Exploration: 
the People and the Mines

by

Tony Hope
Murray Basin Joint Venture
1998 Drilling
Exploration Licence 5474
Bemax Resources N.L. 50%
(operator)
Imperial Mining (Aust) Pty Ltd 25%
Probo Mining Pty Ltd 25%
A.R. Hope January 4, 1999
Ginkgo Mineral Sands Project
Bankable Feasibility Study
Executive Summary
February 2002
Plate 3.1. The Aboriginal field crew who participated in the Ginkgo archaeological survey. From left to right: Junette Mitchell, Philip Lawson and Lotty Williams.
Arumpo Bentonite

BROWNS CREEK GOLD N.L.
ARUMPPO BENTONITE PROJECT
Location Map
ARUMPO!

THE BIGGEST NATURAL DEPOSIT
OF KITTY LITTER IN THE WORLD...

AND NO PRIOR CLAIM!
<table>
<thead>
<tr>
<th>SAMPLE INTERVAL METRES</th>
<th>SAMPLE WIDTH METRES</th>
<th>MONTMORILLONITE %</th>
<th>MOISTURE</th>
<th>Ph</th>
<th>SWELLING VOLUME ml/2g</th>
<th>CEC (NH₄)</th>
<th>EXCHANGEABLE CATIONS</th>
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<td>0 - 0.80</td>
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<td>77</td>
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<td>7.0</td>
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<td>85</td>
<td>34.4</td>
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<td>9.5</td>
<td>76.9</td>
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<td>&gt;99</td>
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<td>100.2</td>
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<td>Mg 17.9 Na 32.3</td>
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<td>WEIGHTED AVERAGE</td>
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<td>87.5</td>
<td>Mg 48.6 Na 32.3</td>
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**MC 130E TEST CUT**

- **CLAY**, red brown
- **CLAY**, mottled red, brown clay and cream gritty bentonite.

**METRES**

- (bentonite 40%)
- (bentonite 75%)
- (bentonite 90%)

- **BENTONITE**, light cream green, pitted texture slight grit.
- **BENTONITE**, light cream green, high purity with strong lustre on fracture surfaces.
- **BENTONITE**, mottled, darker cream green, light to dark olive brown to chocolate brown, high purity with lustre on fracture surfaces. Some 2-3 mm sandy bands, trace oxidised heavy mineral.
- **BENTONITE**, grey to olive brown clay, gritty with trace black heavy minerals.
- **SAND**, fine, white to orange in part.

**VERTICAL SCALE METRES**

**AUSTRALIAN ENVIRONMENTAL RESOURCES NL**

**ARUMPO BENTONITE SECTION**

**MC 130E**

ARUMPO BENTONITE PROJECT, NSW
BULK SAMPLE PIT
PLANNING FOCUS MEETING ON SEPTEMBER 29, 1993

From left to right:
Harvey Johnston - National Parks and Wildlife Service
Ken Mansell - Citrus grower
Howard Clay - Shire Engineer, Wentworth Shire Council
Robin Baird - Environment Protection Authority
Stephen Harding - General Manager, Wentworth shire Council
Don McKinnon - Mayor, Wentworth Shire Council
Tony Hope - Arumpo Bentonite Pty Limited
David Harris - Department of Water Resources
Keith Chilman - Senior Inspector of Mines, Department of Mineral Resources
Debbie Tkachenko - Total Catchment Management Committee
Ken Sue - Pastoralist, Arumpo Station
Jo Gorman - National Parks and Wildlife Service
Ted Lowe (seated) - Department of Conservation and Land Management

Photographer: Stan Goodman - Regional Inspector of Mines, Department of Mineral Resources
Bentonite can hold up to 15 times its weight in water

An absorbing material

It seems that the Murray Valley was going to have a new problem related to clay. Bentonite, a soft, highly plastic clay with valuable swelling and sealing properties, has been used overseas to line earth water storages and canals to minimise seepage into the water table, to line toxic waste storage facilities and to condition soil in sandy loams.

The problem of seepage across the Murray has been an important issue for many years.

Bentonite is described as a soft, highly plastic clay with valuable swelling and sealing properties, and is used for many different purposes, depending on the application.

The major traditional uses of bentonite are in sewage management, as a binding agent in concrete, as a filler in paints, as a thickening agent in food products, and as a filter aid in pharmaceuticals.

Bentonite is made from finely divided volcanic ash, which is sourced from a variety of locations around the world.

In Japan, bentonite is used as a water filter, and in Europe, it is used as a water treatment agent.

In the Murray Valley, bentonite has been used to help reduce seepage and maintain water levels in canals.

The project is not expected to contribute greatly to the overall soil market - it is a labor-intensive process using traditional technology.

The project is expected to provide benefits to the local community by improving water quality and reducing the risk of flooding.

Bentonite can be found in many different locations around the world, including the USA, Canada, Australia, and Europe.
**Water Storage Sealing**

**Bentonite & Permeability**

Soils of low permeability are needed for water storage construction to reduce seepage loss. Where the local country soil has high or marginal permeability, addition of bentonite can lower the seepage rate and make the material most suitable for dam construction.

Arumpo Bentonite is ideally suited to sealing water storages due to its extremely fine grain size, swell and liquid limit. It has a low permeability which decreases with increased head pressure.

Addition rates of typically 5-15% in the barrier layer when effectively compacted will reduce permeability many times with substantial reduction in seepage loss. The performance of every soil system differs so therefore it's important to know its characteristics and the best addition level of bentonite to use. Tests are available using specialised laboratories.

For further details on permeability of different soils and the effect of Bentonite addition ask for our technical bulletin.

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**A Dam Leak...**

There is nothing more frustrating than to find that the water storage you have built has become a muddy puddle when you most need it. But many dams do just that.

The leak can be most effectively repaired using bentonite to reduce soil permeability and provide a permanent solution.

**Method of Use**

The most effective method of using Arumpo Bentonite for dam sealing is during the construction stage or when the existing dam has been completely emptied.

There are 4 techniques by which Arumpo Bentonite can be incorporated into a dam. These are: mixed blanket, pure blanket sprinkle method, and cut-off wall.

Blanket techniques are the most common with new dams. The particular method used depends also on the local country soil type and its permeability characteristics.

The following are brief descriptions. Ask for our detailed technical bulleting for more information.

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**Mixed Blanket** - Incorporation of bentonite with existing soil by rotary hoe, followed by compaction and a protective layer over the barrier. Typically 5-15Kg/m² is needed to form an impermeable seal. This is the most reliable method and is recommended to be applied during construction or when the dam is empty.

**Pure Blanket** - Application of continuous blanket of Arumpo Bentonite 6-12mm thick overlayed by a compacted protective layer.

**Sprinkle Method** - Broadcast of granular bentonite over water surface area to sink and be drawn into leaking zone. Typical usage rate 10kg/m² of dam floor area.

**Cut-Off Wall** - Specialised technique for sealing horizontal flows by back-filling a trench with a bentonite.

**Dam Entry/Discharge Points** - Arumpo Bentonite can be used in a 30-50% mix to provide an impervious barrier around pipes and similar structures.

**Delivery** - Arumpo bentonite is packed in convenient easy to handle 25kg bags and can also be shipped in bulka bags and in bulk trucks.
Arumpo Stockfeed Bentonite is accessible to most major markets.

Arumpo Stockfeed Bentonite is the best product for inclusion in most feeds. Some of the benefits demonstrated through research are:
- Rumen buffering properties that provide faster adaptation to dietary changes.
- Provides acidosis protection.
- Can protect stock against the affects of feed toxins such as aflotoxin.
- Improves feed pellet quality through its binding capability.
- It also has lubricating qualities that can reduce friction to extend die life.

Arumpo Stockfeed Bentonite is available in fine and granular grades to suit various requirements.

Arumpo Stockfeed Bentonite is extremely high purity and top quality.

Arumpo Stockfeed Bentonite is registered by the Australian Pesticides & Veterinary Medicines Authority as a veterinary therapeutic product: allowing improved adaptation to high concentrate diets and assists in the prevention of acidosis in sheep and cattle. It also guards against the affect on aflotoxins in contaminated grain inadvertently fed to stock.

Arumpo Bentonite is proud of the purity and the quality of its product. Arumpo Bentonite is certified to the exacting requirements of ISO 9001 and also the Good Manufacturing Practice requirements of the Australian Pesticides & Veterinary Medicines Authority.

Safe to use, application rates should be 3-4% of finished feed initially and can be reduced after 3-4 weeks to 1-2%.

There is no with-holding period required as Arumpo Stockfeed Bentonite is a completely natural product.

Packed in convenient and easy to handle 25 Kg packs, it can also be shipped in bulk bags and in bulk trucks for users equipped to handle bulk ingredients.

Arumpo Bentonite’s management team is totally committed to provide courteous and efficient service guaranteeing prompt on-time deliveries with accurate documentation every time.
VIEWS OF THE BROWN’S CREEK MINE, BLAYNEY, N.S.W.

1.—GENERAL VIEW OF THE MINE.
Geotechnical Drill Hole BYD 1, January, 1990.

<table>
<thead>
<tr>
<th>19.0 - 26.0 metres</th>
<th>7.0 metres at 4.97 g/t Gold</th>
</tr>
</thead>
<tbody>
<tr>
<td>from (m)</td>
<td>to (m)</td>
</tr>
<tr>
<td>3.80</td>
<td>10.45</td>
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<tr>
<td>10.45</td>
<td>15.62</td>
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<tr>
<td>15.62</td>
<td>19.00</td>
</tr>
<tr>
<td>19.00</td>
<td>26.00</td>
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SILTSTONE
GRAYWACKE
SILTSTONE, Brecciated
ALTERED SILTSTONE, Dark clay high in Fe and Mn, vein quartz fragments, sulphides.
BROWNS CREEK
EXPLORATION
JOINT VENTURE
BY DEPOSIT
Geotechnical Drill Hole
BYD 3, January, 1990
This book is devoted to people with exploration and mining in their blood, but will also be of great interest for those wanting to learn about the minerals industry and some of its personalities.

Professor Ross R Large
Director ARC Centre of Excellence in Ore Deposits
University of Tasmania.

This is an important record of activities that contributes to the heritage record of the AusIMM, but will also excite young people looking for a career that offers intellectual challenge, travel and adventure.

Peter McCarthy
Chairman, AusIMM Heritage Committee
AusIMM Past President 2007-08

The book is for people who want to know where our minerals come from.

Dr Peter Greenwood,
HonFIEAust, EngExec, FIE, SME, FIA
Former National President Engineers Australia.

4. Chalcopyrite (copper) and pyrite. Parkes NSW.
5. Azurite (copper). Ok Tedi PNG.
7. Gold with magnetite and bismuthinite. Tennant Creek NT.

The general public as well as explorers and students will be keen to read this book.

David Mason, General Manager
Geological Survey of Queensland.

The book covers a period in Australia's history when the mineral resources industry has achieved unprecedented prominence.

Lindsay Gilligan PSM
Former Director, Geological Survey of New South Wales.

Mineral Discoveries
Australia Papua New Guinea
& The Philippines

Anthony R. Hope
THE END