

## Red Mud

*Red mud is the fine-grained residue left after alumina has been extracted from bauxite at the Queensland Alumina Limited (QAL) refinery.*

### What is red mud?

Bauxite residue material is the by product of the Bayer process, an industrial chemical process for refining aluminium containing ores (bauxites) into alumina (aluminium oxide) via digestion with sodium hydroxide (caustic soda).

Alumina is the raw material for production of aluminium metal and also has important uses in the ceramics and pharmaceutical industries.

Bauxite residue material is often described as red mud due to the colour of the original bauxite ore and the iron oxide it contains.

The red mud is separated during the refining process when caustic soda and alumina

solution passes into thickener tanks in the Clarification section. Here, solid impurities sink to the bottom as a fine, red mud.

The red mud is washed several times with water to recover caustic soda. Sea water is then added to neutralise any remaining caustic soda, before being pumped to the Residual Disposal Area (RDA).

### What is bauxite?

Bauxite is the mineral form of aluminium and occurs naturally in the earth's crust. The ore contains around 50 per cent alumina and is formed by the weathering of sedimentary rocks that contain a high proportion of aluminium bearing minerals.

Bauxite at Weipa is located about half a metre beneath the topsoil in a site and is around three to five metres deep, existing in a free-flowing form that makes it easy to dig out. The mineral resembles small red pebbles, called pisolites, averaging about five millimetres in diameter.

QAL's bauxite supplies are mined in Weipa. The bauxite is loaded onto ships and transported 2 000 kilometres around Cape York and down to Gladstone. In the refining process, it takes around two tonnes of bauxite



to produce one tonne of alumina.

### **How is red mud stored?**

Red mud has been stored at the QAL's 1 000 hectare Residual Disposal Area (RDA) at Boyne Island since the commencement of operations in 1967.

The facility consists of Dam 1, which was decommissioned in the 1980s and the current operational Dam 2, constructed in 1975.

The QAL dams are designed applying Australian National Commission on Large Dams (ANCOLD) guidelines, and world recognised engineering standards, in compliance with regional legislative requirements.

## Did you know?

QAL's red mud has been used to treat heavy metals and acid sulphate soils and remediate mine sites in Australia and overseas.

### **How is it treated?**

Red mud from the washing stage in Clarification is alkaline at pH 14. Seawater, at pH 8, is added to the mud to neutralise any residual caustic, reducing the pH of the mud to 8.

The mud is then thickened and deposited in the dam as a slurry from multiple points around the dam perimeter to form drying beaches. The water that drains from the red mud is of similar pH to sea water and is discharged continuously from the RDA into the estuary.

Monitoring within the surrounding dam areas has shown there is no impact to the environment and waterways.

### **How is it monitored?**

QAL works closely with regulatory authorities to ensure that our bauxite residue management processes comply with the respective environmental standards.

The Department of Environment and Resource Management (DERM) conducted a site inspection and risk assessment of QAL's red mud dam in September this year, with the integrity of the dam a major focus.

Following this review, departmental engineers were satisfied that the dam wall is well designed and the risk of failure is low.

The dam is inspected daily by specialised dam operations staff that are trained to recognise conditions that could compromise dam integrity, or indicate that an unsafe condition is developing.

The dam is also inspected annually by an independent dams design expert, to check structural integrity.

The water quality at the facility is routinely monitored by QAL and in addition, the Port Curtis Integrated Monitoring Program



(PCIMP) group undertakes additional independent monitoring in the surrounding estuarine waters.

Dam 1 was recommissioned in 2010 and in the future both areas will be joined and walls constructed utilising the upstream method.

### What is the future for the dam?

QAL is currently implementing a 50 year disposal strategy to increase the dam volume without increasing the dam's footprint.

Utilising the 'upstream' methodology, existing mud in the area is thickened to a higher solids concentration and 'recycled' for use constructing new internal dam walls within the existing outer walls.

This enables the walls to be revegetated as they are progressively raised, to blend in with the natural surroundings.

In 2007 a neutralising facility was constructed as an integral component of this new disposal method.

The facility works to neutralise the red mud by mixing it with additional seawater and thickening it to a higher solids concentration (approximately 27 per cent solids) than what was previously pumped to the dam (less than 10 per cent solids).

The red mud is then dried using a combination of solar drying and mud farming techniques to achieve a density of 70 per cent solids around the edge, whilst the remainder of the dam dries to 60 per cent solids.

The higher solids concentration around the edge of the dam enables new walls to be progressively built on top of the existing red mud surface.

### Need further information?

This information sheet is designed to provide answers to what we believe will be some commonly asked questions. However, if you have any other questions or would like to speak with someone directly, please call 1800 181 110.

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### About QAL

Queensland Alumina Limited (QAL) commenced operation in March 1967 with an annual production rate of 600 000 tonnes of alumina.

Today QAL is one of the world's largest alumina refineries, producing 3.95 million tonnes of the world's best smelter grade alumina per year. With an average workforce of 1 050 employees, QAL is the region's largest employer and annually contributes approximately \$400 million directly to the local economy.