


Mine water recycling East Kimberley, Western Australia

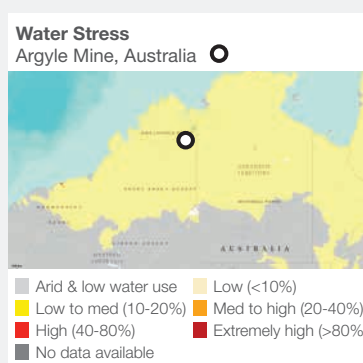
water scarcity impact

| | |
|------------------------|---|
| Reduced withdrawal | ● |
| Reduced consumption | |
| Improved water quality | |
| Increased productivity | ● |
| Net basin benefit | |




volumetric impact
3 492 000m³/yr

capital cost
\$4 500 000 

estimated unit cost of water
10¢/m³ 



Water Stress Map:
Gassert, F., M. Landis, M. Luck, P. Reig, and T. Shiao. 2013. "Aqueduct Global Maps 2.0."

Confidence level
 Low  Medium  High

Water Scarcity Impact Key
 Main  Minor

Credits
We wish to acknowledge the input of Mr Peter Firth of Argyle Mine in the preparation of this case study.

Project Overview

Rio Tinto's Argyle Mine is located in the East Kimberley region of Western Australia. The mine consists of an open pit and underground development project, processing plant, two accommodation villages, an airport and ancillary facilities. The Argyle Mine is located upstream of Lake Argyle which is a RAMSAR listed site; a wetland of international importance.

In 2006, during a proposal to expand the facility, the Argyle Mine identified significant water losses in their Tailings Storage Facility (TSF). The expansion provided the opportunity to change how water is managed on site and initiated a series of site interventions to reduce the amount of freshwater abstracted from Lake Argyle and replace it with lower quality water mainly abstracted from mine dewatering activities.

The total water withdrawn from Lake Argyle has been reduced from 3 645 000m³ in 2005 to 153 000m³ in 2011. This has created an increased margin between water supply and demand in the basin and additional water availability for other users. Argyle Mine's long term target is zero draw from Lake Argyle.

Key Elements

- Construction of two dams to collect lower grade water from mine dewatering activities and rainwater harvesting.
- Water recycling in the washing process through the use of a retention pond.
- Consultation with traditional owners on water management issues.
- The Project was financed by Rio Tinto as part of a programme to transform operations from surface to underground mining.

Key Outcomes

- 96% reduction in water abstraction from Lake Argyle from 3 645 000m³ in 2005 to 153 000m³ in 2011.
- Recycling of 40% of Argyle Mine water.
- Reduction in costs of pumping water through 35km of pipeline from Lake Argyle to the mine site and the associated reduction in energy consumption and the corresponding greenhouse gas production.
- More sustainable water supply for the community including the Ord Dam Hydropower plant, the Ord River irrigation area and the Kununurra town site and surrounding communities.



East Kimberley, Australia

Intervention Features

- Wastewater reuse in mines
- Rainwater harvesting

Project Levers

(1) Mine dewatering and rainwater harvesting:

The Argyle Mine expansion of a 400m deep underground pit has allowed for the abstraction of water from the pit into two dams constructed by Rio Tinto (Gap dam and Jacko's dam). The water is turbid with elevated levels of sulphate, iron, magnesium and calcium. The dams also allow for the collection of rainwater to be used throughout the mining process. Rainwater collection accounted for over 3 000 000m³ of water required on site in 2012 whilst dewatering of the underground pit accounted for more than 4 000 000m³.

(2) Water recycling at processing plant:

The biggest user on site is the processing plant where the ore is washed and separated from the tailings. A retention pond has been installed to receive the process water and feed recycled water back through the processing plant. This process pond has resulted in the recycling of 40% of Argyle mine's water. Construction of a sump in Upper Gap Creek was implemented in order to catch any water lost from the process plant or the drainage system.

(3) Consultation with traditional owners:

The Argyle mining lease area is located in the traditional country of the Miriwung, Gidja, Malignin and Woolah peoples. A Traditional Owner relationship committee comprising 26 Traditional Owner representatives and four Argyle Mine representatives has been set up and meets quarterly. The committee jointly monitors key activities including water management issues that may have an impact on the nearby springs that are sites of particular cultural significance to Traditional Owners. An annual inspection also takes place to provide assurance that water efficiency and water quality at the site are being maintained.

Outcomes and Challenges

The Argyle Mine has contributed to an increased sustainability of water supply to the community by reducing its consumption of Lake Argyle water from 3 645 000m³ in 2005 to 153 000m³ in 2011. This has allowed additional water availability for the Pacific Hydropower plant, the Ord River irrigation area and the Kununurra town site and surrounding communities. This benefit was highlighted in 2010 as the prior wet season did not produce enough runoff to fill dams to capacity.

As a result the Shire of Wyndham East Kimberley was on the verge of having to implement water use restrictions. If the Argyle Mine was still consuming water from Lake Argyle to similar quantities it was using in 2005, it was likely that this would have impacted on the amount of water available in Kununurra town and surrounding communities and therefore it is likely that the water restrictions would have been enforced. Pressures on the Lake Argyle water supply will increase further when the Ord Stage 2 irrigation project is completed in 2013 emphasising the importance of the Argyle Mine intervention.

The Argyle mine continues to use water from the basin through its groundwater abstraction and thus the value of the intervention arises from the transfer of the mine demand from a stressed surface water resource to a lower quality groundwater resource. Ongoing monitoring is taking place to ensure that other groundwater sources are not negatively impacted by the mine.

The \$4.5m investment included the cost to construct the process retention pond as well as the 7km pipe and pumps required to return the water to the process plant. This has resulted in the recycling of 40% of the water used at the mine. Costs of pumping water have also been reduced by \$150 000/yr.



Above: Lake Argyle Western Australia (© Veronica Wools | Dreamstime.com)