

All is Not Golden

What is Acid Mine Drainage (AMD)?

Acid Mine Drainage (AMD) is generated when sulfidic rocks, such as pyrite (ie. iron sulphide) from some types of mining are exposed to water and oxygen in the surface environment rather than being isolated as crystalline rock underground. Above ground in the surface environment, the sulphides react with water and oxygen to form sulfuric acid – which in turn dissolves extreme concentrations of salts and metals, including potentially copper, arsenic, nickel, cadmium, zinc, aluminium, iron and many more. These heavy metal ions are moved into ground water or surface water where they cause further pollution.

Acid Mine Drainage in Australia?

Once started the ongoing release of pollutants from oxidation of sulphides is a persistent and severe source of pollution that persists long after mining ceases. In Australia there are a number of historic closed sites which continue to pollute waterways and are undergoing rehabilitation. The Rum Jungle mine site in Northern Territory, Captains Flat mine site in NSW, Mt Lyell in Tasmania and Mt Morgan in Central Queensland are in various stages of rehabilitation.

What impact has Acid Mine Drainage had on the Dee River and Callide catchment?

Over decades the sulfuric acid and dissolved iron from the Mt Morgan Mine's long history has caused AMD, which has impacted the waterway health of the Dee River and the Callide Catchment. Even though the mine has been officially closed since the early 1990s, there remains a large tailings pond onsite which continues to impact the downstream environment.

Waterways which are polluted by AMD will have a lower pH than usual, impacting chemical and biological processes in the water. The pH of AMD impacted waterways can vary from a relatively neutral 6 to a highly acidic 2. This acidic water can impact aquatic organisms and have a significant detrimental impact on the ongoing biodiversity of a site. Downstream of the Mt Morgan Mine, the Dee River, AMD continues to impact the aquatic ecosystem for some kilometres.

Mt Morgan Mine



Gaangalu Nation people are the Traditional Owners of the lands the Mt Morgan mine sits on.

Mount Morgan was founded as a gold mining town in 1882 with its mining operations continuing until November 1990. It was the largest gold mine in the world in the 19th and early 20th centuries with about 250 tonnes of gold and 260,000 tonnes of copper extracted from the mine, with about 134 million tonnes of waste rock and tailings generated.

"Source, Queensland Government.

Before the Mt Morgan mine closed in 1990, the town was home to some 15,000 people. At one time, Mt Morgan had 27 hotels. Wealth from the Mount Morgan mine funded Persian oil exploration, establishing the Anglo-Persian Oil Company, which became BP in 1954.

The Mount Morgan mine remains an area of historical interest. About half of the site is listed on either the Queensland Heritage Register or the National Trust of Australia (Queensland) Register. The site includes Fireclay Caverns excavated between 1906 and 1927 for clay to supply local brick making. Fossilised dinosaur footprints and trackways were discovered in the limestone ceiling of the caverns in the 1950s.





Impacts on the ecosystem

The acidity of AMD impacted waterways can be around a pH of 2 and while humans can consume limited quantities of beverages with a high acid content, the story is more complex for aquatic organisms. The level of acidity of water can increase the toxicity of dissolved metals to organisms. For example, some dragonfly larvae might not be able to survive due to metal poisoning whilst reproductive capacity of smaller organisms might be reduced. Aquatic plants are also affected, and this can result in less biodiversity that can support a healthy system.

Don't be deceived as AMD waters can be quite beautiful and range from crystal clear blue water to hues of oranges and reds.

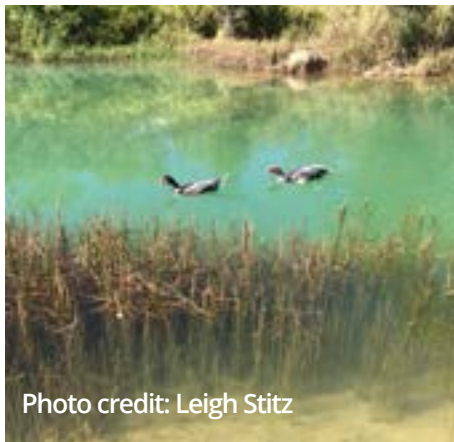


Photo credit: Leigh Stitz

References:

Mt Morgan Fact Sheet: <https://www.mountmorgan.org.au/Home>

Queensland Government: <https://www.qld.gov.au/environment/land/management/abandoned-mines/remediation-projects/mount-morgan>

Is it possible to see improvement in water quality in future?

The Queensland Government manages the legacy issues of the Mt Morgan mine, following its decommissioning in 1991. During the past two decades, works have been undertaken to try and reduce the pollution, such as seepage interception from leaking waste rock dumps, a water treatment plant to treat the highly acidic water which had accumulated in the former open cut and evaporators to decrease mine pit water levels.

In 2023 Heritage Minerals announced they would be mining the tailings (waste spoil) at Mt Morgan Mine. Part of the project will include remediation works which will improve the downstream water quality in the future. However, it is anticipated that water quality issues will continue to impact the Dee River for decades to come.



Photo credit: Leigh Stitz

The pH Scale: common comparisons

For comparison, the following list provides the pH of known acid items compared to Acid Mine Drainage impacted water.

- Acidity of freshwater: 7
- Acid Mine Drainage impacted water: 2 to 6
- Cola Drinks: 2 to 3
- Stomach acid: 1 to 2
- Lemon: 2

