



## A COMMERCIAL APPLICATION OF VIROMINE™ TECHNOLOGY

### CASE STUDY: THALANGA COPPER MINES HIGHWAY REWARD MINE SITE

*“Following treatment using ViroMine™ Technology  
water at the contaminated sites was improved to  
stock water quality within 24 hours...”*



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*The Highway Reward mine pit.*

**PROBLEM**

At the Thalanga Copper Mine's Highway Reward mine site in central Queensland, Australia, there are several problems with acid rock drainage (ARD). During the wet season sedimentation ponds around the site are unable to cope with the large quantity of water that needs to be treated to livestock drinking water quality standards before being discharged into the local environment.

**VIROTEC TOTAL SOLUTION**

The application of Virotec's solution resulted in treated water with a quality that was better than local discharge guideline standards.

ViroMine™ Technology used in this treatment was Acid B™ reagent, which is designed to neutralise acidity in the water and bind metals in non-bioavailable, chemically inert forms without producing the large volumes of unstable sludge typically associated with lime-based treatments.

ViroMine™ Technology converted the contaminated water into a reservoir of clean water by simultaneously extracting the contaminants, and creating and maintaining an isolating blanket over the tailings that had settled at the bottom of the pond. The isolating blanket prevented the escape of contaminated pore water interfering with the treatment of the surface water.

The ViroMine™ Technology solution components included design, engineering, trial application and ongoing monitoring. The solution was ideally applicable to the situation; both as an ongoing treatment for process water and as a simple, rapid response to heavy rainfall events at the Highway Reward site.



*One of the contaminated sediment ponds at Thalanga.*

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*An aerial view of the Highway Reward mine site.*

**BACKGROUND**

Virotec was approached by Thalanga Copper Mines, part of the Indian Sterlite group, to carry out treatment of contaminated water at the Highway Reward mine site that includes two interconnected open cut mines 35km south of Charters Towers. Highway Reward had an original resource of 1.2mt and will be mined to a final depth of 210m from the surface.

A by-product of the mining operation is mine waste rock which has high sulphide mineral content and is capable of generating substantial quantities of acid. The mine has many problems with acid mine drainage. During the wet season sedimentation settling ponds around the site were unable to cope with the large quantity of water, which needed to be treated to stock water quality standards before being discharged into the local environment. In the past, the dams were treated with lime to increase the pH to discharge levels and reduce metal concentrations. However, the metal concentrations still exceeded discharge limits and Thalanga Copper Mines had to get around this by diluting the contaminated water with rainwater during heavy rainfall events.



*The tailings dam at Thalanga.*

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*During Australia's wet season the mine's sedimentation ponds are unable to cope with the large quantities of water generated.*

When underground mining commenced, large quantities of mine water needed to be pumped to the surface; this water was collected in an old tailings dam. In the view of onsite personnel, the volume of water being pumped from underground would have soon exceeded the capacity of the tailings dam and they anticipated the need to release water all year round. During the dry season Thalanga Copper Mines did not have the benefit of being able to dilute the water before release and therefore another method for treatment was required. As an interim step, the mine was also considering raising the dam wall to provide a greater holding capacity.

ViroMine™ Technology has many advantages over other technologies, especially in soil/rock amendment for the revegetation of acidic waste rock dumps. As demonstrated in many field trials, Acid B™ reagent blended with the rock/soil will sustain a strong plant growth without the need to place additional topsoil. The used Acid B™ reagent from water treatment can therefore have a secondary use at the Highway Reward site as a soil amendment media, adding significantly to the value of the product.

#### TREATMENT METHODS

After extensive testing and monitoring of the site water quality, a suitable reagent was developed and applied. Acid B™ reagent, a ViroMine™ Technology, was chosen for this treatment. During a two-week period, onsite tests were performed on several contaminated water sources around the Highway Reward mine site to demonstrate the capability of ViroMine™ Technology.

Acid B™ reagent was prepared in a 1,000 litre mobile bulk test plant and sprayed onto the surface of the four contaminated ponds. The good dispersion properties of this reagent ensured that there was an even coverage. The treatment produced an extremely thin and dense sediment that subsequently acted as a passive barrier for treatment of further ingress of acid rock drainage water inflows.

The *in-situ* treatment method used involved no expensive capital infrastructure and a simple application procedure (see figure overleaf).

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*The ViroMine™ Technology reagent was applied by a simple direct addition method as in the example shown above.*

**RESULTS**

Following treatment using ViroMine™ Technology, water at the contaminated sites was improved to stock water quality within 24 hours, with one water body achieving aquatic eco-system standards within one hour. Results achieved during the period show high metal removal efficiency plus acid neutralisation that produced water to satisfy local discharge standards.

*Table: Examples of heavy metal concentrations and acidity before and 24 hours after treatment with ViroMine™ Technology (all values in mg/L).*

Parameter	Tailings Dam		Open Cut		Contractor's sediment dam	
	Before	After	Before	After	Before	After
pH	5.78	8.08	4.24	7.87	3.61	8.9
Cu	2.4	<0.1	76	<0.1	188	<0.1
Cd	0.11	0.02	0.39	0.04	0.42	<0.01
Zn	13.7	0.4	77	0.4	30	<0.1
Pb	0.2	<0.2	0.6	<0.1	<0.1	<0.1

**CONCLUSION**

ViroMine™ Technology has proven to be applicable for the treatment of heavy metal and acidity problems associated with acid mine drainage and tailings dams.

Acid mine drainage water and contaminated tailings dams can now be economically treated to strict environmental standards.