 kgs
TARE 5500 kgs
GCM 16000kgs





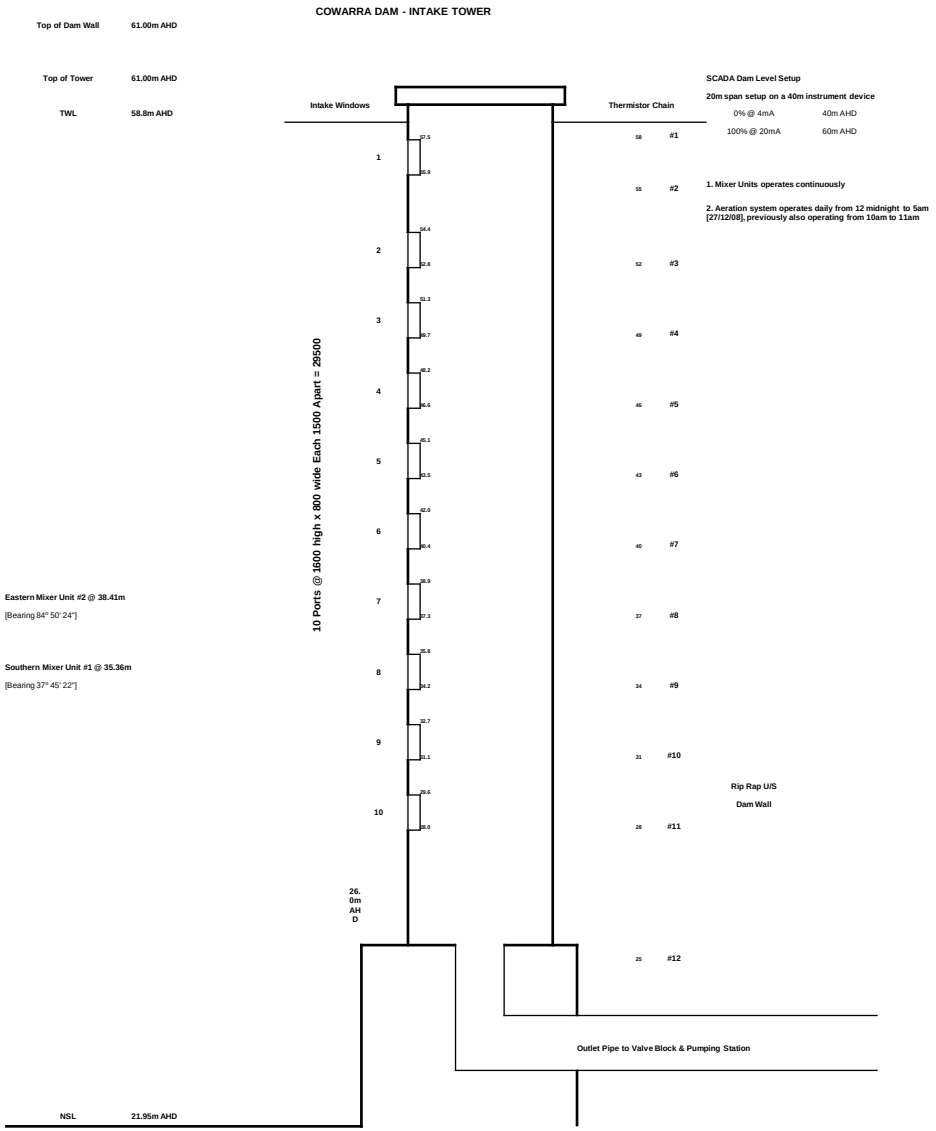


- New aeration line, with s/s clamps & cable
- Immediate floats for buoyancy &
- Permanent anchors points for water sampling locations

10,000 ML Cowarra Off-Creek Storage Dam

Gypsum Application Using Spray Unit

Cowarra Dam Intake Tower



PORT MACQUARIE HASTINGS

Submerged Aeration System & Mixer Units on Intake Tower

Submerged Aeration System & Mixer Units on Intake Tower


07/02/2005


MERCURY

Thank You & Questions

Acknowledgements to;

- Port Macquarie-Hastings Council,
- AquaLift Diving, and
- Paul Heinrichs